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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE
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OPERATOR BUILDING AND LABORATORY IN MNA (76IA-10)**HVAC CALCULATION REPORT**

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1. GENERAL

Scope of this document is to show the thermal calculations and the utilities consumptions as result of the basic design of the Heating, Ventilating and Air Conditioning (HVAC) system to be provided for Operator Building and Laboratory in MNA, one of the Buildings included in the expansion of the plant, namely "Rotterdam Capacity Growth".

The HVAC systems performances, hereinafter shown, are based on preliminary thermal calculations and shall be updated during the detail design phase.

For any technical – economical evaluation to be correlated to the HVAC systems supply, said performances shall be verified by Supplier and assumed as valid, under their responsibility.

2. REFERENCE DOCUMENTS

This document is complementary to the "HVAC process flow diagram" and to the "HVAC layout" relevant to the HVAC system and complies with the following Technip Specifications:

- a. 082755C-000-JSD-3400-001 "Job Design Specification for HVAC Systems".
- b. 082755C-000-JSS-3480-001 "General supply rules for HVAC Systems".

Calculations are based on following drawings:

- 082755C-076-DW-2053-0001-01 rev.A: "Op. Bldg and Laboratory in MNA (76IA-10) – Architectural layout - plans"
- 082755C-076-DW-2053-0001-02 rev.A: "Op. Bldg and Laboratory in MNA (76IA-10) – Architectural layout – Sections"

3. THERMAL CALCULATIONS**3.1. General**

The thermal calculations, shown in the attached printout, are to be considered preliminary and shall be checked/updated, taking into account the latest revision of architectural and structural drawings and the above mentioned Technip Specifications.

The used calculation software is the widely known and recognized Carrier HAP program v.5.11.

The figures used as input data are those shown in the above mentioned 082755C-000-JSD-3400-001 "Job Design Specification for HVAC Systems".

Particularly, the internal heat gains due to equipment are preliminary: they shall be checked/updated during the Detail design phase.

3.2. Thermal calculations summary

The preliminary thermal calculation results are summarized in the following table: it shows the minimum required capacity for each equipment.

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Equipment	quantity (no.)	supply air (l/s)	fresh air (l/s)	exhaust air (l/s)	Cooling cap. (kW)	Heating cap. (kW)
OB-ACWC-01A/B – Air cooled water chiller with integrated hydronic module and free cooling mode (one duty, one stand-by, each sized for 100% of total cooling capacity)	2				405	
OB-WWHP-01A/B – Water to water heat pump with integrated hydronic module (both duty, each sized for 50% of total heating capacity)	2					195
OB-CFU-01 – Chemical filtration unit (duty, sized for 100% of total air flow rate)	1	1055	1055			
OB-AHU-01 – Fresh air handling unit for Offices (duty, sized for 100% of total cooling/heating capacity)	1	1569	1569		40	50
OB-AHU-02 – Fresh air handling unit for Laboratory (duty, sized for 100% of total cooling/heating capacity)	1	8782	8782		262	268
OB-AHU-03A/B – Air handling unit for Technical rooms (one duty, one stand-by, each sized for 100% of total cooling/heating capacity)	2	5075	1055		76	33
OB-SSHP-01A/B – Rev.heat pump type Multisplit-systems air conditioners for Fire Command (n.1 duty, n.1 stand-by)	2				17	Min.3
OB-EF-01 – Exhaust fan for Lockers and Mud room	1			457		
OB-EF-02 – Exhaust fan for Toilets	1			116		
OB-EF-03 – Exhaust fan for Lunch room	1			39		
OB-EF-04 – Exhaust fan for Chemical storage	1			120		
OB-EF-05 – Exhaust fan for Battery rooms	1			430		
OB-EF-06A/B – Exhaust	2			8268		

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fans for Laboratory (one duty, one stand-by, each sized for 100% of total air flow rate)						
Fan coil units for Offices					27	32
Hot water fed radiators						23
Hot water fed re-heat coils for Technical rooms						7
Hot water fed re-heat coils for Laboratory and Sample rooms						18

Note: Hot water fed re-heat coils are calculated considering the possible absence of 30% of internal heat loads: in this case, for the control of indoor temperature, they shall be replaced with heating provided by re-heat coils.

4. ELECTRICAL LOADS SUMMARY

The preliminary electrical consumptions for HVAC are summarized in the following table: it shows the maximum contemporary consumption for the duty units, during summer operation (worst case):

<i>Equipment</i>	<i>Tot. el. power input (kW)</i>
OB-ACWC-01A/B – Air cooled water chiller with integrated hydronic module and free cooling mode (n.1 duty unit)	200
OB-WWHP-01A/B – Water to water heat pump with integrated hydronic module (both duty units) (*)	10
OB-CFU-01 – Chemical filtration unit	3
OB-AHU-01 – Fresh air handling unit for Offices	3
OB-AHU-02 – Fresh air handling unit for Laboratory	18
OB-AHU-03A/B – Air handling unit for Technical rooms (only n.1 duty unit)	10
OB-SSHP-01A/B – Rev.heat pump type Multisplit-systems air conditioners for Fire Command (n.1 duty unit)	9
OB-EF-01 – Exhaust fan for Lockers and Mud room	0.55
OB-EF-02 – Exhaust fan for Toilets	0.25
OB-EF-03 – Exhaust fan for Lunch room	0.25
OB-EF-04 – Exhaust fan for Chemical storage	0.25
OB-EF-05 – Exhaust fan for Battery rooms	0.55
HEATOB-EF-06A/B – Exhaust fans for Laboratory (one duty unit)	15
Fan coil units for Offices	1.5
TOTAL	272

(*): Electrical power input for Heat pump during summer operation is estimated considering only hot water used for re-heating purposes.

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5. CARRIER HAP THERMAL CALCULATIONS PRINTOUT**5.1. Design weather parameters**

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Design Weather Parameters & MSHGs

Rotterdam RDCG - OPB and Labo in MNA 13-07-21

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Design Parameters:

City Name **Rotterdam**
 Location **Netherlands**
 Latitude **52,3** Deg.
 Longitude **-4,8** Deg.
 Elevation **5,0** m
 Summer Design Dry-Bulb **28,0** °C
 Summer Coincident Wet-Bulb **21,0** °C
 Summer Daily Range **9,3** K
 Winter Design Dry-Bulb **-10,0** °C
 Winter Design Wet-Bulb **-10,0** °C
 Atmospheric Clearness Number **1,00**
 Average Ground Reflectance **0,20**
 Soil Conductivity **1,385** W/(m K)
 Local Time Zone (GMT +/- N hours) **-1,0** hours
 Consider Daylight Savings Time **No**
 Simulation Weather Data **N/A**
 Current Data is **User Modified**
 Design Cooling Months **January to December**

Design Day Maximum Solar Heat Gains

(The MSHG values are expressed in W/m²)

Month	N	NNE	NE	ENE	E	ESE	SE	SSE	S
January	38,8	38,8	38,8	98,7	308,2	473,1	618,1	687,5	715,2
February	55,8	55,8	72,2	288,0	480,0	639,4	730,3	775,6	780,0
March	74,7	74,7	242,5	454,2	611,0	724,2	761,7	755,4	742,3
April	94,1	186,7	400,6	555,9	679,0	712,3	689,8	650,0	629,4
May	113,0	305,1	487,7	621,3	687,3	680,1	627,5	556,8	529,7
June	156,7	346,4	514,5	633,8	681,4	657,2	591,6	514,4	481,4
July	121,5	292,0	483,9	602,9	676,6	664,8	608,7	547,0	515,0
August	99,5	190,3	383,3	541,5	652,7	690,1	668,2	630,2	608,5
September	78,4	78,4	207,4	425,5	567,6	686,1	722,0	721,7	716,9
October	58,7	58,7	84,1	257,4	462,4	607,7	708,1	747,1	757,4
November	40,0	40,0	40,0	117,9	278,2	473,7	589,8	681,0	706,2
December	31,5	31,5	31,5	44,3	228,7	378,7	538,8	614,4	652,4
Month	SSW	SW	WSW	W	WNW	NW	NNW	HOR	Mult
January	695,2	617,9	473,7	306,6	106,1	38,8	38,8	185,7	1,00
February	770,8	727,7	643,5	465,5	291,7	68,1	55,8	353,1	1,00
March	752,0	759,6	711,4	622,6	440,4	251,6	74,7	526,9	1,00
April	649,4	697,7	714,0	674,0	564,6	399,0	191,9	661,6	1,00
May	559,0	630,7	685,8	678,1	624,4	477,2	311,6	738,6	1,00
June	516,8	595,8	664,1	679,6	633,7	511,7	348,8	760,6	1,00
July	548,1	616,6	672,1	670,4	611,6	473,1	308,7	731,3	1,00
August	629,1	674,2	688,9	648,8	544,4	385,3	190,6	652,5	1,00
September	719,3	718,7	685,0	574,3	424,7	206,4	78,4	511,0	1,00
October	748,8	707,9	596,6	464,8	253,0	86,0	58,7	352,7	1,00
November	679,4	594,2	473,7	285,1	117,6	40,0	40,0	189,4	1,00
December	623,5	529,5	397,8	216,4	62,0	31,5	31,5	128,0	1,00

Mult. = User-defined solar multiplier factor.

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Cooling Design Temperature Profiles

Rotterdam RDCG - OPB and Labo in MNA 13-07-21

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Location: Rotterdam, Netherlands

(Dry and Wet Bulb temperatures are expressed in °C)

Hr	January		February		March		April		May		June	
	DB	WB	DB	WB	DB	WB	DB	WB	DB	WB	DB	WB
0000	8,9	8,6	10,4	10,1	13,5	13,2	15,6	15,3	18,2	17,4	19,8	18,6
0100	8,4	8,1	9,9	9,6	13,0	12,8	15,1	14,8	17,7	17,2	19,4	18,5
0200	7,9	7,7	9,4	9,1	12,6	12,3	14,6	14,3	17,2	16,9	18,9	18,3
0300	7,6	7,3	9,0	8,8	12,2	11,9	14,2	14,0	16,8	16,6	18,5	18,2
0400	7,3	7,0	8,8	8,5	11,9	11,7	14,0	13,7	16,6	16,3	18,2	18,0
0500	7,2	6,9	8,7	8,4	11,8	11,6	13,9	13,6	16,5	16,2	18,1	17,9
0600	7,4	7,1	8,9	8,6	12,0	11,7	14,1	13,8	16,7	16,4	18,3	18,1
0700	7,8	7,6	9,3	9,1	12,5	12,2	14,5	14,3	17,1	16,9	18,8	18,3
0800	8,7	8,4	10,2	9,9	13,3	13,0	15,4	15,1	18,0	17,3	19,6	18,6
0900	9,9	9,6	11,4	11,1	14,5	14,3	16,6	16,3	19,2	17,7	20,8	18,9
1000	11,3	11,0	12,8	12,5	15,9	15,7	18,0	17,0	20,6	18,2	22,2	19,4
1100	12,9	12,6	14,4	14,1	17,5	16,4	19,6	17,6	22,2	18,7	23,8	19,9
1200	14,3	13,5	15,8	14,7	19,0	16,9	21,0	18,1	23,6	19,2	25,3	20,4
1300	15,5	13,9	17,0	15,1	20,1	17,3	22,2	18,5	24,8	19,6	26,4	20,7
1400	16,2	14,2	17,7	15,3	20,9	17,6	22,9	18,7	25,5	19,8	27,2	20,9
1500	16,5	14,3	18,0	15,4	21,1	17,7	23,2	18,8	25,8	19,9	27,4	21,0
1600	16,2	14,2	17,7	15,3	20,9	17,6	22,9	18,7	25,5	19,8	27,2	20,9
1700	15,6	14,0	17,0	15,1	20,2	17,4	22,2	18,5	24,8	19,6	26,5	20,7
1800	14,5	13,6	16,0	14,7	19,2	17,0	21,2	18,1	23,8	19,3	25,5	20,4
1900	13,3	13,1	14,8	14,3	18,0	16,6	20,0	17,7	22,6	18,9	24,3	20,0
2000	12,1	11,8	13,6	13,3	16,8	16,1	18,8	17,3	21,4	18,5	23,1	19,7
2100	11,1	10,8	12,6	12,3	15,7	15,5	17,8	17,0	20,4	18,2	22,1	19,3
2200	10,2	9,9	11,7	11,4	14,8	14,5	16,9	16,6	19,5	17,8	21,1	19,0
2300	9,4	9,1	10,9	10,6	14,1	13,8	16,1	15,8	18,7	17,6	20,4	18,8

