TECHNICAL SPECIFICATIONS

SHKOLLA 9-VJECARE "EMIN DURAKU"

Project Name:

Reconstruction of 9-Year School "Emin Duraku",

Tirana Municipality

Programme Title: *EU4Schools*

Financed by: *European Union EU*

Design Team: *HT Construction (High Tech Construction) Ltd*

Alma Velaj

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Date: 2022.03.09 12:52:32 +02'00'

TIRANA, 2021

TECHNICAL SPECIFICATIONS HVAC

1 Regulation and Standards

1.1 European Regulations

EU 2281	2016	Lot21
EU 327	2011	Lot 11
EU 1253	2014	EU 2014/1253 for HVAC systems
ErP Directive /125/EC	2009	Energy-related Products Directive

European standards

DIN EN ISO 1632	2000	Acoustic – Equipment installation and noise level inside buildings
DIN 4755	2001	Safety for heating systems
DIN EN 303	2003	Heating Equipment
DIN EN 442	2003	Indoor units
DIN EN 12170	2002	Heating and cooling Systems
DIN EN 12828	2003	Health and Safety
DIN EN 13831	2000	Expansion vessels
DIN EN 14336	2002	Installation of heating systems
VDI 2035	1996	Water cooled systems
DIN EN 1057	1996	Copper pipes for HVAC applications
DIN EN 12449	1999	Copper pipe installation
DIN 16892	2000	Polyethylenehigh density pipes (PE-X)
DIN 16893	2000	Polyethylenehigh density pipes (PE-X) for HVAC applications

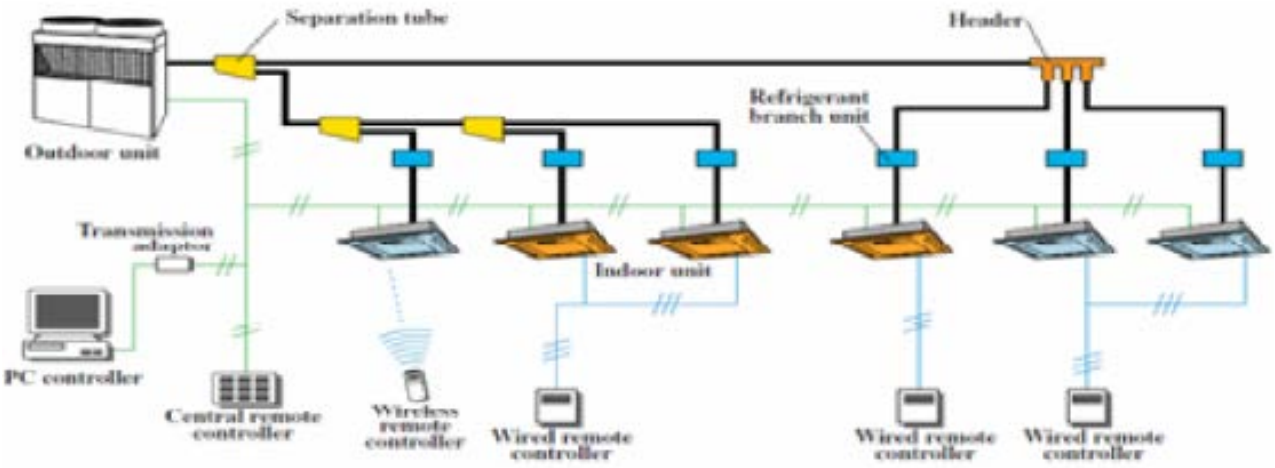
2 General specifications for HVAC systems

2.1 General

After careful consideration of all the alternatives, VRV central HVAC system is designed for EMIN DURAKU School.

VRV system can control circulating refrigerant for indoor units by selecting operating mode or changing air terminals configuration. Using its modular valve, the system can apply requested need for refrigerant according to design and IOM.

All indoor units are connected in an addressed schedule with outdoor units, applying respective operating parameters for covering thermal needs during heating and cooling season.

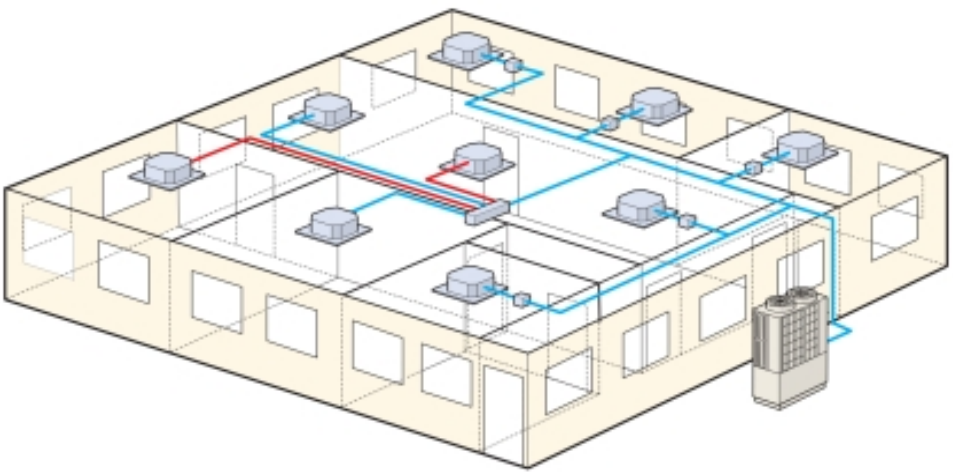


3 HVAC System Equipment

3.1 Outdoor Units

The outdoor unit leads the connection and control of indoor units by ensuring temperature and air quality based on technical norms. DC inverter technology ensures high efficiency and personalized control of each indoor unit.

All school facilities will have same VRV system but all indoor units will have autonomy of operation.



These central units control the system by providing individual control and minimize energy consumption by being classified as high energy efficiency devices. Inverter technology provides high coefficient of performance (COP).

The flexibility of these devices provides personalized installations for any type of environment.

The outdoor units of the VRF plant will be of the monoblock type, pre-assembled in the factory and ready for connection to the pipeline network.

Their construction will be made of galvanized steel sheet, coated with baked resin, to guarantee a good UV resistance.

They must guarantee operation in heating under external temperature conditions down to -10 ° C (wet bulb) and in cooling up to external temperature + 43 ° C (dry bulb).

External equipment should include one or more high-pressure coil-type scroll compressors, one or more air exchangers equipped with sub-cooling circuit, electronic expansion valves protected on both sides by two filters, a 4-way valve, liquid tank and a set of manually-operated valves at the inlet of the pipelines, etc.

Lubrication should be performed as a result of the difference between the inlet and outlet pressures, without the need to use a pump.

All compressors must be mounted on anti-vibration brackets. They will be preloaded with both polyvinyl and oil, be electrically protected by phase control, HP pressure sensor, relay, outdoor temperature sensor, etc.

The electronic regulator modules integrated in these units must provide a continuous linear control of the compressors and the speed of the external fans. The fans will be of the helical type and will remove the air vertically.

Each module will have:

• A DC motor, continuously lubricated and protected from water infiltrations;

• High efficiency, dynamically balanced fan

A display (positioned inside the air-conditioned premises) must ensure the reading of all working and safety parameters.

The main values to be read will be:

- HP and LP operating pressures and temperatures

-% of opening of each electronic expansion valve

- Operating frequency of each compressor

- Operating time of each compressor

3.2 Outdoor units technical data

3.2.1 Ground floor

Location	Albania
Project	Shkolla Emin Duraku
Title	Piping schematics - Skema e Tubacioneve
Title	Sistemi ne akset A-C Kati Perdhe Air cooled heat pump Kapaciteti ne ftohje 72 kw Kapaciteti ne ngrohje 76 kw
	Te dhenat per eficencen e energjise COP 4 EER 3.5

Location	Albania
Project	Shkolla Emin Duraku
Title	Piping schematics - Skema e Tubacioneve
Title	Sistemi ne akset D-L Kati Perdhe Air cooled heat pump Kapaciteti ne ftohje 68.7 kw Kapaciteti ne ngrohje 71 kw
	Te dhenat per eficencen e energjise COP 4 EER 3.5

3.2.2 First floor

Location	Albania
Project	Shkolla Emin Duraku
Title	Piping schematics - Skema e Tubacioneve
Title	Sistemi ne akset A-C Kati i Pare Air cooled heat pump Kapaciteti ne ftohje 74 kw Kapaciteti ne ngrohje 79 kw
	Te dhenat per eficencen e energjise COP 4 EER 3.5