Hr	July		August		September		October		November		December	
	DB	WB	DB	WB	DB	WB	DB	WB	DB	WB	DB	WB
0000	20,4	18,6	20,4	18,6	19,3	18,0	16,7	16,4	13,0	12,7	9,8	9,5
0100	19,9	18,5	19,9	18,5	18,8	17,9	16,2	15,9	12,5	12,2	9,3	9,1
0200	19,4	18,3	19,4	18,3	18,3	17,7	15,7	15,5	12,0	11,7	8,9	8,6
0300	19,1	18,2	19,1	18,2	18,0	17,6	15,4	15,1	11,6	11,4	8,5	8,2
0400	18,8	18,1	18,8	18,1	17,7	17,4	15,1	14,8	11,4	11,1	8,2	7,9
0500	18,7	18,1	18,7	18,1	17,6	17,3	15,0	14,7	11,3	11,0	8,1	7,8
0600	18,9	18,1	18,9	18,1	17,8	17,5	15,2	14,9	11,5	11,2	8,3	8,0
0700	19,4	18,3	19,4	18,3	18,2	17,7	15,6	15,4	11,9	11,7	8,8	8,5
0800	20,2	18,6	20,2	18,6	19,1	17,9	16,5	16,2	12,8	12,5	9,6	9,3
0900	21,4	19,0	21,4	19,0	20,3	18,3	17,7	16,7	14,0	13,7	10,8	10,5
1000	22,8	19,4	22,8	19,4	21,7	18,8	19,1	17,2	15,4	15,1	12,2	11,9
1100	24,4	19,9	24,4	19,9	23,3	19,3	20,7	17,8	17,0	16,4	13,8	13,5
1200	25,9	20,4	25,9	20,4	24,7	19,8	22,1	18,3	18,4	16,9	15,3	14,7
1300	27,0	20,7	27,0	20,7	25,9	20,1	23,3	18,6	19,6	17,3	16,4	15,1
1400	27,7	20,9	27,7	20,9	26,6	20,4	24,0	18,9	20,3	17,6	17,1	15,3
1500	28,0	21,0	28,0	21,0	26,9	20,4	24,3	19,0	20,6	17,7	17,4	15,4
1600	27,7	20,9	27,7	20,9	26,6	20,4	24,0	18,9	20,3	17,6	17,1	15,3
1700	27,1	20,7	27,1	20,7	26,0	20,2	23,4	18,7	19,6	17,3	16,5	15,1
1800	26,0	20,4	26,0	20,4	24,9	19,8	22,3	18,3	18,6	17,0	15,5	14,7
1900	24,8	20,0	24,8	20,0	23,7	19,5	21,1	17,9	17,4	16,6	14,3	14,0
2000	23,6	19,7	23,6	19,7	22,5	19,1	19,9	17,5	16,2	15,9	13,1	12,8
2100	22,6	19,3	22,6	19,3	21,5	18,7	18,9	17,2	15,2	14,9	12,0	11,8
2200	21,7	19,0	21,7	19,0	20,6	18,4	18,0	16,8	14,3	14,0	11,1	10,8
2300	20,9	18,8	20,9	18,8	19,8	18,2	17,2	16,6	13,5	13,2	10,4	10,1

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Design Temperature Profile

Rotterdam RDCG - OPB and Labo in MNA 13-07-21

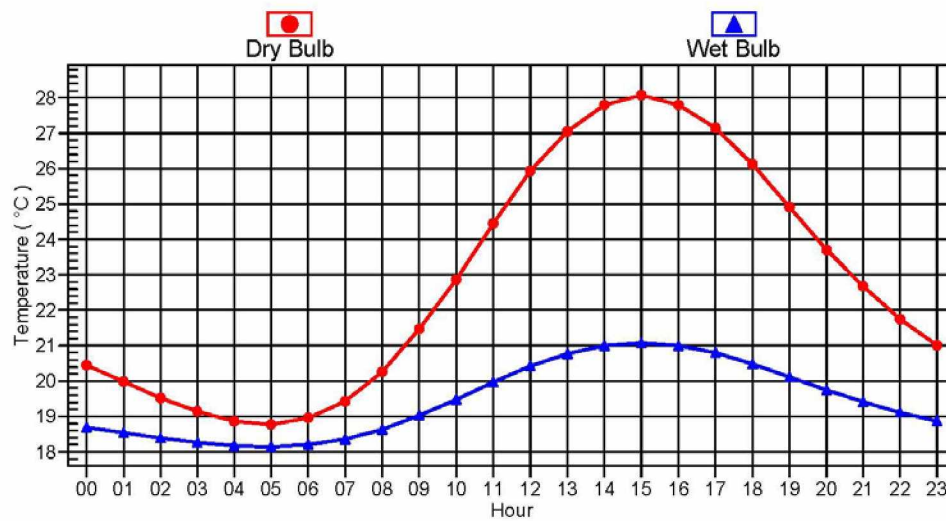
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Location: Rotterdam, Netherlands

Design Temperature Profiles for July



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5.2. Walls, roof, doors, windows construction

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Wall Constructions

 Rotterdam RDCG - OPB and Labo in MNA 13-07-21
 Ing. ZE

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External Insulated wall

Wall Details

 Outside Surface Color Medium
 Absorptivity 0,675
 Overall U-Value 0,442 W/(m²·K)

Wall Layers Details (Inside to Outside)

Layers	Thickness mm	Density kg/m³	Specific Ht. kJ / (kg K)	R-Value (m²·K)/W	Weight kg/m²
Inside surface resistance	0,000	0,0	0,00	0,12064	0,0
Plaster	20,000	1400,0	0,84	0,03000	28,0
Gypsum board	20,000	750,0	0,84	0,03300	15,0
Rockwall insulation	50,000	80,0	0,84	1,25000	4,0
CMU wall	250,000	650,0	0,84	0,74000	162,5
Plaster	20,000	1400,0	0,84	0,03000	28,0
Outside surface resistance	0,000	0,0	0,00	0,05864	0,0
Totals	360,000	-		2,26228	237,5

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Roof Constructions

Rotterdam RDCG - OPB and Labo in MNA 13-07-21

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Insulated roof

Roof Details

Outside Surface Color Medium
 Absorptivity 0,675
 Overall U-Value 0,223 W/(m²·K)

Roof Layers Details (Inside to Outside)

Layers	Thickness mm	Density kg/m³	Specific Ht. kJ / (kg K)	R-Value (m²·K)/W	Weight kg/m²
Inside surface resistance	0,000	0,0	0,00	0,12064	0,0
Reinforced concrete	250,000	1800,0	0,84	0,25000	450,0
Polystyrene insulation	150,000	30,0	1,25	3,75000	4,5
Water proofing membrane	5,000	1000,0	0,92	0,03000	5,0
Light concrete	50,000	800,0	0,88	0,17000	40,0
Concrete panel	50,000	1200,0	0,88	0,10000	60,0
Outside surface resistance	0,000	0,0	0,00	0,05864	0,0
Totals	505,000	-		4,47928	559,5

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Door Constructions

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 Ing. ZE

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Door SD 01

Door Details:

 Gross Area 4,8 m²
 Door U-Value 0,500 W/(m²·K)

Glass Details:

 Glass Area 0,0 m²
 Glass U-Value 3,293 W/(m²·K)
 Glass Shade Coefficient 0,880
 Glass Shaded All Day? No

Door SD 02

Door Details:

 Gross Area 6,8 m²
 Door U-Value 0,500 W/(m²·K)

Glass Details:

 Glass Area 0,0 m²
 Glass U-Value 3,293 W/(m²·K)
 Glass Shade Coefficient 0,880
 Glass Shaded All Day? No

Door SD 03

Door Details:

 Gross Area 3,4 m²
 Door U-Value 0,500 W/(m²·K)

Glass Details:

 Glass Area 0,0 m²
 Glass U-Value 3,293 W/(m²·K)
 Glass Shade Coefficient 0,880
 Glass Shaded All Day? No

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Window Constructions

Rotterdam RDCG - OPB and Labo in MNA 13-07-21

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Window 1

Window Details:

Detailed Input Vero
 Height 0,80 m
 Width 1,30 m
 Frame Type Aluminum with thermal breaks
 Internal Shade Type None
 Overall U-Value 3,723 W/(m²·K)
 Overall Shade Coefficient 0,792

Glass Details:

Gap Type 6mm Air Space

Glazing	Glass Type	Transmissivity	Reflectivity	Absorptivity
Outer Glazing	3mm clear	0,841	0,078	0,081
Glazing #2	3mm clear	0,841	0,078	0,081
Glazing #3	Not Used	1,000	0,000	0,000

Window 2

Window Details:

Detailed Input Vero
 Height 0,80 m
 Width 1,80 m
 Frame Type Aluminum with thermal breaks
 Internal Shade Type None
 Overall U-Value 3,712 W/(m²·K)
 Overall Shade Coefficient 0,792

Glass Details:

Gap Type 6mm Air Space

Glazing	Glass Type	Transmissivity	Reflectivity	Absorptivity
Outer Glazing	3mm clear	0,841	0,078	0,081
Glazing #2	3mm clear	0,841	0,078	0,081
Glazing #3	not used	1,000	0,000	0,000

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5.3. Air system sizing summary – Offices – fresh air and fan coil units

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Dedicated Outdoor Air System (DOAS) Sizing Summary for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: ZE

07/14/2021
09:24

Air System Information

Air System Name **Offices - Fresh air & fan coils**
Equipment Class **TERM**
Air System Type **4P-FC**

Number of zones **23**
Floor Area **789,8** m²
Location **Rotterdam, Netherlands**

Sizing Calculation Information

Calculation Months **Jan to Dec**
Sizing Data **Calculated**

Zone L/s Sizing **Sum of space airflow rates**
Space L/s Sizing **Individual peak space loads**

Cooling Coil Sizing Data

Total coil load **36,4** kW
Total coil load **43,1** L/(s kW)
Sensible coil load **24,3** kW
Coil L/s at Jul 1500 **1569** L/s
Max coil L/s **1569** L/s
Sensible heat ratio **0,667**
Water flow @ 5,0 K rise **1,74** L/s

Load occurs at **Jul 1500**
OA DB / WB **28,0 / 21,0** °C
Entering DB / WB **28,0 / 21,0** °C
Leaving DB / WB **15,2 / 14,6** °C
Bypass Factor **0,100**

Heating Coil Sizing Data

Max coil load **45,8** kW
Coil L/s at Des Htg **1569** L/s
Max coil L/s **1569** L/s
Water flow @ 5,0 K drop **2,19** L/s

Load occurs at **Des Htg**
Ent. DB / Lvg DB **-10,0 / 14,2** °C

Ventilation Fan Sizing Data

Actual max L/s **1569** L/s
Standard L/s **1568** L/s
Actual max L/(s·m²) **1,99** L/(s·m²)

Fan motor BHP **1,98** BHP
Fan motor kW **1,57** kW
Fan static **600** Pa

Outdoor Ventilation Air Data

Design airflow L/s **1569** L/s
L/(s·m²) **1,99** L/(s·m²)

L/s/person **21,80** L/s/person

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Zone Sizing Summary for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E 2E

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Air System Information

Air System Name **Offices - Fresh air & fan coils**
Equipment Class **TERM**
Air System Type **4P-FC**

Number of zones **23**
Floor Area **789,8 m²**
Location **Rotterdam, Netherlands**

Sizing Calculation Information

Calculation Months **Jan to Dec**
Sizing Data **Calculated**

Zone L/s Sizing **Sum of space airflow rates**
Space L/s Sizing **Individual peak space loads**

Terminal Unit Sizing Data - Cooling

Zone Name	Total Coil Load (kW)	Sens Coil Load (kW)	Coil Entering DB / WB (°C)	Coil Leaving DB / WB (°C)	Water Flow @ 5,0 K (L/s)	Time of Peak Coil Load	Zone L/(s·m²)
Zone 1	0,1	0,0	18,8 / 16,8	15,2 / 15,0	0,00	Jun 0300	1,23
Zone 2	0,0	0,0	-17,8 / -17,8	-17,8 / -17,8	0,00	Des 0000	0,89
Zone 3	0,0	0,0	-17,8 / -17,8	-17,8 / -17,8	0,00	Des 0000	1,73
Zone 4	0,0	0,0	-17,8 / -17,8	-17,8 / -17,8	0,00	Des 0000	2,57
Zone 5	2,9	2,6	23,7 / 18,5	16,1 / 15,6	0,14	Jul 0100	2,24
Zone 6	0,0	0,0	-17,8 / -17,8	-17,8 / -17,8	0,00	Des 0000	0,88
Zone 7	2,0	1,9	23,1 / 17,8	15,3 / 14,8	0,10	Jun 0900	9,47
Zone 8	3,8	3,6	23,2 / 17,8	15,3 / 14,8	0,18	Jun 0900	8,77
Zone 9	0,0	0,0	24,1 / 19,5	23,2 / 19,2	0,00	Jul 0000	4,03
Zone 10	0,3	0,2	17,3 / 15,9	15,2 / 15,1	0,01	Jun 2300	3,56
Zone 11	1,9	1,9	18,7 / 16,2	15,2 / 14,9	0,09	Jun 1900	9,35
Zone 12	3,5	3,3	21,6 / 17,2	15,2 / 14,8	0,17	Jul 0900	10,92
Zone 13	0,0	0,0	-17,8 / -17,8	-17,8 / -17,8	0,00	Des 0000	3,49
Zone 14	0,0	0,0	-17,8 / -17,8	-17,8 / -17,8	0,00	Des 0000	4,62
Zone 15	0,0	0,0	-17,8 / -17,8	-17,8 / -17,8	0,00	Des 0000	2,50
Zone 16	1,3	1,2	23,0 / 17,7	15,3 / 14,8	0,06	Apr 0000	8,22
Zone 17	1,3	1,2	23,0 / 17,7	15,3 / 14,8	0,06	Apr 0000	8,22
Zone 18	1,3	1,2	23,0 / 17,7	15,3 / 14,8	0,06	Apr 0000	8,22
Zone 19	4,5	4,2	23,4 / 17,8	15,2 / 14,6	0,22	Jun 1000	8,37
Zone 20	3,2	3,0	23,4 / 17,8	15,2 / 14,6	0,15	Jul 1000	8,62
Zone 21	0,0	0,0	-17,8 / -17,8	-17,8 / -17,8	0,00	Des 0000	0,82
Zone 22	0,0	0,0	-17,8 / -17,8	-17,8 / -17,8	0,00	Des 0000	3,33
Zone 23	0,0	0,0	-17,8 / -17,8	-17,8 / -17,8	0,00	Des 0000	3,75

Terminal Unit Sizing Data - Heating, Fan, Ventilation

Zone Name	Heating Coil Load (kW)	Heating Coil Ent/Lvg DB (°C)	Htg Coil Water Flow @5,0 K (L/s)	Fan Design Airflow (L/s)	Fan Motor (BHP)	Fan Motor (kW)	OA Vent Design Airflow (L/s)
Zone 1	0,1	17,2 / 27,1	0,01	9	0,000	0,000	6
Zone 2	2,4	15,3 / 29,4	0,11	138	0,000	0,000	130
Zone 3	0,2	15,0 / 28,7	0,01	14	0,000	0,000	14
Zone 4	0,5	15,0 / 28,7	0,02	28	0,000	0,000	28
Zone 5	4,1	17,5 / 29,6	0,20	279	0,000	0,000	129
Zone 6	0,1	15,0 / 28,7	0,00	6	0,000	0,000	6
Zone 7	0,8	20,7 / 24,2	0,04	202	0,000	0,000	30
Zone 8	1,5	20,8 / 24,1	0,07	374	0,000	0,000	50
Zone 9	0,3	18,7 / 29,6	0,02	25	0,000	0,000	5
Zone 10	1,0	15,6 / 24,6	0,05	92	0,000	0,000	80
Zone 11	3,6	17,3 / 24,2	0,17	434	0,000	0,000	290
Zone 12	2,1	19,6 / 23,7	0,10	426	0,000	0,000	140
Zone 13	4,2	15,0 / 29,2	0,20	247	0,000	0,000	247
Zone 14	0,9	15,0 / 28,7	0,04	54	0,000	0,000	54
Zone 15	1,5	15,0 / 29,5	0,07	84	0,000	0,000	84
Zone 16	0,3	20,8 / 22,6	0,01	131	0,000	0,000	20
Zone 17	0,3	20,8 / 22,6	0,01	131	0,000	0,000	20
Zone 18	0,3	20,8 / 22,6	0,01	131	0,000	0,000	20

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Zone Sizing Summary for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
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Zone Name	Heating Coil Load (kW)	Heating Coil Ent/Lvg DB (°C)	Htg Coil Water Flow @5,0 K (L/s)	Fan Design Airflow (L/s)	Fan Motor (BHP)	Fan Motor (kW)	OA Vent Design Airflow (L/s)
Zone 19	1,3	21,1 / 23,7	0,06	423	0,000	0,000	40
Zone 20	1,0	21,0 / 23,9	0,05	301	0,000	0,000	30
Zone 21	0,1	15,0 / 28,7	0,00	6	0,000	0,000	6
Zone 22	0,2	15,0 / 28,7	0,01	14	0,000	0,000	14
Zone 23	2,1	15,0 / 28,7	0,10	126	0,000	0,000	126

Zone Peak Sensible Loads

Zone Name	Zone Cooling Sensible (kW)	Time of Peak Sensible Cooling Load	Zone Heating Load (kW)	Zone Floor Area (m²)
Zone 1	0,1	Jun 0200	0,1	7,3
Zone 2	1,8	Jun 0100	1,7	156,0
Zone 3	0,1	Jun 0200	0,1	8,1
Zone 4	0,1	Jun 0200	0,1	10,9
Zone 5	4,8	Jul 0000	3,4	125,0
Zone 6	0,1	Jun 0200	0,1	6,8
Zone 7	2,2	Jun 0900	0,7	21,3
Zone 8	4,1	Jun 0900	1,1	42,6
Zone 9	0,1	Jul 0000	0,3	6,2
Zone 10	1,2	Jun 2300	0,5	25,7
Zone 11	4,7	Jun 1800	1,1	46,4
Zone 12	4,6	Jun 0900	1,0	39,0
Zone 13	0,9	Jun 0100	1,1	70,8
Zone 14	0,1	Jun 0200	0,1	11,7
Zone 15	0,6	Jun 1800	0,7	33,7
Zone 16	1,4	Jun 0200	0,1	15,9
Zone 17	1,4	Jun 0200	0,1	15,9
Zone 18	1,4	Jun 0200	0,1	15,9
Zone 19	4,6	Jun 0900	1,1	50,6
Zone 20	3,3	Jun 0900	0,9	34,9
Zone 21	0,1	Jun 0200	0,1	7,3
Zone 22	0,0	Jun 0200	0,0	4,2
Zone 23	0,4	Jun 0200	0,2	33,6

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Zone Sizing Summary for Offices - Fresh air & fan coils

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Space Loads and Airflows

Zone Name / Space Name	Mult.	Cooling Sensible (kW)	Time of Peak Sensible Load	Air Flow (L/s)	Heating Load (kW)	Floor Area (m²)	Space L/(s·m²)
Zone 1							
Copy room	1	0,1	Jun 0200	9	0,1	7,3	1,23
Zone 2							
Corridor	1	1,8	Jun 0100	138	1,7	156,0	0,89
Zone 3							
Disabled Toilet	1	0,1	Jun 0200	14	0,1	8,1	1,73
Zone 4							
Women Toilet	1	0,1	Jun 0200	28	0,1	10,9	2,57
Zone 5							
HVAC Room	1	4,8	Jul 0000	279	3,4	125,0	2,24
Zone 6							
Janitor	1	0,1	Jun 0200	6	0,1	6,8	0,88
Zone 7							
Lab Manager office	1	2,2	Jun 0900	202	0,7	21,3	9,47
Zone 8							
Lab office	1	4,1	Jun 0900	374	1,1	42,6	8,77
Zone 9							
Lobby	1	0,1	Jul 0000	25	0,3	6,2	4,03
Zone 10							
Lobby Waiting area	1	1,2	Jun 2300	92	0,5	25,7	3,56
Zone 11							
Lunch room	1	4,7	Jun 1800	434	1,1	46,4	9,35
Zone 12							
Meeting room	1	4,6	Jun 0900	426	1,0	39,0	10,92
Zone 13							
Men Locker room	1	0,9	Jun 0100	247	1,1	70,8	3,49
Zone 14							
Men Toilet	1	0,1	Jun 0200	54	0,1	11,7	4,62
Zone 15							
Mud room	1	0,6	Jun 1800	84	0,7	33,7	2,50
Zone 16							
Office 1	1	1,4	Jun 0200	131	0,1	15,9	8,22
Zone 17							
Office 2	1	1,4	Jun 0200	131	0,1	15,9	8,22
Zone 18							
Office 3	1	1,4	Jun 0200	131	0,1	15,9	8,22
Zone 19							
Office room	1	4,6	Jun 0900	423	1,1	50,6	8,37
Zone 20							
Permit area	1	3,3	Jun 0900	301	0,9	34,9	8,62
Zone 21							
Storage room	1	0,1	Jun 0200	6	0,1	7,3	0,82
Zone 22							
Toilet	1	0,0	Jun 0200	14	0,0	4,2	3,33
Zone 23							
Women Locker room	1	0,4	Jun 0200	126	0,2	33,6	3,75

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Ventilation Sizing Summary for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: 

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1. Summary

Ventilation Sizing Method: Sum of Space OA Airflows
Design Ventilation Airflow Rate: 1569 L/s

2. Space Ventilation Analysis

2.1 Zone: Zone 1

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 1									
Copy room	1	7,3	0,0	9,0	0,00	0,00	6,0	0,0	6,0
Totals (Incl. Space Multipliers)				9,0					6,0

2.2 Zone: Zone 2

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 2									
Corridor	1	156,0	0,0	138,4	0,00	0,00	130,0	0,0	130,0
Totals (Incl. Space Multipliers)				138,4					130,0

2.3 Zone: Zone 3

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 3									
Disabled Toilet	1	8,1	0,0	14,0	0,00	0,00	14,0	0,0	14,0
Totals (Incl. Space Multipliers)				14,0					14,0

2.4 Zone: Zone 4

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 4									
Women Toilet	1	10,9	0,0	28,0	0,00	0,00	28,0	0,0	28,0
Totals (Incl. Space Multipliers)				28,0					28,0

2.5 Zone: Zone 5

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 5									
HVAC Room	1	125,0	0,0	279,4	0,00	0,00	129,0	0,0	129,0
Totals (Incl. Space Multipliers)				279,4					129,0

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Ventilation Sizing Summary for Offices - Fresh air & fan coils

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2.6 Zone: Zone 6

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 6									
Janitor	1	6,8	0,0	6,0	0,00	0,00	6,0	0,0	6,0
Totals (incl. Space Multipliers)				6,0					6,0

2.7 Zone: Zone 7

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 7									
Lab Manager office	1	21,3	3,0	201,7	10,00	0,00	0,0	0,0	30,0
Totals (incl. Space Multipliers)				201,7					30,0

2.8 Zone: Zone 8

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 8									
Lab office	1	42,6	5,0	373,5	10,00	0,00	0,0	0,0	50,0
Totals (incl. Space Multipliers)				373,5					50,0

2.9 Zone: Zone 9

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 9									
Lobby	1	6,2	0,0	25,0	0,00	0,00	5,0	0,0	5,0
Totals (incl. Space Multipliers)				25,0					5,0

2.10 Zone: Zone 10

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 10									
Lobby Waiting area	1	25,7	6,0	91,6	10,00	0,00	0,0	0,0	80,0
Totals (incl. Space Multipliers)				91,6					80,0

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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2.11 Zone: Zone 11

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 11									
Lunch room	1	46,4	29,0	433,7	10,00	0,00	0,0	0,0	290,0
Totals (incl. Space Multipliers)				433,7					290,0

2.12 Zone: Zone 12

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 12									
Meeting room	1	39,0	14,0	426,0	10,00	0,00	0,0	0,0	140,0
Totals (incl. Space Multipliers)				426,0					140,0

2.13 Zone: Zone 13

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 13									
Men Locker room	1	70,8	0,0	247,0	0,00	0,00	247,0	0,0	247,0
Totals (incl. Space Multipliers)				247,0					247,0

2.14 Zone: Zone 14

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 14									
Men Toilet	1	11,7	0,0	54,0	0,00	0,00	54,0	0,0	54,0
Totals (incl. Space Multipliers)				54,0					54,0

2.15 Zone: Zone 15

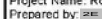
Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 15									
Mud room	1	33,7	0,0	84,3	0,00	2,50	0,0	0,0	84,3
Totals (incl. Space Multipliers)				84,3					84,3

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2.16 Zone: Zone 16

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 16									
Office 1	1	15,9	2,0	130,7	10,00	0,00	0,0	0,0	20,0
Totals (incl. Space Multipliers)				130,7					20,0

2.17 Zone: Zone 17

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 17									
Office 2	1	15,9	2,0	130,7	10,00	0,00	0,0	0,0	20,0
Totals (incl. Space Multipliers)				130,7					20,0

2.18 Zone: Zone 18

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 18									
Office 3	1	15,9	2,0	130,7	10,00	0,00	0,0	0,0	20,0
Totals (incl. Space Multipliers)				130,7					20,0

2.19 Zone: Zone 19

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 19									
Office room	1	50,6	4,0	423,4	10,00	0,00	0,0	0,0	40,0
Totals (incl. Space Multipliers)				423,4					40,0

2.20 Zone: Zone 20

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 20									
Permit area	1	34,9	3,0	300,9	10,00	0,00	0,0	0,0	30,0
Totals (incl. Space Multipliers)				300,9					30,0

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2.21 Zone: Zone 21

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 21									
Storage room	1	7,3	0,0	6,0	0,00	0,00	6,0	0,0	6,0
Totals (incl. Space Multipliers)				6,0					6,0

2.22 Zone: Zone 22

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 22									
Toilet	1	4,2	0,0	14,0	0,00	0,00	14,0	0,0	14,0
Totals (incl. Space Multipliers)				14,0					14,0

2.23 Zone: Zone 23

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 23									
Women Locker room	1	33,6	0,0	126,1	0,00	0,00	126,1	0,0	126,1
Totals (incl. Space Multipliers)				126,1					126,1

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Air System Design Load Summary for Offices - Fresh air & fan coils

 Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
 Prepared by: Ing. 2E 2E

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	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 2300			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 20,4 °C / 18,8 °C			HEATING OA DB / WB -10,0 °C / -10,0 °C		
ZONE LOADS	Details	Sensible (W)	Latent (W)	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	8 m²	817	-	8 m²	-	-
Wall Transmission	355 m²	689	-	355 m²	4830	-
Roof Transmission	790 m²	924	-	790 m²	5419	-
Window Transmission	8 m²	-102	-	8 m²	907	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	29 m²	-119	-	29 m²	441	-
Floor Transmission	665 m²	0	-	665 m²	1604	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	10980 W	10979	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	15733 W	15732	-	0	0	-
People	72	5151	3672	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	3407	367	10%	1320	0
>> Total Zone Loads	-	37478	4039	-	14522	0
Zone Conditioning	-	37591	4039	-	14188	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Exhaust Fan Load	1569 L/s	0	-	1569 L/s	0	-
Ventilation Load	1569 L/s	-13473	8289	1569 L/s	57806	0
Ventilation Fan Load	1569 L/s	1569	-	1569 L/s	-1569	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	-	25688	12328	-	70425	0
Cooling Coil	-	9856	10751	-	0	0
Heating Coil	-	0	-	-	45765	-
Terminal Unit Cooling	-	23586	1436	-	0	0
Terminal Unit Heating	-	-339	-	-	28954	-
>> Total Conditioning	-	33103	12188	-	74719	0
Key:	Positive values are clg loads Negative values are htg loads			Positive values are htg loads Negative values are clg loads		

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Space Design Load Summary for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E 2E

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TABLE 1.1.A. Component Loads For Space "Copy room" In Zone "Zone 1"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0200			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 18,9 °C / 18,3 °C			HEATING OA DB / WB -10,0 °C / -10,0 °C		
		OCCUPIED T-STAT 24,0 °C			OCCUPIED T-STAT 22,0 °C	
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	0 m²	0	-	0 m²	0	-
Roof Transmission	7 m²	16	-	7 m²	52	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	7 m²	0	-	7 m²	0	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	73 W	73	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	0 W	0	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	9	0	10%	5	0
>> Total Zone Loads	-	97	0	-	57	0

TABLE 1.1.B. Envelope Loads For Space "Copy room" In Zone "Zone 1"						
	Area	U-Value	Shade	COOLING	COOLING	HEATING
				TRANS	SOLAR	TRANS
	(m²)	(W/(m²·K))	Coeff.	(W)	(W)	(W)
H EXPOSURE						
ROOF	7	0,223	-	16	-	52

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Space Design Load Summary for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E 2E

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TABLE 2.1.A. Component Loads For Space "Corridor" In Zone "Zone 2"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0100			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 19,4 °C / 18,5 °C			HEATING OA DB / WB -10,0 °C / -10,0 °C		
	OCCUPIED T-STAT 30,0 °C			OCCUPIED T-STAT 20,0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	8 m²	5	-	8 m²	101	-
Roof Transmission	156 m²	119	-	156 m²	1045	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	10 m²	-46	-	10 m²	144	-
Floor Transmission	156 m²	0	-	156 m²	228	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	1560 W	1560	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	0 W	0	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	164	0	10%	152	0
>> Total Zone Loads	-	1802	0	-	1670	0

TABLE 2.1.B. Envelope Loads For Space "Corridor" In Zone "Zone 2"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
E EXPOSURE						
WALL	8	0,442	-	5	-	101
DOOR	10	0,500	-	-46	-	144
H EXPOSURE						
ROOF	156	0,223	-	119	-	1045

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Space Design Load Summary for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E 2E

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TABLE 3.1.A. Component Loads For Space "Disabled Toilet" In Zone "Zone 3"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0200			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 18,9 °C / 18,3 °C			HEATING OA DB / WB -10,0 °C / -10,0 °C		
	OCCUPIED T-STAT 30,0 °C			OCCUPIED T-STAT 20,0 °C		
	Details	Sensible (W)	Latent (W)	Details	Sensible (W)	Latent (W)
SPACE LOADS						
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	0 m²	0	-	0 m²	0	-
Roof Transmission	8 m²	6	-	8 m²	54	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	8 m²	0	-	8 m²	0	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	81 W	81	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	0 W	0	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	9	0	10%	5	0
>> Total Zone Loads	-	96	0	-	60	0

TABLE 3.1.B. Envelope Loads For Space "Disabled Toilet" In Zone "Zone 3"						
	Area	U-Value	Shade	COOLING TRANS	COOLING SOLAR	HEATING TRANS
	(m²)	(W/(m²·K))	Coeff.	(W)	(W)	(W)
H EXPOSURE						
ROOF	8	0.223	-	6	-	54

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Space Design Load Summary for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E 2E

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TABLE 4.1.A. Component Loads For Space "Women Toilet" In Zone "Zone 4"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0200			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 18,9 °C / 18,3 °C			HEATING OA DB / WB -10,0 °C / -10,0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	0 m²	0	-	0 m²	0	-
Roof Transmission	11 m²	9	-	11 m²	73	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	11 m²	0	-	11 m²	0	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	109 W	109	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	0 W	0	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	12	0	10%	7	0
>> Total Zone Loads	-	129	0	-	80	0

TABLE 4.1.B. Envelope Loads For Space "Women Toilet" In Zone "Zone 4"						
	Area	U-Value	Shade	COOLING	COOLING	HEATING
				TRANS	SOLAR	TRANS
	(m²)	(W/(m²·K))	Coeff.	(W)	(W)	(W)
H EXPOSURE						
ROOF	11	0,223	-	9	-	73

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Space Design Load Summary for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E 2E

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TABLE 5.1.A. Component Loads For Space "HVAC Room" In Zone "Zone 5"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 0000			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 20,4 °C / 18,6 °C			HEATING OA DB / WB -10,0 °C / -10,0 °C		
		OCCUPIED T-STAT 30,0 °C			OCCUPIED T-STAT 20,0 °C	
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	156 m²	92	-	156 m²	2074	-
Roof Transmission	125 m²	79	-	125 m²	837	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	10 m²	-44	-	10 m²	153	-
Floor Transmission	0 m²	0	-	0 m²	0	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	1250 W	1250	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	3000 W	3000	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	438	0	10%	306	0
>> Total Zone Loads	-	4814	0	-	3371	0

TABLE 5.1.B. Envelope Loads For Space "HVAC Room" In Zone "Zone 5"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
N EXPOSURE						
WALL	46	0,442	-	-54	-	614
E EXPOSURE						
WALL	37	0,442	-	34	-	491
S EXPOSURE						
WALL	43	0,442	-	55	-	569
DOOR	3	0,500	-	-15	-	51
W EXPOSURE						
WALL	30	0,442	-	58	-	400
DOOR	7	0,500	-	-29	-	102
H EXPOSURE						
ROOF	125	0,223	-	79	-	837

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Space Design Load Summary for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E 2E

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TABLE 6.1.A. Component Loads For Space "Janitor" In Zone "Zone 6"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0200			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 18,9 °C / 18,3 °C			HEATING OA DB / WB -10,0 °C / -10,0 °C		
		OCCUPIED T-STAT 30,0 °C			OCCUPIED T-STAT 20,0 °C	
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	0 m²	0	-	0 m²	0	-
Roof Transmission	7 m²	5	-	7 m²	46	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	7 m²	0	-	7 m²	0	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	68 W	68	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	0 W	0	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	7	0	10%	5	0
>> Total Zone Loads	-	81	0	-	50	0

TABLE 6.1.B. Envelope Loads For Space "Janitor" In Zone "Zone 6"						
	Area	U-Value	Shade	COOLING	COOLING	HEATING
				TRANS	SOLAR	TRANS
	(m²)	(W/(m²·K))	Coeff.	(W)	(W)	(W)
H EXPOSURE						
ROOF	7	0,223	-	5	-	46

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Space Design Load Summary for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E 2E

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TABLE 7.1.A. Component Loads For Space "Lab Manager office" In Zone "Zone 7"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0900 COOLING OA DB / WB 20,8 °C / 18,9 °C OCCUPIED T-STAT 24,0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 22,0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	1 m²	236	-	1 m²	-	-
Wall Transmission	15 m²	23	-	15 m²	216	-
Roof Transmission	21 m²	37	-	21 m²	152	-
Window Transmission	1 m²	-12	-	1 m²	124	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	21 m²	0	-	21 m²	100	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	426 W	426	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	1065 W	1065	-	0	0	-
People	3	215	180	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	199	18	10%	59	0
>> Total Zone Loads	-	2190	198	-	651	0

TABLE 7.1.B. Envelope Loads For Space "Lab Manager office" In Zone "Zone 7"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
E EXPOSURE						
WALL	15	0,442	-	23	-	216
WINDOW 1	1	3,723	0,792	-12	236	124
H EXPOSURE						
ROOF	21	0,223	-	37	-	152

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Space Design Load Summary for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E 2E

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TABLE 8.1.A. Component Loads For Space "Lab office" In Zone "Zone 8"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0900 COOLING OA DB / WB 20,8 °C / 18,9 °C OCCUPIED T-STAT 24,0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 22,0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	1 m²	236	-	1 m²	-	-
Wall Transmission	32 m²	48	-	32 m²	448	-
Roof Transmission	43 m²	74	-	43 m²	304	-
Window Transmission	1 m²	-12	-	1 m²	124	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	43 m²	0	-	43 m²	133	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	852 W	852	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	2130 W	2130	-	0	0	-
People	5	359	300	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	369	30	10%	101	0
>> Total Zone Loads	-	4056	330	-	1110	0

TABLE 8.1.B. Envelope Loads For Space "Lab office" In Zone "Zone 8"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
E EXPOSURE						
WALL	32	0,442	-	48	-	448
WINDOW 1	1	3,723	0,792	-12	236	124
H EXPOSURE						
ROOF	43	0,223	-	74	-	304

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Space Design Load Summary for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E 2E

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TABLE 9.1.A. Component Loads For Space "Lobby" In Zone "Zone 9"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 0000			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 20,4 °C / 18,6 °C OCCUPIED T-STAT 30,0 °C			HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 20,0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	8 m²	16	-	8 m²	113	-
Roof Transmission	6 m²	4	-	6 m²	42	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	5 m²	-21	-	5 m²	72	-
Floor Transmission	6 m²	0	-	6 m²	48	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	62 W	62	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	0 W	0	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	6	0	10%	27	0
>> Total Zone Loads	-	68	0	-	302	0

TABLE 9.1.B. Envelope Loads For Space "Lobby" In Zone "Zone 9"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
W EXPOSURE						
WALL	8	0,442	-	16	-	113
DOOR	5	0,500	-	-21	-	72
H EXPOSURE						
ROOF	6	0,223	-	4	-	42

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Space Design Load Summary for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E 2E

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TABLE 10.1.A. Component Loads For Space "Lobby Waiting area" In Zone "Zone 10"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 2300			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 20,4 °C / 18,8 °C			HEATING OA DB / WB -10,0 °C / -10,0 °C		
		OCCUPIED T-STAT 26,0 °C			OCCUPIED T-STAT 20,0 °C	
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	8 m²	23	-	8 m²	113	-
Roof Transmission	26 m²	40	-	26 m²	172	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	5 m²	-11	-	5 m²	72	-
Floor Transmission	26 m²	0	-	26 m²	91	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	514 W	514	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	0 W	0	-	0	0	-
People	8	539	282	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	110	28	10%	45	0
>> Total Zone Loads	-	1215	310	-	492	0

TABLE 10.1.B. Envelope Loads For Space "Lobby Waiting area" In Zone "Zone 10"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
E EXPOSURE						
WALL	8	0,442	-	23	-	113
DOOR	5	0,500	-	-11	-	72
H EXPOSURE						
ROOF	26	0,223	-	40	-	172

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Space Design Load Summary for Offices - Fresh air & fan coils

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TABLE 11.1.A. Component Loads For Space "Lunch room" In Zone "Zone 11"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 1800 COOLING OA DB / WB 25,5 °C / 20,4 °C OCCUPIED T-STAT 24,0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 22,0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	1 m²	351	-	1 m²	-	-
Wall Transmission	23 m²	46	-	23 m²	332	-
Roof Transmission	46 m²	69	-	46 m²	331	-
Window Transmission	1 m²	4	-	1 m²	171	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	46 m²	0	-	46 m²	178	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	928 W	928	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	928 W	928	-	0	0	-
People	29	1955	1021	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	428	102	10%	101	0
>> Total Zone Loads	-	4709	1123	-	1114	0

TABLE 11.1.B. Envelope Loads For Space "Lunch room" In Zone "Zone 11"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
W EXPOSURE						
WALL	23	0,442	-	46	-	332
WINDOW 1	1	3,712	0,792	4	351	171
H EXPOSURE						
ROOF	46	0,223	-	69	-	331

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TABLE 12.1.A. Component Loads For Space "Meeting room" In Zone "Zone 12"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0900 COOLING OA DB / WB 20,8 °C / 18,9 °C OCCUPIED T-STAT 24,0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 22,0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	1 m²	236	-	1 m²	-	-
Wall Transmission	22 m²	34	-	22 m²	313	-
Roof Transmission	39 m²	68	-	39 m²	279	-
Window Transmission	1 m²	-12	-	1 m²	124	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	39 m²	0	-	39 m²	159	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	780 W	780	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	1950 W	1950	-	0	0	-
People	14	1149	1107	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	420	111	10%	87	0
>> Total Zone Loads	-	4625	1218	-	962	0