Location	Albania
Project	Shkolla Emin Duraku
Title	Piping schematics - Skema e Tubacioneve
Title	Sistemi ne akset D-L Kati i Pare Air cooled heat pump Kapaciteti ne ftohje 83 kw Kapaciteti ne ngrohje 90 kw
	Te dhenat per eficencen e energjise COP 4 EER 3.5

3.2.3 Second floor

Location	Albania
Project	Shkolla Emin Duraku
Title Title	Piping schematics - Skema e Tubacioneve Sistemi ne akset A-C Kati i Dyte Air cooled heat pump **Kapaciteti ne ftohje 74 kw** **Kapaciteti ne ngrohje 79 kw**
	Te dhenat per eficencen e energjise COP 4 EER 3.5

Location	Albania
Project	Shkolla Emin Duraku
Title Title	Piping schematics - Skema e Tubacioneve Sistemi ne akset D-L Kati i Dyte Air cooled heat pump **Kapaciteti ne ftohje 84 kw** **Kapaciteti ne ngrohje 92 kw**
	Te dhenat per eficencen e energjise COP 4 EER 3.5

3.2.4 Third floor

Location	Albania
Project	Shkolla Emin Duraku
Title Title	Piping schematics - Skema e Tubacioneve Sistemi ne akset A-C Kati i Trete Air cooled heat pump **Kapaciteti ne ftohje 76 kw** **Kapaciteti ne ngrohje 80 kw**
	Te dhenat per eficencen e energjise COP 4 EER 3.5

Location	Albania
Project	Shkolla Emin Duraku
Title Title	Piping schematics - Skema e Tubacioneve Sistemi ne akset D-L Kati i Trete Air cooled heat pump **Kapaciteti ne ftohje 86 kw** **Kapaciteti ne ngrohje 94 kw**
	Te dhenat per eficencen e energjise COP 4 EER 3.5

4 HVAC System Air Terminals

The indoor units will be of vertical type on the floor for the offices and hi walls for classes. They will be installed inside the air-conditioned areas; unit cover shall be made of polystyrene.

Each indoor unit will be equipped with the following elements:

- a multi-pass heat exchanger,

- an electronic expansion valve with adjustable range protected by two filters,

- an internal fan capable of achieving at least 4 working speeds,

- two fluid control sensors (liquid and gas),

- two air sensors (sending and recirculating),

- an easily removable, washable filter for air conditioning.

4.1 Indoor Cassette air terminal VRV

For common areas cassette units are selected

4.1.1 Technical specifications of Cassette indoor units

Dim.	Unit		Depth	mm	600	600
			Length	mm	700	700
			Width	mm	210	210
Fan		Cooling	Hi	m³/min	8.5	10.7
			lo	m³/min	4.9	7.8
			Silent	m³/min	4.5	6.6
		Heating	Hi	m³/min	9.4	11.8
			lo	m³/min	5.2	8.5
			Silent	m³/min	4.7	7.1
			Nom.	m³/min	8.5	10.7
		Heating	Nom.	m³/min	7.3	10.1
Niveli I forces zanore	Cooling			dBA	52	60
	Heating			dBA	52	60
Niveli I pres zanor	Cooling		Hi	dBA	39	44

			lo	dBA	27	36
			Silent	dBA	24	32
	Heating		Hi	dBA	39	45
			lo	dBA	27	36
			Silent	dBA	24	32
			Nom.	dBA	33	40
	Heating		Nom.	dBA	33	40
Tubacionet	Fluid		OD	mm	6.35	6.35
	Gas		OD	mm	9.52	12.7
	Condense				20	20

4.2 Indoor wall mounted air terminal VRV

For classrooms, wall mounted units are selected.

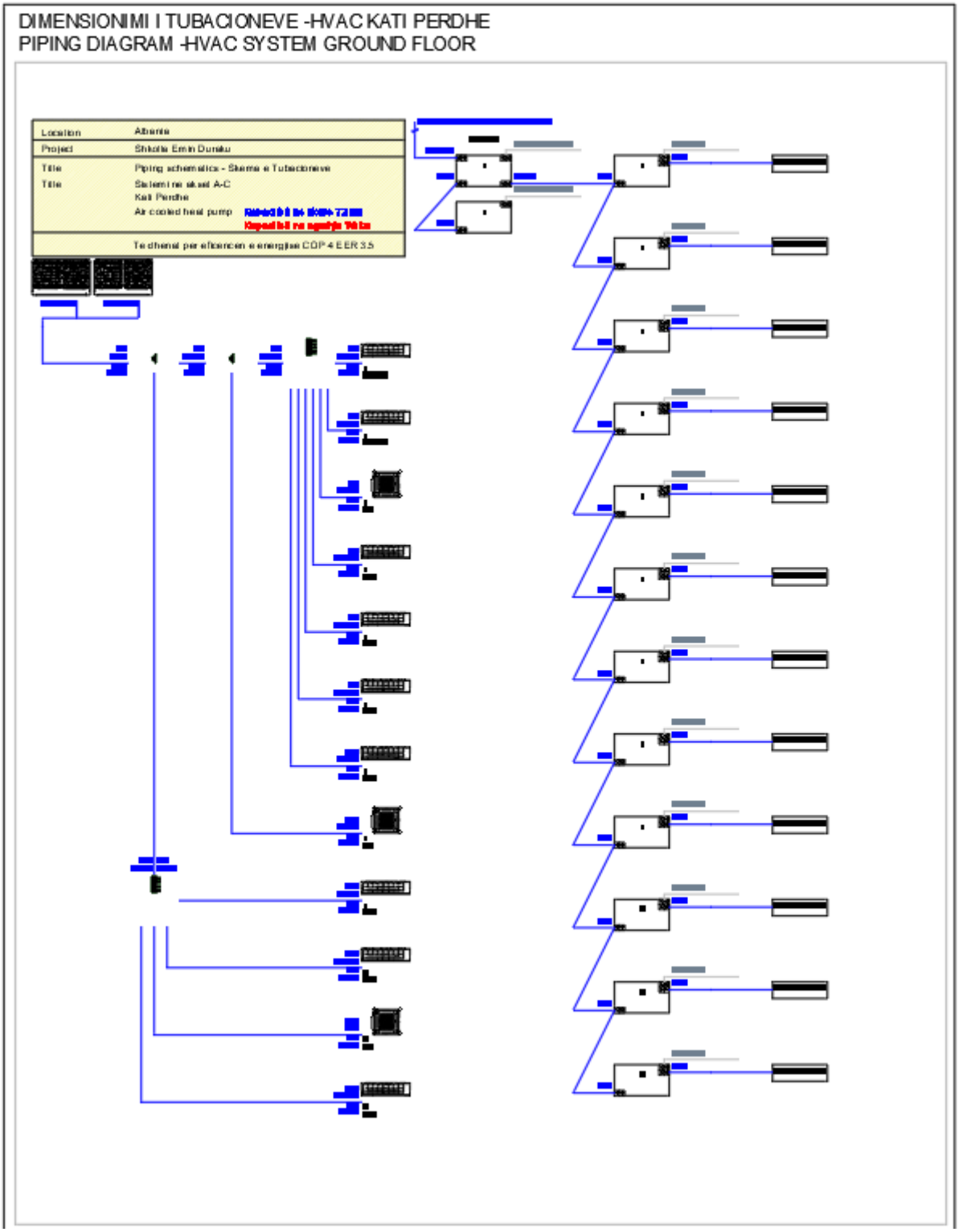
4.2.1 Technical specifications of Hi wall indoor units