TABLE 12.1.B. Envelope Loads For Space "Meeting room" In Zone "Zone 12"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
E EXPOSURE						
WALL	22	0,442	-	34	-	313
WINDOW 1	1	3,723	0,792	-12	236	124
H EXPOSURE						
ROOF	39	0,223	-	68	-	279

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TABLE 13.1.A. Component Loads For Space "Men Locker room" In Zone "Zone 13"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0100			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 19,4 °C / 18,5 °C			HEATING OA DB / WB -10,0 °C / -10,0 °C		
		OCCUPIED T-STAT 30,0 °C			OCCUPIED T-STAT 20,0 °C	
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	25 m²	47	-	25 m²	332	-
Roof Transmission	71 m²	54	-	71 m²	474	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	71 m²	0	-	71 m²	196	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	708 W	708	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	0 W	0	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	81	0	10%	100	0
>> Total Zone Loads	-	890	0	-	1102	0

TABLE 13.1.B. Envelope Loads For Space "Men Locker room" In Zone "Zone 13"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
W EXPOSURE						
WALL	25	0,442	-	47	-	332
H EXPOSURE						
ROOF	71	0,223	-	54	-	474

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TABLE 14.1.A. Component Loads For Space "MenToilet" In Zone "Zone 14"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0200 COOLING OA DB / WB 18,9 °C / 18,3 °C OCCUPIED T-STAT 30,0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 20,0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	0 m²	0	-	0 m²	0	-
Roof Transmission	12 m²	9	-	12 m²	78	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	12 m²	0	-	12 m²	0	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	117 W	117	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	0 W	0	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	13	0	10%	8	0
>> Total Zone Loads	-	139	0	-	86	0

TABLE 14.1.B. Envelope Loads For Space "MenToilet" In Zone "Zone 14"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
H EXPOSURE						
ROOF	12	0,223	-	9	-	78

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TABLE 15.1.A. Component Loads For Space "Mud room" In Zone "Zone 15"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 1800 COOLING OA DB / WB 25,5 °C / 20,4 °C OCCUPIED T-STAT 30,0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 20,0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	1 m²	254	-	1 m²	-	-
Wall Transmission	14 m²	-9	-	14 m²	180	-
Roof Transmission	34 m²	5	-	34 m²	226	-
Window Transmission	1 m²	-20	-	1 m²	116	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	34 m²	0	-	34 m²	105	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	337 W	337	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	0 W	0	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	57	0	10%	63	0
>> Total Zone Loads	-	623	0	-	689	0

TABLE 15.1.B. Envelope Loads For Space "Mud room" In Zone "Zone 15"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
W EXPOSURE						
WALL	14	0,442	-	-9	-	180
WINDOW 1	1	3,723	0,792	-20	254	116
H EXPOSURE						
ROOF	34	0,223	-	5	-	226

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TABLE 16.1.A. Component Loads For Space "Office 1" In Zone "Zone 16"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0200			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 18,9 °C / 18,3 °C			HEATING OA DB / WB -10,0 °C / -10,0 °C		
		OCCUPIED T-STAT 24,0 °C			OCCUPIED T-STAT 22,0 °C	
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	0 m²	0	-	0 m²	0	-
Roof Transmission	16 m²	34	-	16 m²	114	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	16 m²	0	-	16 m²	0	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	318 W	318	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	795 W	795	-	0	0	-
People	2	144	120	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	129	12	10%	11	0
>> Total Zone Loads	-	1419	132	-	125	0

TABLE 16.1.B. Envelope Loads For Space "Office 1" In Zone "Zone 16"						
	Area	U-Value	Shade	COOLING	COOLING	HEATING
				TRANS	SOLAR	TRANS
	(m²)	(W/(m²·K))	Coeff.	(W)	(W)	(W)
H EXPOSURE						
ROOF	16	0,223	-	34	-	114

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TABLE 17.1.A. Component Loads For Space "Office 2" In Zone "Zone 17"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0200			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 18,9 °C / 18,3 °C			HEATING OA DB / WB -10,0 °C / -10,0 °C		
		OCCUPIED T-STAT 24,0 °C			OCCUPIED T-STAT 22,0 °C	
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	0 m²	0	-	0 m²	0	-
Roof Transmission	16 m²	34	-	16 m²	114	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	16 m²	0	-	16 m²	0	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	318 W	318	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	795 W	795	-	0	0	-
People	2	144	120	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	129	12	10%	11	0
>> Total Zone Loads	-	1419	132	-	125	0

TABLE 17.1.B. Envelope Loads For Space "Office 2" In Zone "Zone 17"						
	Area	U-Value	Shade	COOLING	COOLING	HEATING
				TRANS	SOLAR	TRANS
	(m²)	(W/(m²·K))	Coeff.	(W)	(W)	(W)
H EXPOSURE						
ROOF	16	0,223	-	34	-	114

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TABLE 18.1.A. Component Loads For Space "Office 3" In Zone "Zone 18"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0200 COOLING OA DB / WB 18,9 °C / 18,3 °C OCCUPIED T-STAT 24,0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 22,0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	0 m²	0	-	0 m²	0	-
Roof Transmission	16 m²	34	-	16 m²	114	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	16 m²	0	-	16 m²	0	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	318 W	318	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	795 W	795	-	0	0	-
People	2	144	120	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	129	12	10%	11	0
>> Total Zone Loads	-	1419	132	-	125	0

TABLE 18.1.B. Envelope Loads For Space "Office 3" In Zone "Zone 18"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
H EXPOSURE						
ROOF	16	0,223	-	34	-	114

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TABLE 19.1.A. Component Loads For Space "Office room" In Zone "Zone 19"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0900 COOLING OA DB / WB 20,8 °C / 18,9 °C OCCUPIED T-STAT 24,0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 22,0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	1 m²	236	-	1 m²	-	-
Wall Transmission	25 m²	38	-	25 m²	356	-
Roof Transmission	51 m²	88	-	51 m²	361	-
Window Transmission	1 m²	-12	-	1 m²	124	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	51 m²	0	-	51 m²	190	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	1012 W	1012	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	2530 W	2530	-	0	0	-
People	4	287	240	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	418	24	10%	103	0
>> Total Zone Loads	-	4597	264	-	1135	0

TABLE 19.1.B. Envelope Loads For Space "Office room" In Zone "Zone 19"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
E EXPOSURE						
WALL	25	0,442	-	38	-	356
WINDOW 1	1	3,723	0,792	-12	236	124
H EXPOSURE						
ROOF	51	0,223	-	88	-	361

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TABLE 20.1.A. Component Loads For Space "Permit area" In Zone "Zone 20"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0900 COOLING OA DB / WB 20,8 °C / 18,9 °C OCCUPIED T-STAT 24,0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 22,0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	1 m²	236	-	1 m²	-	-
Wall Transmission	18 m²	27	-	18 m²	254	-
Roof Transmission	35 m²	61	-	35 m²	249	-
Window Transmission	1 m²	-12	-	1 m²	124	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	35 m²	0	-	35 m²	176	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	698 W	698	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	1745 W	1745	-	0	0	-
People	3	215	180	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	297	18	10%	80	0
>> Total Zone Loads	-	3267	198	-	884	0

TABLE 20.1.B. Envelope Loads For Space "Permit area" In Zone "Zone 20"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
E EXPOSURE						
WALL	18	0,442	-	27	-	254
WINDOW 1	1	3,723	0,792	-12	236	124
H EXPOSURE						
ROOF	35	0,223	-	61	-	249

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Space Design Load Summary for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E 2E

07/14/2021
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TABLE 21.1.A. Component Loads For Space "Storage room" In Zone "Zone 21"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0200 COOLING OA DB / WB 18,9 °C / 18,3 °C OCCUPIED T-STAT 30,0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 20,0 °C		
		Sensible (W)	Latent (W)		Sensible (W)	Latent (W)
SPACE LOADS	Details			Details		
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	0 m²	0	-	0 m²	0	-
Roof Transmission	7 m²	6	-	7 m²	49	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	7 m²	0	-	7 m²	0	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	73 W	73	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	0 W	0	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	8	0	10%	5	0
>> Total Zone Loads	-	87	0	-	54	0

TABLE 21.1.B. Envelope Loads For Space "Storage room" In Zone "Zone 21"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
H EXPOSURE						
ROOF	7	0,223	-	6	-	49

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Space Design Load Summary for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E 2E

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TABLE 22.1.A. Component Loads For Space "Toilet" In Zone "Zone 22"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0200			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 18,9 °C / 18,3 °C OCCUPIED T-STAT 30,0 °C			HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 20,0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	0 m²	0	-	0 m²	0	-
Roof Transmission	4 m²	3	-	4 m²	28	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	4 m²	0	-	4 m²	0	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	42 W	42	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	0 W	0	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	5	0	10%	3	0
>> Total Zone Loads	-	50	0	-	31	0

TABLE 22.1.B. Envelope Loads For Space "Toilet" In Zone "Zone 22"						
	Area	U-Value	Shade	COOLING	COOLING	HEATING
				TRANS	SOLAR	TRANS
	(m²)	(W/(m²·K))	Coeff.	(W)	(W)	(W)
H EXPOSURE						
ROOF	4	0,223	-	3	-	28

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Space Design Load Summary for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E 2E

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TABLE 23.1.A. Component Loads For Space "Women Locker room" In Zone "Zone 23"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0200			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 18,9 °C / 18,3 °C			HEATING OA DB / WB -10,0 °C / -10,0 °C		
		OCCUPIED T-STAT 30,0 °C			OCCUPIED T-STAT 20,0 °C	
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	0 m²	0	-	0 m²	0	-
Roof Transmission	34 m²	26	-	34 m²	225	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	34 m²	0	-	34 m²	0	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	336 W	336	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	0 W	0	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	36	0	10%	23	0
>> Total Zone Loads	-	399	0	-	248	0

TABLE 23.1.B. Envelope Loads For Space "Women Locker room" In Zone "Zone 23"						
	Area	U-Value	Shade	COOLING	COOLING	HEATING
				TRANS	SOLAR	TRANS
	(m²)	(W/(m²·K))	Coeff.	(W)	(W)	(W)
H EXPOSURE						
ROOF	34	0,223	-	26	-	225

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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System Psychrometrics for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21

07/14/2021

Prepared by: Ing. 2E 2E

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June DESIGN COOLING DAY, 2300

TABLE 1: SYSTEM DATA

Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Ventilation Air	Inlet	20.4	0.01295	1569	400	-13473	8289
Vent - Return Mixing	Outlet	20.4	0.01295	1569	0	-	-
Vent. Cooling Coil	Outlet	15.2	0.01063	1569	400	9856	10751
Vent. Heating Coil	Outlet	15.2	0.01063	1569	400	0	-
Ventilation Fan	Outlet	16.0	0.01063	1569	400	1569	-
Cold Supply Duct	Outlet	16.0	0.01063	1569	400	0	-
Zone Air	-	27.5	0.01119	1569	641	37591	4039
Return Plenum	Outlet	27.5	0.01119	1569	641	0	-

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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System Psychrometrics for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
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Air Density x Heat Capacity x Conversion Factor: At sea level = 1,207; At site altitude = 1,206 W/(L/s-K)
Air Density x Heat of Vaporization x Conversion Factor: At sea level = 2947,6; At site altitude = 2945,8 W/(L/s)
Site Altitude = 5,0 m