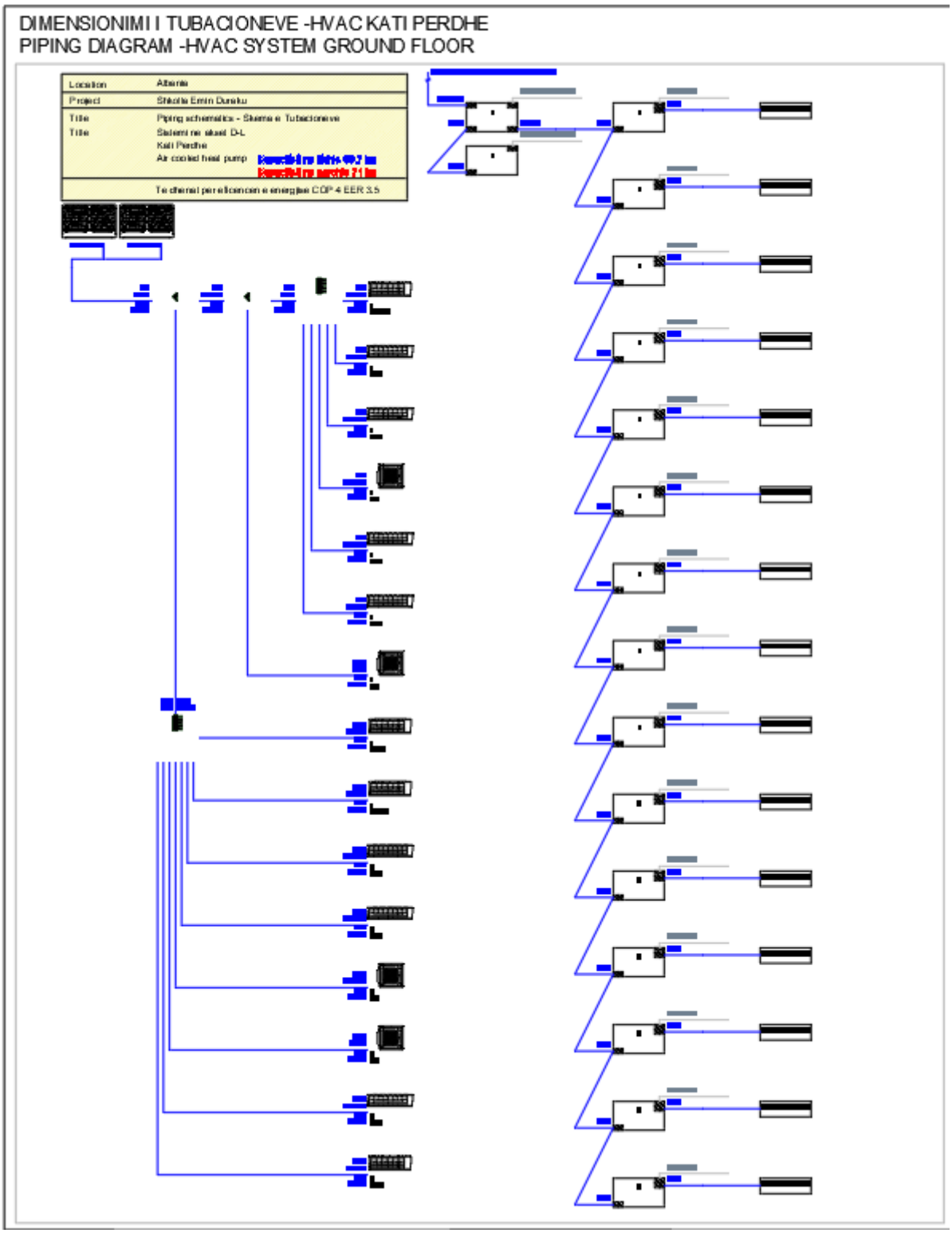
Dimensions	Unit		Hight	mm	286	286	286
			Length	mm	770	770	770
			Width	mm	225	225	225
Fan		Cooling	High	m³/min	9.9	10.4	11.8
			Low	m³/min	5.8	6.1	6.3
			Silent	m³/min	4.8	4.8	4.9
		Heating	High	m³/min	10.9	11.1	12.8
			Low	m³/min	6.4	6.7	6.9
			Silent	m³/min	5.2	5.2	5.2
			Nom.	m³/min	7.8	8.0	8.2
		Heating	Nom.	m³/min	8.5	8.5	8.5
Noise level	Cooling			dBA	55	55	58
	Heating			dBA	55	55	58

Noise pressure	Cooling		High	dBA	39	40	43
			Low	dBA	25	26	27
			Silent	dBA	20	20	20
	Heating		High	dBA	39	40	43
			Low	dBA	28	28	29
			Silent	dBA	23	23	26
			Nom.	dBA	33	33	34
	Heating		Nom.	dBA	34	34	35
Piping	Liquid		OD	mm	6.35	6.35	6.35
	Gas		OD	mm	9.50	9.50	9.50
	Condense				18	18	18