TABLE 2: ZONE DATA

Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Zone 1 (Cooling)							
Ventilation Air	-	-	-	6	-	-	-
Cooling Coil Inlet	-	18,8	0,01121	9	0	-	-
Cooling Coil Outlet	-	15,8	0,01100	9	0	33	6
Heating Coil Inlet	-	15,8	0,01100	9	0	-	-
Heating Coil Outlet	-	15,8	0,01100	9	0	0	-
Zone Air	-	24,5	0,01241	9	400	94	-
Zone 2 (Deadband)							
Ventilation Air	-	-	-	130	-	-	-
Cooling Coil Inlet	-	16,8	0,01075	138	0	-	-
Cooling Coil Outlet	-	16,8	0,01075	138	0	0	0
Heating Coil Inlet	-	16,8	0,01075	138	0	-	-
Heating Coil Outlet	-	18,9	0,01075	138	0	339	-
Zone Air	-	30,0	0,01271	138	400	1851	-
Zone 3 (Cooling)							
Ventilation Air	-	-	-	14	-	-	-
Cooling Coil Inlet	-	16,0	0,01063	14	0	-	-
Cooling Coil Outlet	-	16,0	0,01063	14	0	0	0
Heating Coil Inlet	-	16,0	0,01063	14	0	-	-
Heating Coil Outlet	-	16,0	0,01063	14	0	0	-
Zone Air	-	30,0	0,01163	14	400	95	-
Zone 4 (Cooling)							
Ventilation Air	-	-	-	28	-	-	-
Cooling Coil Inlet	-	16,0	0,01063	28	0	-	-
Cooling Coil Outlet	-	16,0	0,01063	28	0	0	0
Heating Coil Inlet	-	16,0	0,01063	28	0	-	-
Heating Coil Outlet	-	16,0	0,01063	28	0	0	-
Zone Air	-	30,0	0,01130	28	400	128	-
Zone 5 (Cooling)							
Ventilation Air	-	-	-	129	-	-	-
Cooling Coil Inlet	-	23,7	0,01121	279	0	-	-
Cooling Coil Outlet	-	16,2	0,01093	279	0	2541	228
Heating Coil Inlet	-	16,2	0,01093	279	0	-	-
Heating Coil Outlet	-	16,2	0,01093	279	0	0	-
Zone Air	-	30,4	0,01170	279	400	4777	-
Zone 6 (Cooling)							
Ventilation Air	-	-	-	6	-	-	-
Cooling Coil Inlet	-	16,0	0,01063	6	0	-	-
Cooling Coil Outlet	-	16,0	0,01063	6	0	0	0
Heating Coil Inlet	-	16,0	0,01063	6	0	-	-
Heating Coil Outlet	-	16,0	0,01063	6	0	0	-
Zone Air	-	30,1	0,01259	6	400	80	-
Zone 7 (Cooling)							
Ventilation Air	-	-	-	30	-	-	-
Cooling Coil Inlet	-	23,3	0,01112	202	0	-	-
Cooling Coil Outlet	-	16,3	0,01103	202	0	1710	56
Heating Coil Inlet	-	16,3	0,01103	202	0	-	-
Heating Coil Outlet	-	16,3	0,01103	202	0	0	-
Zone Air	-	24,6	0,01121	202	966	2022	-
Zone 8 (Cooling)							
Ventilation Air	-	-	-	50	-	-	-
Cooling Coil Inlet	-	23,2	0,01058	374	0	-	-
Cooling Coil Outlet	-	15,4	0,01038	374	0	3500	229
Heating Coil Inlet	-	15,4	0,01038	374	0	-	-
Heating Coil Outlet	-	15,4	0,01038	374	0	0	-
Zone Air	-	24,3	0,01057	374	966	4002	-

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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System Psychrometrics for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E 2E

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Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Zone 9 (Deadband)							
Ventilation Air	-	-	-	5	-	-	-
Cooling Coil Inlet	-	24.1	0.01230	25	0	-	-
Cooling Coil Outlet	-	23.2	0.01231	25	0	26	0
Heating Coil Inlet	-	23.2	0.01231	25	0	-	-
Heating Coil Outlet	-	23.2	0.01231	25	0	0	-
Zone Air	-	26.1	0.01273	25	400	86	-
Zone 10 (Cooling)							
Ventilation Air	-	-	-	80	-	-	-
Cooling Coil Inlet	-	17.3	0.01069	92	0	-	-
Cooling Coil Outlet	-	15.2	0.01063	92	0	234	17
Heating Coil Inlet	-	15.2	0.01063	92	0	-	-
Heating Coil Outlet	-	15.2	0.01063	92	0	0	-
Zone Air	-	26.4	0.01111	92	840	1233	-
Zone 11 (Cooling)							
Ventilation Air	-	-	-	290	-	-	-
Cooling Coil Inlet	-	18.7	0.01071	434	0	-	-
Cooling Coil Outlet	-	15.5	0.01072	434	0	1716	0
Heating Coil Inlet	-	15.5	0.01072	434	0	-	-
Heating Coil Outlet	-	15.5	0.01072	434	0	0	-
Zone Air	-	24.3	0.01091	434	840	4617	-
Zone 12 (Cooling)							
Ventilation Air	-	-	-	140	-	-	-
Cooling Coil Inlet	-	21.6	0.01067	426	0	-	-
Cooling Coil Outlet	-	15.5	0.01052	426	0	3149	183
Heating Coil Inlet	-	15.5	0.01052	426	0	-	-
Heating Coil Outlet	-	15.5	0.01052	426	0	0	-
Zone Air	-	24.3	0.01067	426	1092	4554	-
Zone 13 (Cooling)							
Ventilation Air	-	-	-	247	-	-	-
Cooling Coil Inlet	-	16.0	0.01063	247	0	-	-
Cooling Coil Outlet	-	16.0	0.01063	247	0	0	0
Heating Coil Inlet	-	16.0	0.01063	247	0	-	-
Heating Coil Outlet	-	16.0	0.01063	247	0	0	-
Zone Air	-	30.0	0.01112	247	400	865	-
Zone 14 (Cooling)							
Ventilation Air	-	-	-	54	-	-	-
Cooling Coil Inlet	-	16.0	0.01063	54	0	-	-
Cooling Coil Outlet	-	16.0	0.01063	54	0	0	0
Heating Coil Inlet	-	16.0	0.01063	54	0	-	-
Heating Coil Outlet	-	16.0	0.01063	54	0	0	-
Zone Air	-	30.0	0.01100	54	400	137	-
Zone 15 (Cooling)							
Ventilation Air	-	-	-	84	-	-	-
Cooling Coil Inlet	-	16.0	0.01063	84	0	-	-
Cooling Coil Outlet	-	16.0	0.01063	84	0	0	0
Heating Coil Inlet	-	16.0	0.01063	84	0	-	-
Heating Coil Outlet	-	16.0	0.01063	84	0	0	-
Zone Air	-	30.0	0.01132	84	400	537	-
Zone 16 (Cooling)							
Ventilation Air	-	-	-	20	-	-	-
Cooling Coil Inlet	-	23.1	0.01056	131	0	-	-
Cooling Coil Outlet	-	15.4	0.01034	131	0	1214	87
Heating Coil Inlet	-	15.4	0.01034	131	0	-	-
Heating Coil Outlet	-	15.4	0.01034	131	0	0	-
Zone Air	-	24.3	0.01054	131	966	1415	-
Zone 17 (Cooling)							
Ventilation Air	-	-	-	20	-	-	-
Cooling Coil Inlet	-	23.1	0.01056	131	0	-	-
Cooling Coil Outlet	-	15.4	0.01034	131	0	1214	87
Heating Coil Inlet	-	15.4	0.01034	131	0	-	-
Heating Coil Outlet	-	15.4	0.01034	131	0	0	-

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE
NESTE
System Psychrometrics for Offices - Fresh air & fan coils

 Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
 Prepared by: Ing. 2E 2E

 07/14/2021
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Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Zone Air	-	24,3	0,01054	131	966	1415	-
Zone 18 (Cooling)							
Ventilation Air	-	-	-	20	-	-	-
Cooling Coil Inlet	-	23,1	0,01056	131	0	-	-
Cooling Coil Outlet	-	15,4	0,01034	131	0	1214	87
Heating Coil Inlet	-	15,4	0,01034	131	0	-	-
Heating Coil Outlet	-	15,4	0,01034	131	0	0	-
Zone Air	-	24,3	0,01054	131	966	1415	-
Zone 19 (Cooling)							
Ventilation Air	-	-	-	40	-	-	-
Cooling Coil Inlet	-	23,5	0,01055	423	0	-	-
Cooling Coil Outlet	-	15,4	0,01033	423	0	4147	275
Heating Coil Inlet	-	15,4	0,01033	423	0	-	-
Heating Coil Outlet	-	15,4	0,01033	423	0	0	-
Zone Air	-	24,3	0,01053	423	966	4548	-
Zone 20 (Cooling)							
Ventilation Air	-	-	-	30	-	-	-
Cooling Coil Inlet	-	23,5	0,01064	301	0	-	-
Cooling Coil Outlet	-	15,5	0,01043	301	0	2888	181
Heating Coil Inlet	-	15,5	0,01043	301	0	-	-
Heating Coil Outlet	-	15,5	0,01043	301	0	0	-
Zone Air	-	24,3	0,01063	301	966	3190	-
Zone 21 (Cooling)							
Ventilation Air	-	-	-	6	-	-	-
Cooling Coil Inlet	-	16,0	0,01063	6	0	-	-
Cooling Coil Outlet	-	16,0	0,01063	6	0	0	0
Heating Coil Inlet	-	16,0	0,01063	6	0	-	-
Heating Coil Outlet	-	16,0	0,01063	6	0	0	-
Zone Air	-	30,1	0,01274	6	400	86	-
Zone 22 (Cooling)							
Ventilation Air	-	-	-	14	-	-	-
Cooling Coil Inlet	-	16,0	0,01063	14	0	-	-
Cooling Coil Outlet	-	16,0	0,01063	14	0	0	0
Heating Coil Inlet	-	16,0	0,01063	14	0	-	-
Heating Coil Outlet	-	16,0	0,01063	14	0	0	-
Zone Air	-	30,0	0,01115	14	400	49	-
Zone 23 (Cooling)							
Ventilation Air	-	-	-	126	-	-	-
Cooling Coil Inlet	-	16,0	0,01063	126	0	-	-
Cooling Coil Outlet	-	16,0	0,01063	126	0	0	0
Heating Coil Inlet	-	16,0	0,01063	126	0	-	-
Heating Coil Outlet	-	16,0	0,01063	126	0	0	-
Zone Air	-	30,0	0,01109	126	400	394	-

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE NESTE

System Psychrometrics for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E 2E

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WINTER DESIGN HEATING

TABLE 1: SYSTEM DATA

Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Ventilation Air	Inlet	-10.0	0.00160	1569	400	-57806	0
Vent - Return Mixing	Outlet	-10.0	0.00160	1569	0	-	-
Vent. Cooling Coil	Outlet	-10.0	0.00160	1569	400	0	0
Vent. Heating Coil	Outlet	14.2	0.00160	1569	400	45765	-
Ventilation Fan	Outlet	15.0	0.00160	1569	400	1569	-
Cold Supply Duct	Outlet	15.0	0.00160	1569	400	0	-
Zone Air	-	20.5	0.00160	1569	400	-14188	0
Return Plenum	Outlet	20.5	0.00160	1569	400	0	-

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Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
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Air Density x Heat Capacity x Conversion Factor: At sea level = 1,207; At site altitude = 1,206 W/(L/s-K)
Air Density x Heat of Vaporization x Conversion Factor: At sea level = 2947,6; At site altitude = 2945,8 W/(L/s)
Site Altitude = 5,0 m

TABLE 2: ZONE DATA

Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Zone 1 (Heating)							
Ventilation Air	-	-	-	6	-	-	-
Cooling Coil Inlet	-	17,2	0,00161	9	0	-	-
Cooling Coil Outlet	-	17,2	0,00161	9	0	0	0
Heating Coil Inlet	-	17,2	0,00161	9	0	-	-
Heating Coil Outlet	-	27,1	0,00161	9	0	107	-
Zone Air	-	21,7	0,00160	9	400	-58	-
Zone 2 (Heating)							
Ventilation Air	-	-	-	130	-	-	-
Cooling Coil Inlet	-	15,3	0,00161	138	0	-	-
Cooling Coil Outlet	-	15,3	0,00161	138	0	0	0
Heating Coil Inlet	-	15,3	0,00161	138	0	-	-
Heating Coil Outlet	-	29,4	0,00161	138	0	2351	-
Zone Air	-	19,5	0,00160	138	400	-1640	-
Zone 3 (Heating)							
Ventilation Air	-	-	-	14	-	-	-
Cooling Coil Inlet	-	15,0	0,00161	14	0	-	-
Cooling Coil Outlet	-	15,0	0,00161	14	0	0	0
Heating Coil Inlet	-	15,0	0,00161	14	0	-	-
Heating Coil Outlet	-	28,7	0,00161	14	0	231	-
Zone Air	-	19,6	0,00160	14	400	-58	-
Zone 4 (Heating)							
Ventilation Air	-	-	-	28	-	-	-
Cooling Coil Inlet	-	15,0	0,00161	28	0	-	-
Cooling Coil Outlet	-	15,0	0,00161	28	0	0	0
Heating Coil Inlet	-	15,0	0,00161	28	0	-	-
Heating Coil Outlet	-	28,7	0,00161	28	0	462	-
Zone Air	-	19,6	0,00160	28	400	-79	-
Zone 5 (Heating)							
Ventilation Air	-	-	-	129	-	-	-
Cooling Coil Inlet	-	17,5	0,00161	279	0	-	-
Cooling Coil Outlet	-	17,5	0,00161	279	0	0	0
Heating Coil Inlet	-	17,5	0,00161	279	0	-	-
Heating Coil Outlet	-	29,6	0,00161	279	0	4091	-
Zone Air	-	19,6	0,00160	279	400	-3379	-
Zone 6 (Heating)							
Ventilation Air	-	-	-	6	-	-	-
Cooling Coil Inlet	-	15,0	0,00161	6	0	-	-
Cooling Coil Outlet	-	15,0	0,00161	6	0	0	0
Heating Coil Inlet	-	15,0	0,00161	6	0	-	-
Heating Coil Outlet	-	28,7	0,00161	6	0	99	-
Zone Air	-	19,6	0,00160	6	400	-49	-
Zone 7 (Heating)							
Ventilation Air	-	-	-	30	-	-	-
Cooling Coil Inlet	-	20,7	0,00160	202	0	-	-
Cooling Coil Outlet	-	20,7	0,00160	202	0	0	0
Heating Coil Inlet	-	20,7	0,00160	202	0	-	-
Heating Coil Outlet	-	24,2	0,00160	202	0	845	-
Zone Air	-	21,8	0,00160	202	400	-601	-
Zone 8 (Heating)							
Ventilation Air	-	-	-	50	-	-	-
Cooling Coil Inlet	-	20,8	0,00160	374	0	-	-
Cooling Coil Outlet	-	20,8	0,00160	374	0	0	0
Heating Coil Inlet	-	20,8	0,00160	374	0	-	-
Heating Coil Outlet	-	24,1	0,00160	374	0	1471	-
Zone Air	-	21,7	0,00160	374	400	-1065	-