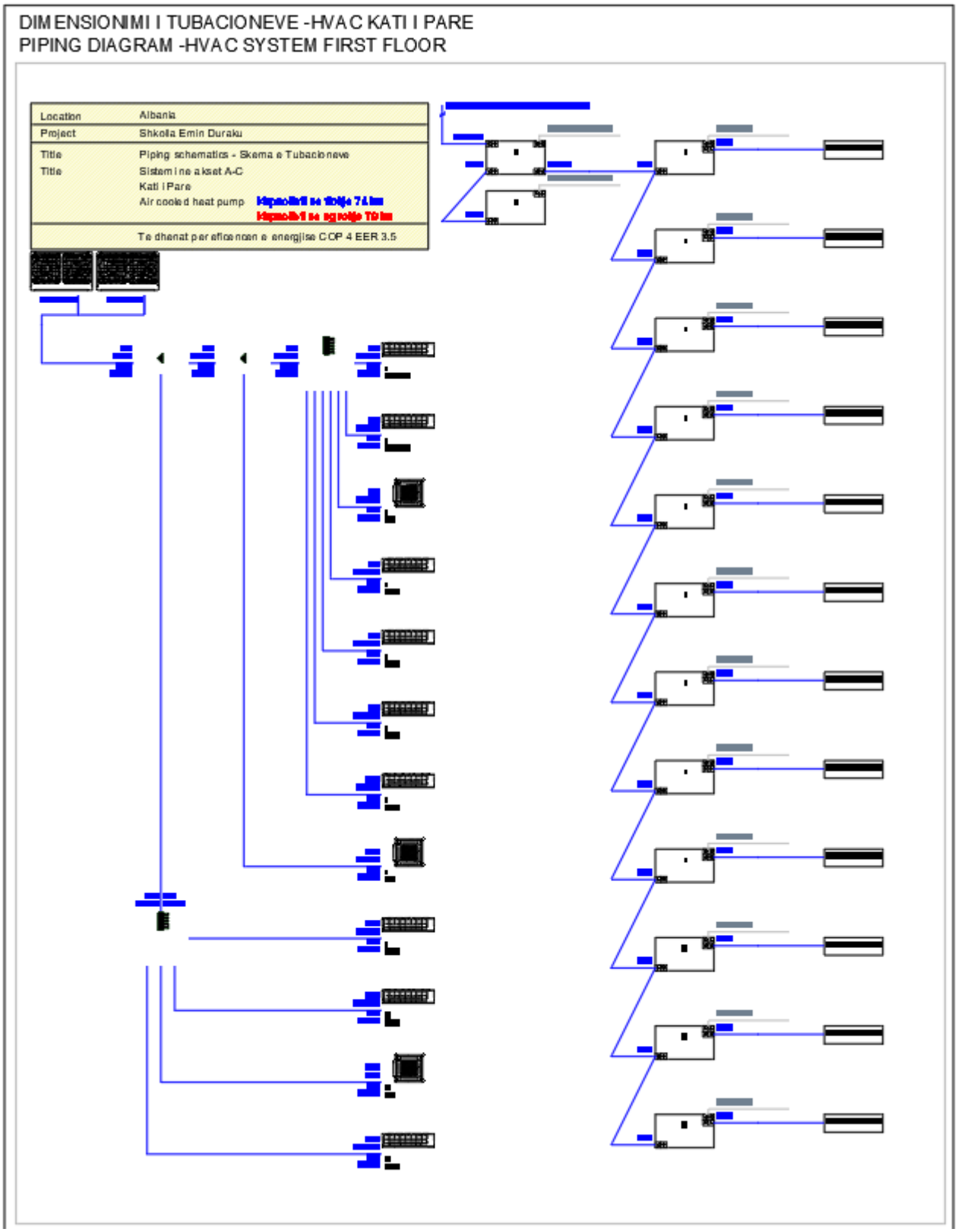
5 Piping Diagrams

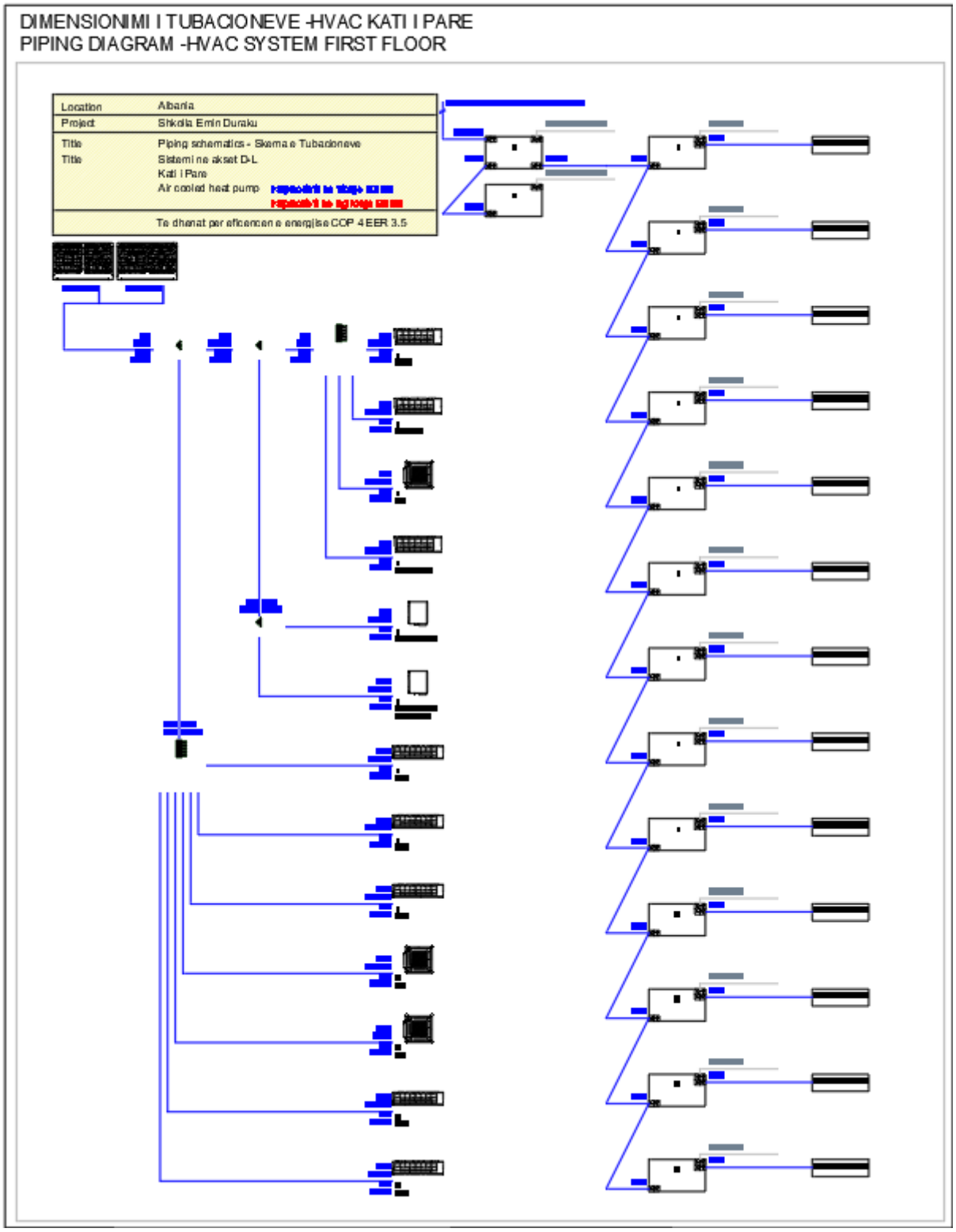
Piping ground floor



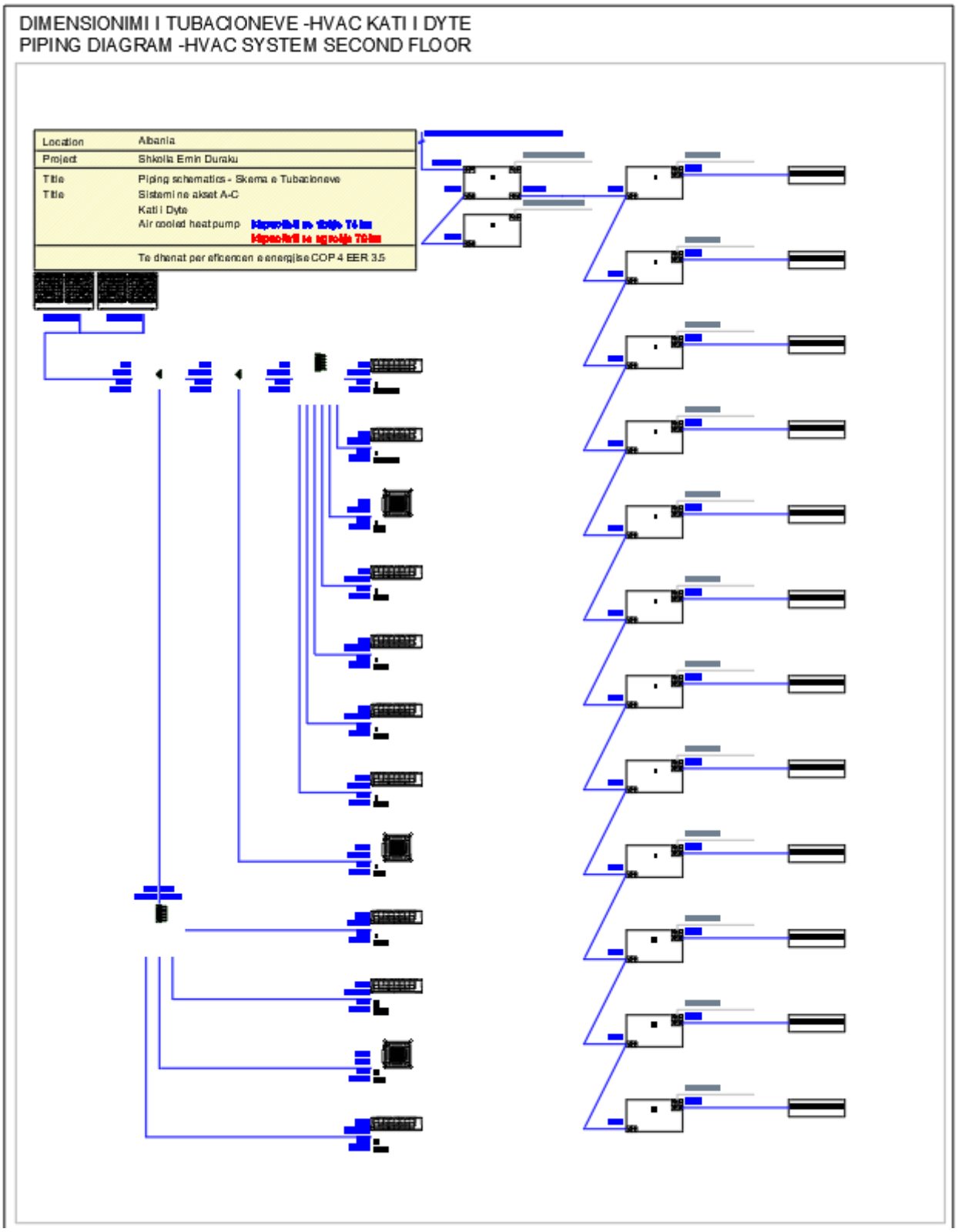

DIMENSIONIMI I TUBACIONEVE -HVAC KATI PERDHE
PIPING DIAGRAM -HVAC SYSTEM GROUND FLOOR

Piping first floor

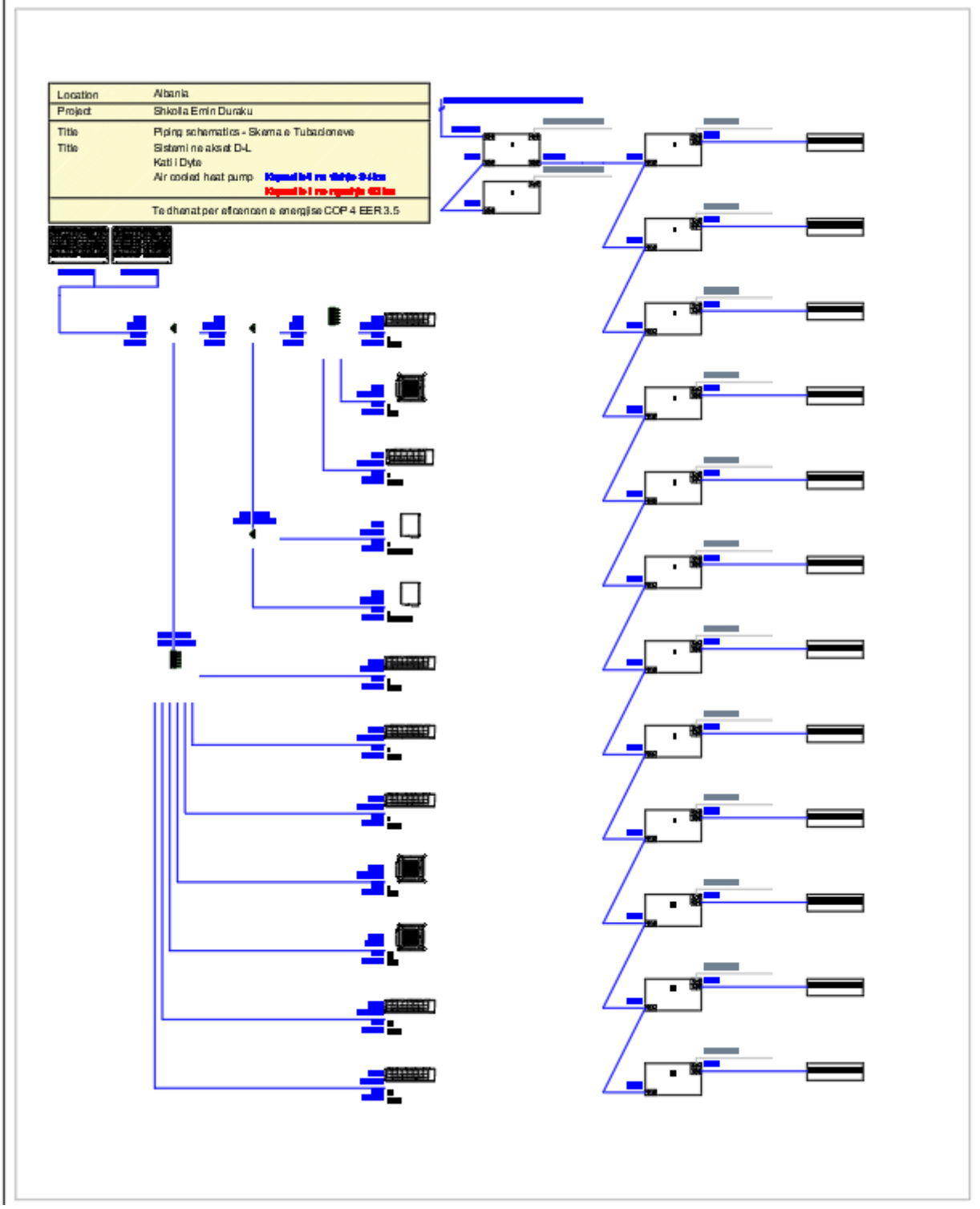



DIMENSIONIMI I TUBACIONEVE -HVAC KATI I PARE
PIPING DIAGRAM -HVAC SYSTEM FIRST FLOOR
Location
Albania
Project
Shkolla Emin Duraku
Title
Piping schematics - Skema e Tubacioneve
Title
Sistemi ne akset D-L
Kati I Pare