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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System Psychrometrics for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
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Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Zone 9 (Heating)							
Ventilation Air	-	-	-	5	-	-	-
Cooling Coil Inlet	-	18,7	0,00161	25	0	-	-
Cooling Coil Outlet	-	18,7	0,00161	25	0	0	0
Heating Coil Inlet	-	18,7	0,00161	25	0	-	-
Heating Coil Outlet	-	29,6	0,00161	25	0	327	-
Zone Air	-	19,6	0,00160	25	400	-300	-
Zone 10 (Heating)							
Ventilation Air	-	-	-	80	-	-	-
Cooling Coil Inlet	-	15,6	0,00161	92	0	-	-
Cooling Coil Outlet	-	15,6	0,00161	92	0	0	0
Heating Coil Inlet	-	15,6	0,00161	92	0	-	-
Heating Coil Outlet	-	24,6	0,00161	92	0	994	-
Zone Air	-	19,9	0,00160	92	400	-517	-
Zone 11 (Deadband)							
Ventilation Air	-	-	-	290	-	-	-
Cooling Coil Inlet	-	17,3	0,00161	434	0	-	-
Cooling Coil Outlet	-	17,3	0,00161	434	0	0	0
Heating Coil Inlet	-	17,3	0,00161	434	0	-	-
Heating Coil Outlet	-	24,2	0,00161	434	0	3576	-
Zone Air	-	22,0	0,00160	434	400	-1121	-
Zone 12 (Heating)							
Ventilation Air	-	-	-	140	-	-	-
Cooling Coil Inlet	-	19,6	0,00161	426	0	-	-
Cooling Coil Outlet	-	19,6	0,00161	426	0	0	0
Heating Coil Inlet	-	19,6	0,00161	426	0	-	-
Heating Coil Outlet	-	23,7	0,00161	426	0	2127	-
Zone Air	-	21,9	0,00160	426	400	-969	-
Zone 13 (Heating)							
Ventilation Air	-	-	-	247	-	-	-
Cooling Coil Inlet	-	15,0	0,00161	247	0	-	-
Cooling Coil Outlet	-	15,0	0,00161	247	0	0	0
Heating Coil Inlet	-	15,0	0,00161	247	0	-	-
Heating Coil Outlet	-	29,2	0,00161	247	0	4246	-
Zone Air	-	19,5	0,00160	247	400	-1074	-
Zone 14 (Heating)							
Ventilation Air	-	-	-	54	-	-	-
Cooling Coil Inlet	-	15,0	0,00161	54	0	-	-
Cooling Coil Outlet	-	15,0	0,00161	54	0	0	0
Heating Coil Inlet	-	15,0	0,00161	54	0	-	-
Heating Coil Outlet	-	28,7	0,00161	54	0	892	-
Zone Air	-	19,6	0,00160	54	400	-84	-
Zone 15 (Heating)							
Ventilation Air	-	-	-	84	-	-	-
Cooling Coil Inlet	-	15,0	0,00161	84	0	-	-
Cooling Coil Outlet	-	15,0	0,00161	84	0	0	0
Heating Coil Inlet	-	15,0	0,00161	84	0	-	-
Heating Coil Outlet	-	29,5	0,00161	84	0	1475	-
Zone Air	-	19,6	0,00160	84	400	-686	-
Zone 16 (Heating)							
Ventilation Air	-	-	-	20	-	-	-
Cooling Coil Inlet	-	20,8	0,00160	131	0	-	-
Cooling Coil Outlet	-	20,8	0,00160	131	0	0	0
Heating Coil Inlet	-	20,8	0,00160	131	0	-	-
Heating Coil Outlet	-	22,6	0,00160	131	0	283	-
Zone Air	-	21,9	0,00160	131	400	-117	-
Zone 17 (Heating)							
Ventilation Air	-	-	-	20	-	-	-
Cooling Coil Inlet	-	20,8	0,00160	131	0	-	-
Cooling Coil Outlet	-	20,8	0,00160	131	0	0	0
Heating Coil Inlet	-	20,8	0,00160	131	0	-	-
Heating Coil Outlet	-	22,6	0,00160	131	0	283	-

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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System Psychrometrics for Offices - Fresh air & fan coils

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
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Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Zone Air	-	21,9	0,00160	131	400	-117	-
Zone 18 (Heating)							
Ventilation Air	-	-	-	20	-	-	-
Cooling Coil Inlet	-	20,8	0,00160	131	0	-	-
Cooling Coil Outlet	-	20,8	0,00160	131	0	0	0
Heating Coil Inlet	-	20,8	0,00160	131	0	-	-
Heating Coil Outlet	-	22,6	0,00160	131	0	283	-
Zone Air	-	21,9	0,00160	131	400	-117	-
Zone 19 (Heating)							
Ventilation Air	-	-	-	40	-	-	-
Cooling Coil Inlet	-	21,1	0,00160	423	0	-	-
Cooling Coil Outlet	-	21,1	0,00160	423	0	0	0
Heating Coil Inlet	-	21,1	0,00160	423	0	-	-
Heating Coil Outlet	-	23,7	0,00160	423	0	1349	-
Zone Air	-	21,7	0,00160	423	400	-1027	-
Zone 20 (Heating)							
Ventilation Air	-	-	-	30	-	-	-
Cooling Coil Inlet	-	21,0	0,00160	301	0	-	-
Cooling Coil Outlet	-	21,0	0,00160	301	0	0	0
Heating Coil Inlet	-	21,0	0,00160	301	0	-	-
Heating Coil Outlet	-	23,9	0,00160	301	0	1049	-
Zone Air	-	21,7	0,00160	301	400	-807	-
Zone 21 (Heating)							
Ventilation Air	-	-	-	6	-	-	-
Cooling Coil Inlet	-	15,0	0,00161	6	0	-	-
Cooling Coil Outlet	-	15,0	0,00161	6	0	0	0
Heating Coil Inlet	-	15,0	0,00161	6	0	-	-
Heating Coil Outlet	-	28,7	0,00161	6	0	99	-
Zone Air	-	19,6	0,00160	6	400	-53	-
Zone 22 (Heating)							
Ventilation Air	-	-	-	14	-	-	-
Cooling Coil Inlet	-	15,0	0,00161	14	0	-	-
Cooling Coil Outlet	-	15,0	0,00161	14	0	0	0
Heating Coil Inlet	-	15,0	0,00161	14	0	-	-
Heating Coil Outlet	-	28,7	0,00161	14	0	231	-
Zone Air	-	19,6	0,00160	14	400	-30	-
Zone 23 (Heating)							
Ventilation Air	-	-	-	126	-	-	-
Cooling Coil Inlet	-	15,0	0,00161	126	0	-	-
Cooling Coil Outlet	-	15,0	0,00161	126	0	0	0
Heating Coil Inlet	-	15,0	0,00161	126	0	-	-
Heating Coil Outlet	-	28,7	0,00161	126	0	2082	-
Zone Air	-	19,6	0,00160	126	400	-242	-

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5.4. Air system sizing summary – Air handling unit for Laboratory rooms

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Air System Sizing Summary for Fresh air AHU for Labor. rooms

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. ZE

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Air System Information

Air System Name **Fresh air AHU for Labor. rooms**
Equipment Class **CW AHU**
Air System Type **CAV/RH**

Number of zones **5**
Floor Area **880,4** m²
Location **Rotterdam, Netherlands**

Sizing Calculation Information

Calculation Months **Jan to Dec**
Sizing Data **Calculated**

Zone L/s Sizing **Sum of space airflow rates**
Space L/s Sizing **Individual peak space loads**

Central Cooling Coil Sizing Data

Total coil load **237,8** kW
Sensible coil load **149,4** kW
Coil L/s at Jul 1500 **8782** L/s
Max block L/s **8782** L/s
Sum of peak zone L/s **8782** L/s
Sensible heat ratio **0,628**
L/(s kW) **36,9**
m²/kW **3,7**
W/m² **270,1**
Water flow @ 5,0 K rise **11,38** L/s

Load occurs at **Jul 1500**
OA DB / WB **28,0 / 21,0** °C
Entering DB / WB **28,0 / 21,0** °C
Leaving DB / WB **13,9 / 13,3** °C
Coil ADP **12,3** °C
Bypass Factor **0,100**
Resulting RH **53** %
Design supply temp. **15,0** °C
Zone T-stat Check **5 of 5** OK
Max zone temperature deviation **0,0** K

Preheat Coil Sizing Data

Max coil load **243,7** kW
Coil L/s at Des Htg **8782** L/s
Max coil L/s **8782** L/s
Water flow @ 5,0 K drop **11,66** L/s

Load occurs at **Des Htg**
Ent. DB / Lvg DB **-10,0 / 13,0** °C

Supply Fan Sizing Data

Actual max L/s **8782** L/s
Standard L/s **8777** L/s
Actual max L/(s·m²) **9,97** L/(s·m²)

Fan motor BHP **14,76** BHP
Fan motor kW **11,71** kW
Fan static **800** Pa

Outdoor Ventilation Air Data

Design airflow L/s **8782** L/s
L/(s·m²) **9,97** L/(s·m²)

L/s/person **174,15** L/s/person

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Zone Sizing Summary for Fresh air AHU for Labor. rooms

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E

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Air System Information

Air System Name Fresh air AHU for Labor. rooms
Equipment Class CW AHU
Air System Type CAV/RH

Number of zones 5
Floor Area 880,4 m²
Location Rotterdam, Netherlands

Sizing Calculation Information

Calculation Months Jan to Dec
Sizing Data Calculated

Zone L/s Sizing Sum of space airflow rates
Space L/s Sizing Individual peak space loads

Zone Terminal Sizing Data

Zone Name	Design Supply Airflow (L/s)	Minimum Supply Airflow (L/s)	Zone L/(s·m²)	Reheat Coil Load (kW)	Reheat Coil Water L/s @ 5,0 K	Zone Htg Unit Coil Load (kW)	Zone Htg Unit Water L/s @ 5,0 K	Mixing Box Fan Airflow (L/s)
Chemical storage	120	120	3,33	0,0	0,00	0,0	0,00	0
General storage	91	91	3,35	0,0	0,00	0,0	0,00	0
Laboratory	7854	7854	11,06	0,0	0,00	0,0	0,00	0
Sample room	514	514	11,08	0,0	0,00	0,0	0,00	0
Waste area ch.yard	203	203	3,34	0,0	0,00	0,0	0,00	0

Zone Peak Sensible Loads

Zone Name	Zone Cooling Sensible (kW)	Time of Peak Sensible Cooling Load	Zone Heating Load (kW)	Zone Floor Area (m²)
Chemical storage	0,4	Jun 2300	0,7	36,0
General storage	0,3	Jun 2300	0,5	27,2
Laboratory	85,3	Jun 0100	12,9	710,0
Sample room	5,6	Jun 2300	0,9	46,4
Waste area ch.yard	0,7	Jun 2300	1,2	60,8

Space Loads and Airflows

Zone Name / Space Name	Mult.	Cooling Sensible (kW)	Time of Peak Sensible Load	Air Flow (L/s)	Heating Load (kW)	Floor Area (m²)	Space L/(s·m²)
Chemical storage							
Chemical storage	1	0,4	Jun 2300	120	0,7	36,0	3,33
General storage							
General storage	1	0,3	Jun 2300	91	0,5	27,2	3,35
Laboratory							
Laboratory	1	85,3	Jun 0100	7854	12,9	710,0	11,06
Sample room							
Sample room	1	5,6	Jun 2300	514	0,9	46,4	11,08
Waste area ch.yard							
Waste area ch.yard	1	0,7	Jun 2300	203	1,2	60,8	3,34

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Ventilation Sizing Summary for Fresh air AHU for Labor. rooms

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: 

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1. Summary

Ventilation Sizing Method: Sum of Space OA Airflows
Design Ventilation Airflow Rate: 8782 L/s

2. Space Ventilation Analysis

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Chemical storage									
Chemical storage	1	36,0	0,0	120,0	0,00	0,00	120,0	0,0	120,0
General storage									
General storage	1	27,2	0,0	91,0	0,00	0,00	91,0	0,0	91,0
Laboratory									
Laboratory	1	710,0	47,3	7854,0	0,00	0,00	0,0	100,0	7854,0
Sample room									
Sample room	1	46,4	3,1	513,9	0,00	0,00	0,0	100,0	513,9
Waste area ch.yard									
Waste area ch.yard	1	60,6	0,0	203,0	0,00	0,00	203,0	0,0	203,0
Totals (Incl. Space Multipliers)				8781,9					8781,9

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Air System Design Load Summary for Fresh air AHU for Labor. rooms