Air cooled heat pump
Te dhenat per eficencen e energjise COP 4 EER 3.5

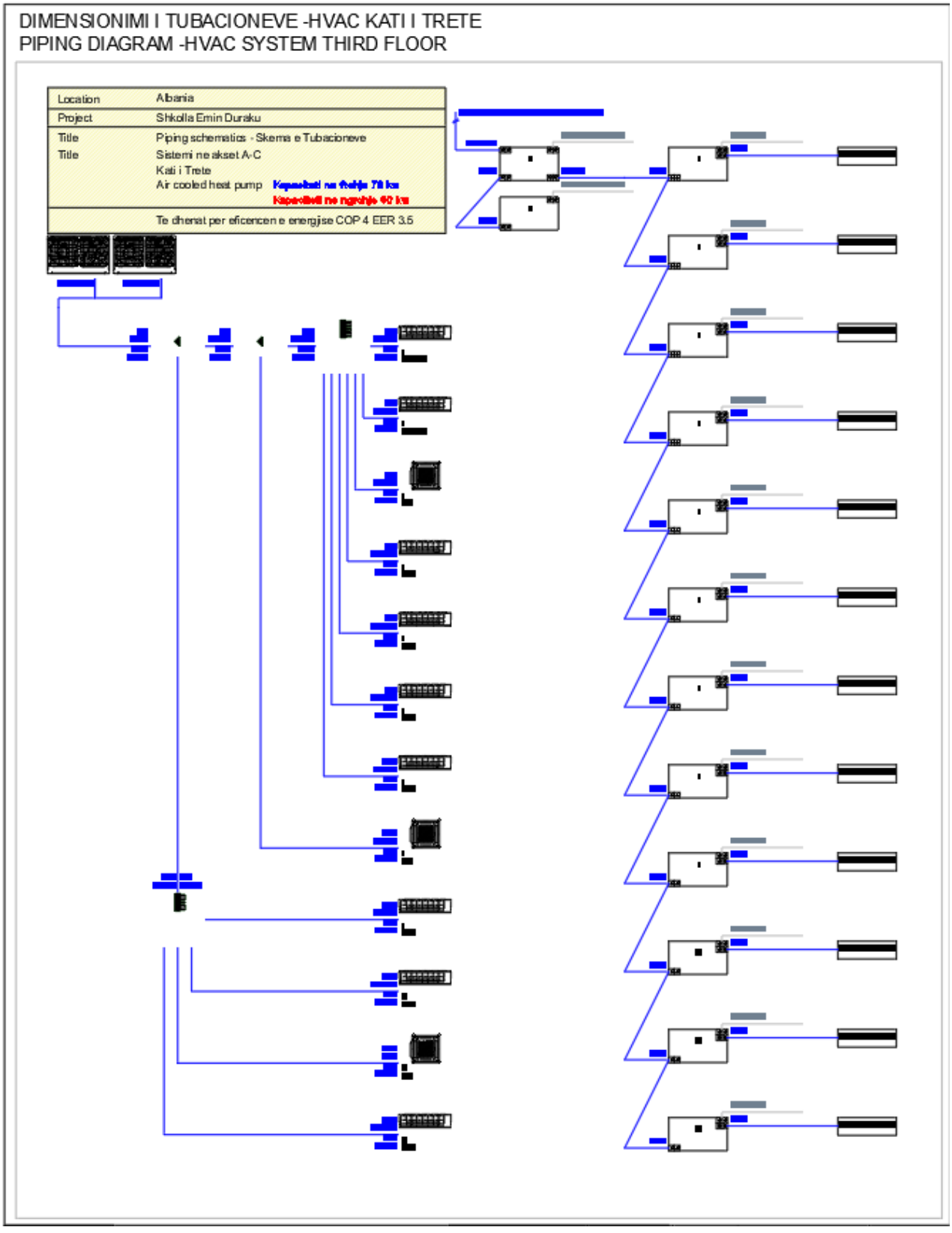
Piping second floor



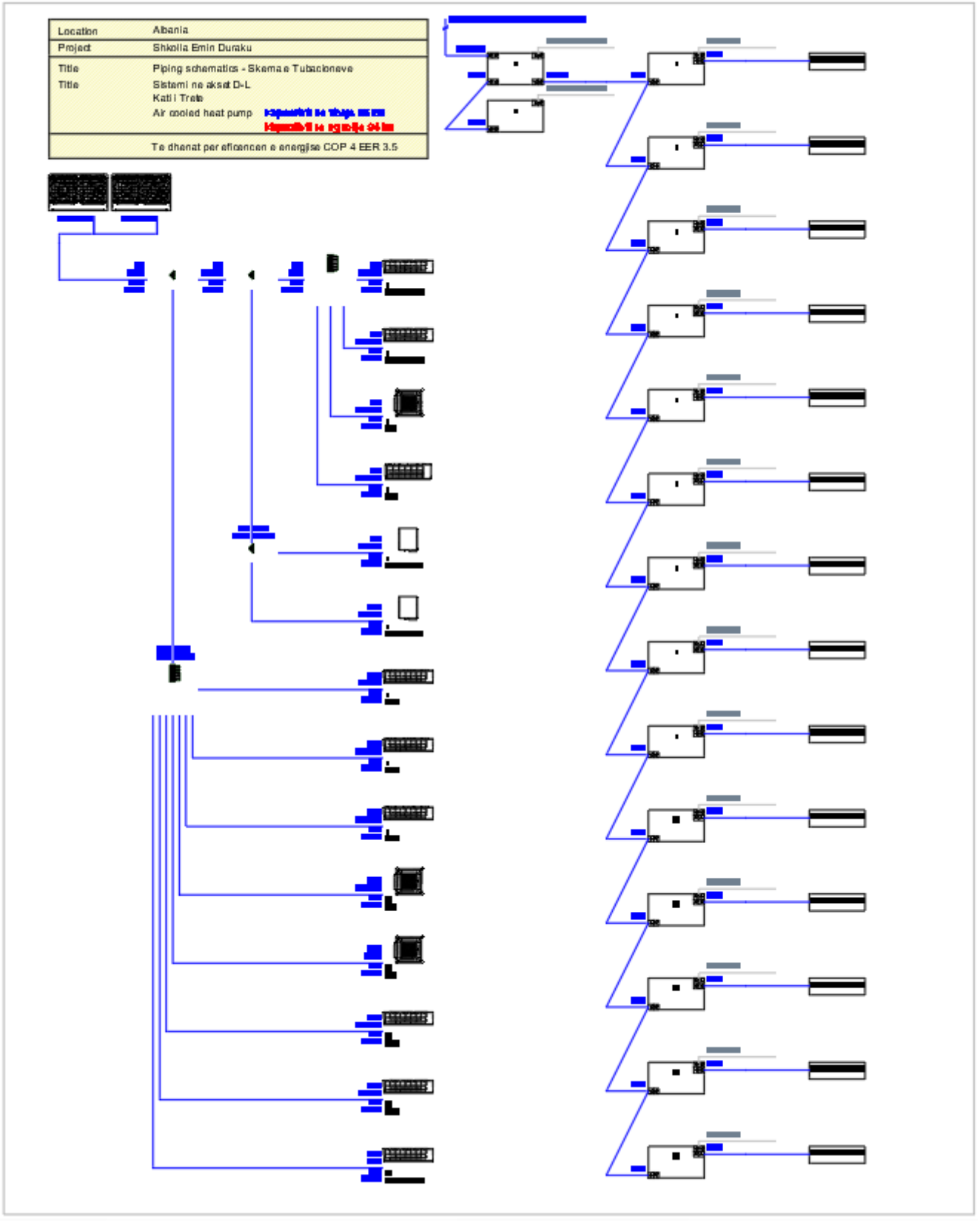
DIMENSIONIMI I TUBACIONEVE -HVAC KATI I DYTE
PIPING DIAGRAM -HVAC SYSTEM SECOND FLOOR



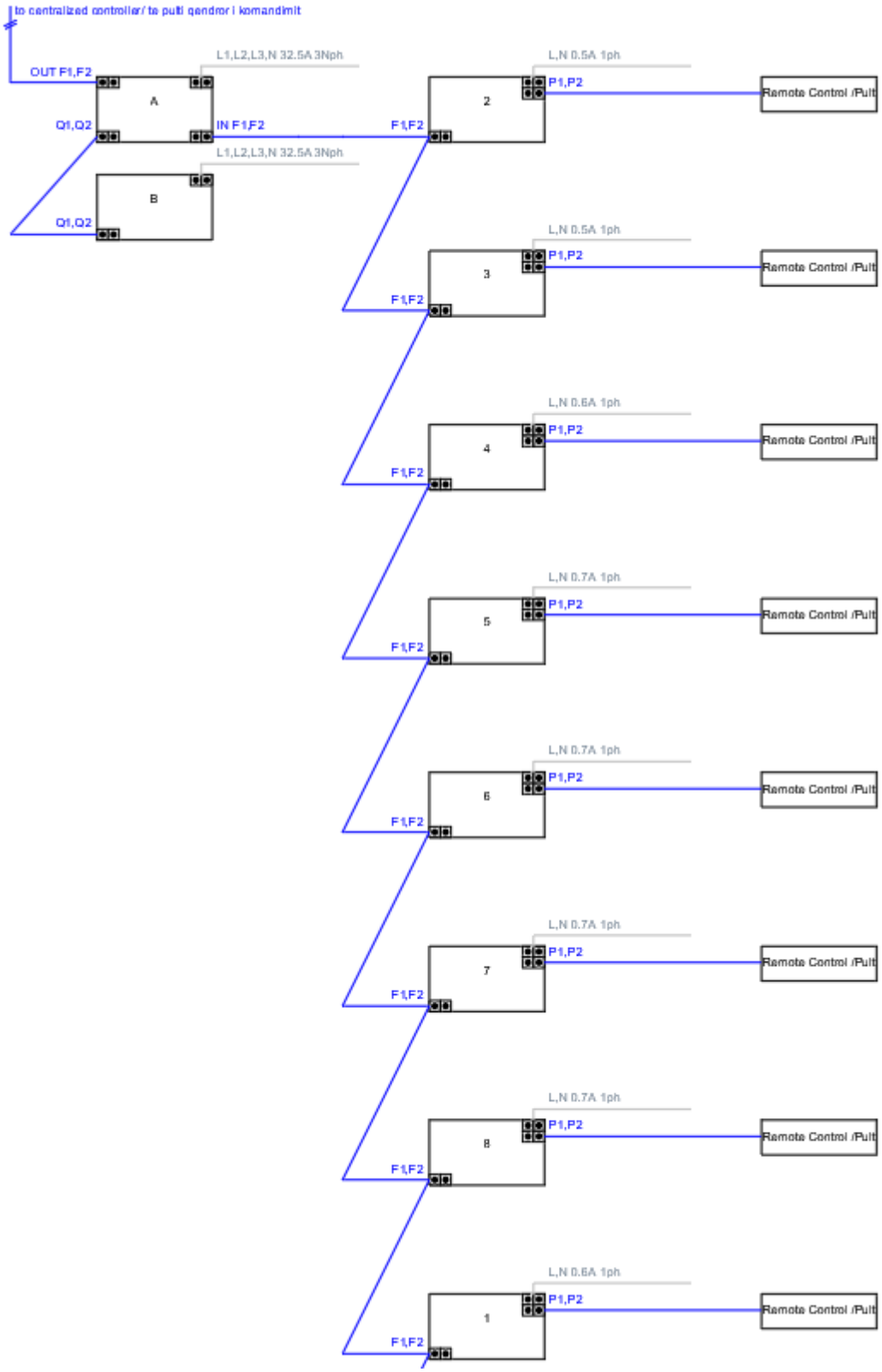
Piping third floor



DIMENSIONIMI I TUBACIONEVE -HVAC KATI I TRETE
PIPING DIAGRAM -HVAC SYSTEM THIRD FLOOR

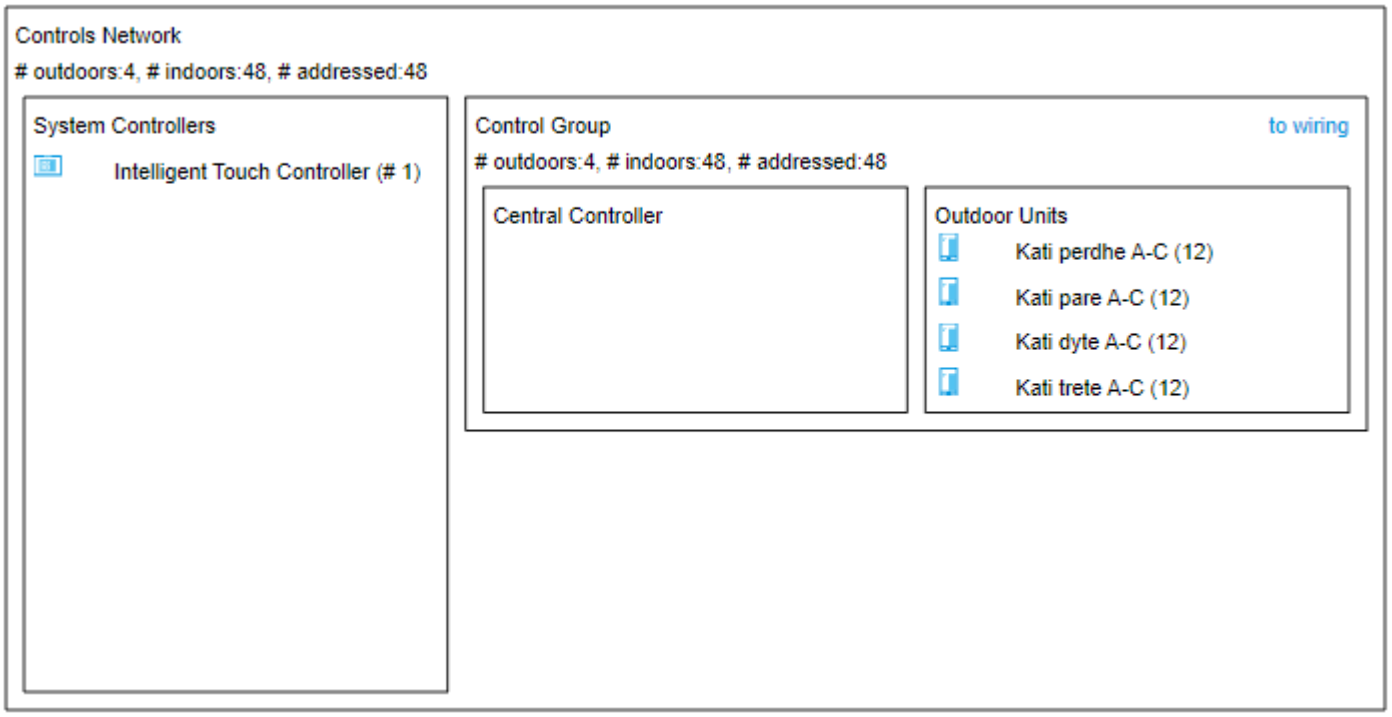


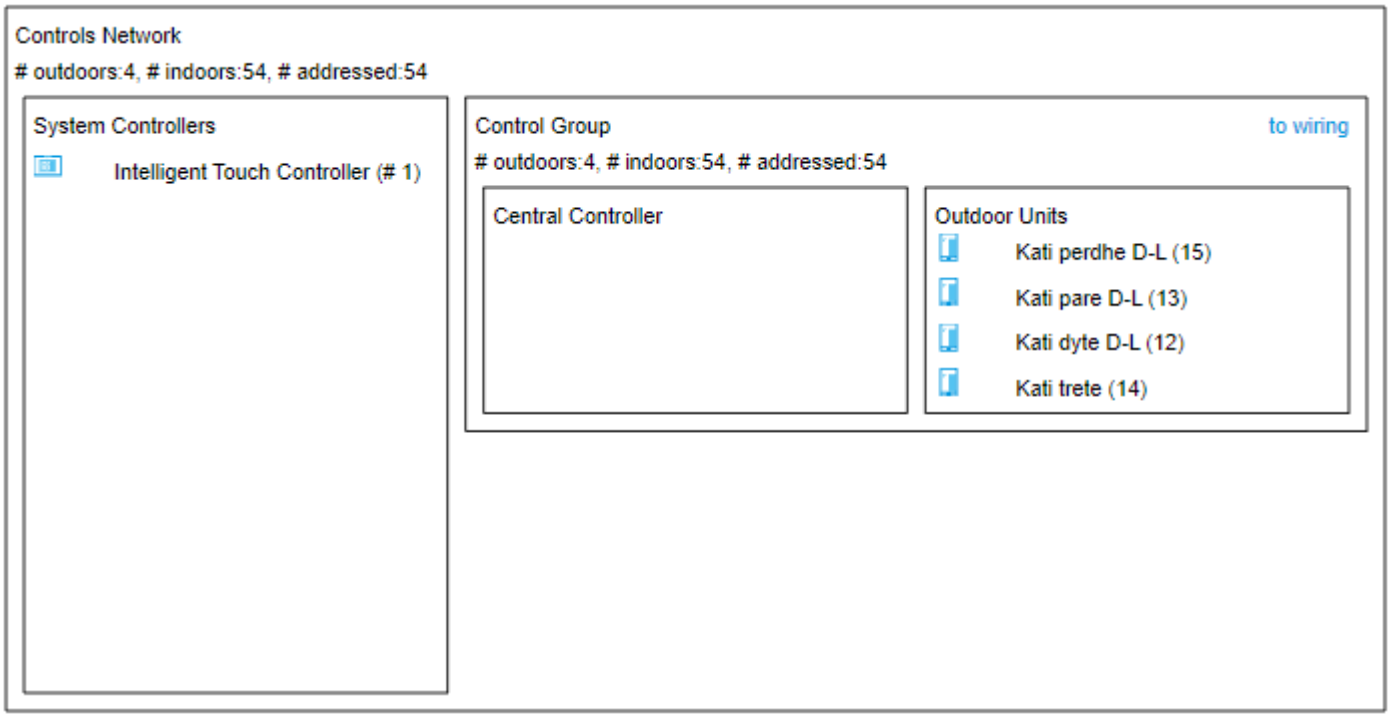
5.1 Wiring Diagrams



5.2 Centralized controllers

Concept

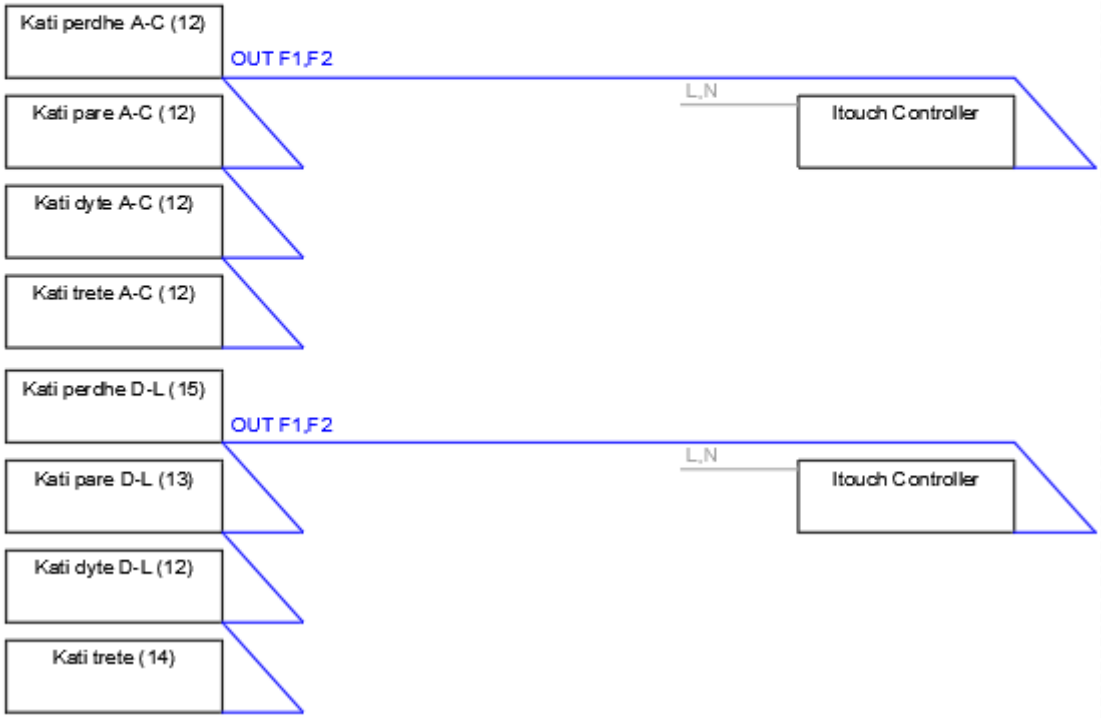




5.3 Controller wiring diagrams

Control Group

Client	Albania
Project	Shkolla Emin Duraku
Title	Controller wiring schematics Control Group
Date	01/21/2022
Drawing No	



Best Practices

5.4 Residual Current Circuit Breaker

For better protection of installations against the risk of fire, power supply of indoor and outdoor units must be protected with a Residual Current Circuit Breaker. For protection against fire, we recommend a sensitivity of 300mA. The selected RCCB should be of the type B, suitable for inverter devices and indicated by the symbols here below. Further electrical characteristics of the RCCB must be selected in accordance with local regulation.

For a complete list of all required safety precautions, warnings and attention points, consult the "general safety precautions manual" delivered with the unit.

6 Gym

One rooftop unit will be used for the air conditioning system of the gym. The control panel shall be included in order to allow remote access to the unit.

Package Rooftop unit shall be factory assembled single piece for outside installation. The Package Rooftop unit shall use the R410A refrigerant with efficient thermodynamic characteristics, and shall be equipped with inverter scroll compressors.

Rooftop unit shall have selection with 100% fresh air and free cooling option. Rooftop shall have rotary heat exchanger.

- Packaged rooftop units shall comply with the requirements of the following European regulations

  - Machinery 98/37/CE revised,
  - Low voltage directive 2006/95/CEE
  - Electromagnetic Compatibility directive 2004/108/CEE and the applicable recommendations of the European standards.
  - Machine safety: electrical equipment in machines, general regulations, EN 60204-1,
  - Electromagnetic Emissions radiated: IEC 61000-3-3
  - Electromagnetic Emissions canalised: IEC 61000-6-4
  - Electromagnetic immunity: IEC 61000-6-2

6.1 General description

Unit(s) shall be designed, manufactured and tested in a facility with a quality assurance system certified ISO 9001 and with an environment management certified ISO 14001.

Unit(s) shall be run tested at the factory before shipment.

6.2 Technical Parameters

Cooling capacity: 123 kW

Compressor power input: 48,7kW

EER : 3.18 kW/kW

Energy class coefficient cooling (@Eurovent conditions) : A

Heating capacity: 130 kW

Heating capacity (integrated with defrost cycles): kW

Compressor power input: kW

COP : 64 kW/kW

Energy class coefficient heating (@Eurovent conditions): A

Outside Air Temperature: 2°C

Outdoor weighted Sound Power Level: 83dB(A)

Indoor Supply duct weighted Sound Power Level: 67dB(A)

As standard, the unit shall be able to start up and operate thermodynamic at full load with ambient temperatures ranging from -10 °C to 52 °C. If heating is operated by one of axuillary heating options (hot water coil, gas module or electrical heater) rooftop unit must be operate down to minimum -20 °C ambient temperature.

6.3 User interface

Unit control shall include as a minimum: microprocessor with non-volatile memory, picture guided unit/operator interface, the LOCAL/OFF/REMOTE/CCN selector and a 4,3 inches coloured touch-screen display with multiple language capability

Unit control shall have an IP port to permit user connection via web browser, allowing same level of access to control menus as unit mounted interface (excluding start/stop and alarm reset capabilities)

Whilst easy to use, menus still allow quick access to all main operating parameters including: Number of compressors on, suction/relief pressure, compressor operating time, set-points, Air temperature, entering/leaving water temperature.

6.4 Local Level Control

Rooftop controller gives end-user or the service technicians to check below listed parts of the unit before start-up and ensure quick commissioning and diagnostics :

Compressor(s)

Indoor fan

Outdoor fan(s)

Electrical heater

Defrost heater

Power exhaust (opt)

Alarm output test

Economiser analog control (optional)

Hot water coil 3 way valve (optional)

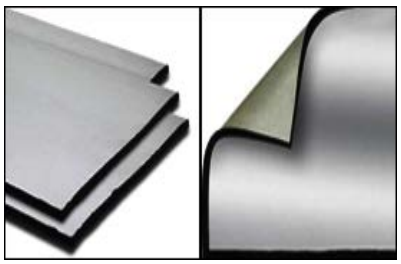
6.5 Air Duct –Galvanized sheet with flanges

Duct Dimension	Minimum thickness of metallic sheets prior to galvanization	Weight
Up to 45 cm	6/10	5.2kg/m2
Up to 41 to 70 cm	8/10	6.7kg/m2
Up to 71 to 100 cm	10/10	8.3kg/m2
greater then 100cm	12/10	10.0kg/m2

6.6 High density insulation of air ducts

Insulating Self-adhesive coating and aluminum protective layer.

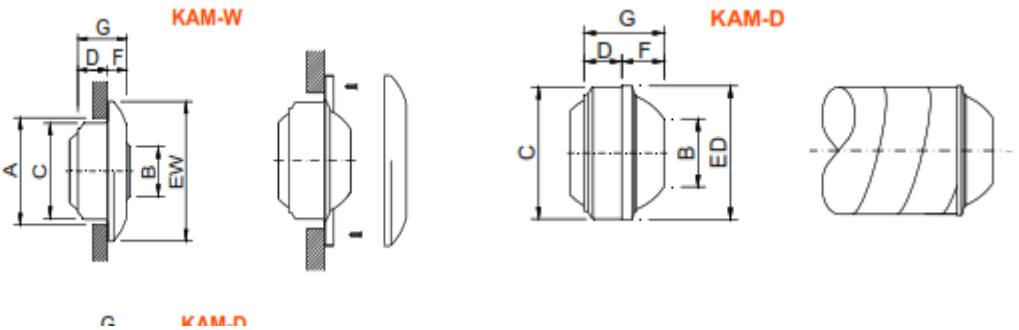
- Premeability: μ> 4000
- Thermal conductivity: λ = 0.045W / mK at 40 ° C
- Operating temperatures -40 ° C to + 150 ° C
- Fire Rating" E-s3,d0



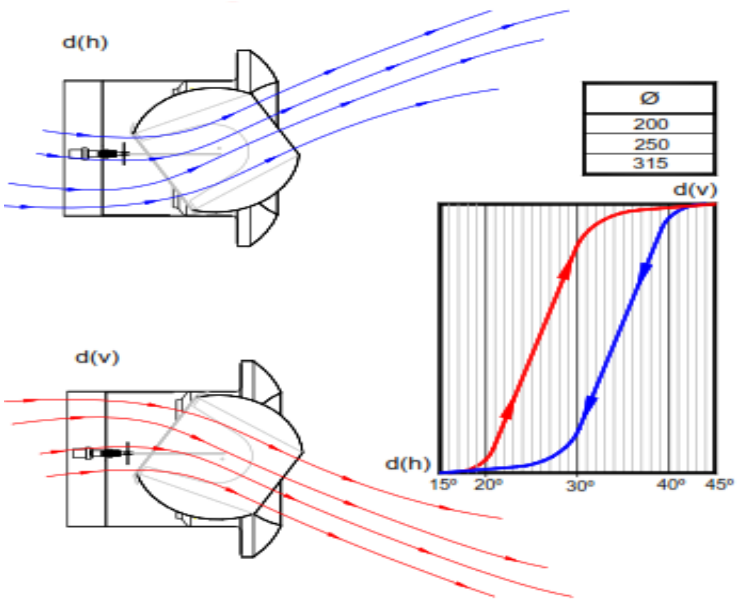
6.7 Jet Nozzle

Jet nozzles have been designed specifically to provide airdiffusion into large spaces. They are special in so far as they can achieve a long throw on either heating or cooling whilst giving complete flexibility of direction.

Supply air jet nozzle, manually adjustable,suitable for mounting in a wall having a connection to either a circular or rectangular duct'



ø	A	B	C	D	EW	ED	ET	F	G
125	135	61	123	55	181	126	165	**27**	85
160	170	80	158	55	231	162	205	**34**	92
200	210	102	198	74	289	203	252	**40**	122
250	260	130	248	99	359	253	304	**48**	158
315	325	166	313	126	423	320	390	44	171
400	410	212	398	162	503	404	490	62	224



Jet nozzle that is autonomouslythermally adjustable by means of athermodynamic piston.The jet nozzles of the KAM-ACTIF series are designed for air diffusion in large spaces andspecial applications, thanks to the long throw anddirectional control

of their air streams and theircapacity to handle large volumes of air.The supply air angle of the air streams varies inaccordance with the supply air temperature,reducing stratification.

7 VRV system Pipe capacities

Maximum Connection Index	Diameters
149.9	9.5mmx15.9mm
199.9	9.5mmx19.1mm
289.9	9.5mmx22.2mm
419.9	12.7mmx28.6mm
639.9	15.9mmx28.6mm
919.9	19.1mmx34.9mm
> 919.9	19.1mmx41.3mm
Main pipe size up	22.2mmx41.3mm

7.1 Piping limitations

Description	Value
Maximum total length	1,000.0m
Maximum longest actual length	165.0m
Maximum longest equivalent length	190.0m
Maximum main pipe length (size up of main pipe required if longer)	-
Maximum length first branch to indoor unit(size up of intermediate pipes required if longer)	40.0m
Maximum length first branch to indoor unit	90.0m
Maximum length of indoor units to nearest branch	40.0m
Maximum length difference between longest and shortest distance to indoor units	40.0m
Maximum height difference, outdoor unit below indoor units	90.0m
Minimum connection ratio, outdoor unit below indoor units	-
Maximum height difference, outdoor unit above indoor units	90.0m
Minimum connection ratio, outdoor unit above indoor units	-
Maximum height difference in technical cooling, outdoor unit below indoor units	90.0m
Maximum height difference in technical cooling, outdoor unit above indoor units	90.0m
Maximum height difference between indoor units	30.0m
Connection ratio range	50.0% - 130.0%
Refrigerant pipe diameters	22.2mm (liquid) x

	41.3mm (gas)
Maximum equivalent length from BP unit or VRV indoor to VRV REFNET	90.0m

8 Piping Materials

8.1 Refrigerant piping for VRV systems

8.1.1 Copper pipe

Copper pipes should be according to EN6507-69 B series

8.1.2 Joints

All joints should be made with copper or bronze materials

8.1.3 Pipe fixing and support

Supports and fixing elements for piping works should be done with galvanized materials and with iron profiles in the case of large pipes where special constructions will be installed and painted with anti-rust paint.

8.1.4 Thermal Insulation

Thermal insulation layers should be similar to:

- Glass wool, minimum density 60 Kg/mc
- polystyrene, minimum density 35 kg/mc
- pipe thermal insulation, density 40 kg/mc