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E 2E

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	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 28,0 °C / 21,0 °C			HEATING OA DB / WB -10,0 °C / -10,0 °C		
ZONE LOADS	Details	Sensible (W)	Latent (W)	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	378 m²	506	-	378 m²	5290	-
Roof Transmission	880 m²	977	-	880 m²	6234	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	18 m²	1	-	18 m²	288	-
Floor Transmission	880 m²	0	-	880 m²	2985	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	16368 W	16367	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	60512 W	60509	-	0	0	-
People	50	4362	6722	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	8272	672	10%	1480	0
>> Total Zone Loads	-	90994	7394	-	16276	0
Zone Conditioning	-	91865	7394	-	12583	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	8782 L/s	0	-	8782 L/s	0	-
Ventilation Load	8782 L/s	45872	80991	8782 L/s	242815	0
Supply Fan Load	8782 L/s	11710	-	8782 L/s	-11710	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	-	149446	88385	-	243688	0
Central Cooling Coil	-	149446	88385	-	0	0
Preheat Coil	-	0	-	-	243688	-
>> Total Conditioning	-	149446	88385	-	243688	0
Key:	Positive values are clg loads Negative values are htg loads			Positive values are htg loads Negative values are clg loads		

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Space Design Load Summary for Fresh air AHU for Labor. rooms

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E

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TABLE 1.1.A. Component Loads For Space "Chemical storage" In Zone "Chemical storage"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 2300			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 20,4 °C / 18,8 °C			HEATING OA DB / WB -10,0 °C / -10,0 °C		
	OCCUPIED T-STAT 30,0 °C			OCCUPIED T-STAT 20,0 °C		
	Details	Sensible (W)	Latent (W)	Details	Sensible (W)	Latent (W)
SPACE LOADS						
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	16 m²	16	-	16 m²	212	-
Roof Transmission	36 m²	23	-	36 m²	241	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	3 m²	-15	-	3 m²	51	-
Floor Transmission	36 m²	0	-	36 m²	130	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	360 W	360	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	0 W	0	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	38	0	10%	63	0
>> Total Zone Loads	-	422	0	-	697	0

TABLE 1.1.B. Envelope Loads For Space "Chemical storage" In Zone "Chemical storage"						
	Area	U-Value	Shade	COOLING TRANS	COOLING SOLAR	HEATING TRANS
	(m²)	(W/(m²·K))	Coeff.	(W)	(W)	(W)
E EXPOSURE						
WALL	16	0.442	-	16	-	212
DOOR	3	0.500	-	-15	-	51
H EXPOSURE						
ROOF	36	0.223	-	23	-	241

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Space Design Load Summary for Fresh air AHU for Labor. rooms

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E 2E

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TABLE 2.1.A. Component Loads For Space "General storage" In Zone "General storage"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 2300			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 20,4 °C / 18,8 °C			HEATING OA DB / WB -10,0 °C / -10,0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	15 m²	14	-	15 m²	194	-
Roof Transmission	27 m²	18	-	27 m²	182	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	27 m²	0	-	27 m²	98	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	272 W	272	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	0 W	0	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	30	0	10%	47	0
>> Total Zone Loads	-	334	0	-	521	0

TABLE 2.1.B. Envelope Loads For Space "General storage" In Zone "General storage"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
E EXPOSURE						
WALL	15	0,442	-	14	-	194
H EXPOSURE						
ROOF	27	0,223	-	18	-	182

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Space Design Load Summary for Fresh air AHU for Labor. rooms

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E

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TABLE 3.1.A. Component Loads For Space "Laboratory" In Zone "Laboratory"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0100 COOLING OA DB / WB 19,4 °C / 18,5 °C OCCUPIED T-STAT 24,0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 22,0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	296 m²	956	-	296 m²	4191	-
Roof Transmission	710 m²	1497	-	710 m²	5072	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	8 m²	-15	-	8 m²	131	-
Floor Transmission	710 m²	0	-	710 m²	2377	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	14200 W	14199	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	56800 W	56797	-	0	0	-
People	47	4094	6310	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	7753	631	10%	1177	0
>> Total Zone Loads	-	85281	6940	-	12949	0

TABLE 3.1.B. Envelope Loads For Space "Laboratory" In Zone "Laboratory"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
E EXPOSURE						
WALL	40	0,442	-	130	-	560
DOOR	3	0,500	-	-6	-	54
N EXPOSURE						
WALL	109	0,442	-	180	-	1545
DOOR	5	0,500	-	-9	-	77
W EXPOSURE						
WALL	148	0,442	-	666	-	2086
H EXPOSURE						
ROOF	710	0,223	-	1497	-	5072

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Space Design Load Summary for Fresh air AHU for Labor. rooms

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E 2E

07/14/2021
02:52

TABLE 4.1.A. Component Loads For Space "Sample room" In Zone "Sample room"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 2300 COOLING OA DB / WB 20,4 °C / 18,8 °C OCCUPIED T-STAT 24,0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 22,0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	22 m²	78	-	22 m²	304	-
Roof Transmission	46 m²	92	-	46 m²	331	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	3 m²	-5	-	3 m²	54	-
Floor Transmission	46 m²	0	-	46 m²	161	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	928 W	928	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	3712 W	3712	-	0	0	-
People	3	268	412	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	507	41	10%	85	0
>> Total Zone Loads	-	5580	454	-	936	0

TABLE 4.1.B. Envelope Loads For Space "Sample room" In Zone "Sample room"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
E EXPOSURE						
WALL	22	0,442	-	78	-	304
DOOR	3	0,500	-	-5	-	54
H EXPOSURE						
ROOF	46	0,223	-	92	-	331

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Space Design Load Summary for Fresh air AHU for Labor. rooms

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E 2E

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TABLE 5.1.A. Component Loads For Space "Waste area ch.yard" In Zone "Waste area ch.yard"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 2300 COOLING OA DB / WB 20,4 °C / 18,8 °C OCCUPIED T-STAT 30,0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 20,0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	29 m²	28	-	29 m²	389	-
Roof Transmission	61 m²	39	-	61 m²	407	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	3 m²	-15	-	3 m²	51	-
Floor Transmission	61 m²	0	-	61 m²	219	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	608 W	608	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	0 W	0	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	66	0	10%	107	0
>> Total Zone Loads	-	727	0	-	1172	0

TABLE 5.1.B. Envelope Loads For Space "Waste area ch.yard" In Zone "Waste area ch.yard"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
E EXPOSURE						
WALL	29	0,442	-	28	-	389
DOOR	3	0,500	-	-15	-	51
H EXPOSURE						
ROOF	61	0,223	-	39	-	407

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE
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System Psychrometrics for Fresh air AHU for Labor. rooms

 Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
 Prepared by: Ing. 2E 2E

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July DESIGN COOLING DAY, 1500

TABLE 1: SYSTEM DATA

Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Ventilation Air	Inlet	28,0	0,01272	8782	400	45872	80991
Vent - Return Mixing	Outlet	28,0	0,01272	8782	400	-	-
Preheat Coil	Outlet	28,0	0,01272	8782	400	0	-
Central Cooling Coil	Outlet	13,9	0,00930	8782	400	149446	88385
Supply Fan	Outlet	15,0	0,00930	8782	400	11710	-
Cold Supply Duct	Outlet	15,0	0,00930	8782	400	-	-
Zone Air	-	23,7	0,00959	8782	454	91865	7394
Return Plenum	Outlet	23,7	0,00959	8782	454	0	-

Air Density x Heat Capacity x Conversion Factor: At sea level = 1,207; At site altitude = 1,206 W/(L/s-K)

Air Density x Heat of Vaporization x Conversion Factor: At sea level = 2947,6; At site altitude = 2945,8 W/(L/s)

Site Altitude = 5,0 m

TABLE 2: ZONE DATA

Zone Name	Zone Sensible Load (W)	T-stat Mode	Zone Cond (W)	Zone Temp (°C)	Zone Airflow (L/s)	CO2 Level (ppm)	Terminal Heating Coil (W)	Zone Heating Unit (W)
Chemical storage	399	Deadband	586	19,0	120	400	0	0
General storage	308	Deadband	450	19,1	91	400	0	0
Laboratory	84060	Deadband	84287	23,9	7854	457	0	0
Sample room	5547	Deadband	5546	23,9	514	457	0	0
Waste area ch.yard	680	Deadband	996	19,1	203	400	0	0

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE
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System Psychrometrics for Fresh air AHU for Labor. rooms

 Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
 Prepared by: Ing. 2E 2E

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WINTER DESIGN HEATING

TABLE 1: SYSTEM DATA

Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Ventilation Air	Inlet	-10,0	0,00160	8782	400	-242815	0
Vent - Return Mixing	Outlet	-10,0	0,00160	8782	400	-	-
Preheat Coil	Outlet	13,0	0,00160	8782	400	243688	-
Central Cooling Coil	Outlet	13,0	0,00160	8782	400	0	0
Supply Fan	Outlet	14,1	0,00160	8782	400	11710	-
Cold Supply Duct	Outlet	14,1	0,00160	8782	400	-	-
Zone Air	-	12,9	0,00160	8782	400	-12583	0
Return Plenum	Outlet	12,9	0,00160	8782	400	0	-

Air Density x Heat Capacity x Conversion Factor: At sea level = 1,207; At site altitude = 1,206 W/(L/s-K)

Air Density x Heat of Vaporization x Conversion Factor: At sea level = 2947,6; At site altitude = 2945,8 W/(L/s)

Site Altitude = 5,0 m

TABLE 2: ZONE DATA

Zone Name	Zone Sensible Load (W)	T-stat Mode	Zone Cond (W)	Zone Temp (°C)	Zone Airflow (L/s)	CO2 Level (ppm)	Terminal Heating Coil (W)	Zone Heating Unit (W)
Chemical storage	-697	Deadband	-486	10,7	120	400	0	0
General storage	-521	Deadband	-364	10,8	91	400	0	0
Laboratory	-12949	Deadband	-10182	13,0	7854	400	0	0
Sample room	-936	Deadband	-732	12,9	514	400	0	0
Waste area ch.yard	-1172	Deadband	-819	10,8	203	400	0	0

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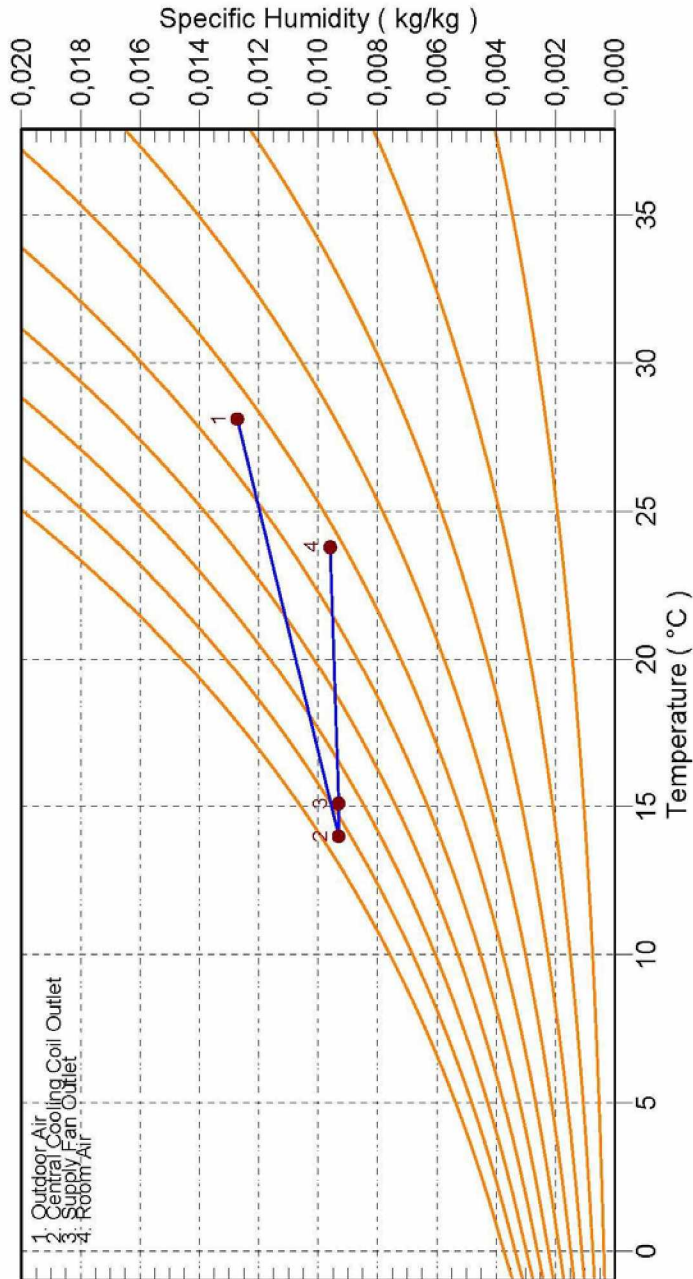
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System Psychrometrics for Fresh air AHU for Labor. rooms

Project Name: Rotterdam RDCG - OPB and Labo in MINA 13-07-21
Prepared by: Ing. [REDACTED]

07/14/2021
02:52

Location: Rotterdam, Netherlands
Altitude: 5,0 m.
Data for: July DESIGN COOLING DAY, 1500



Hourly Analysis Program 5.11

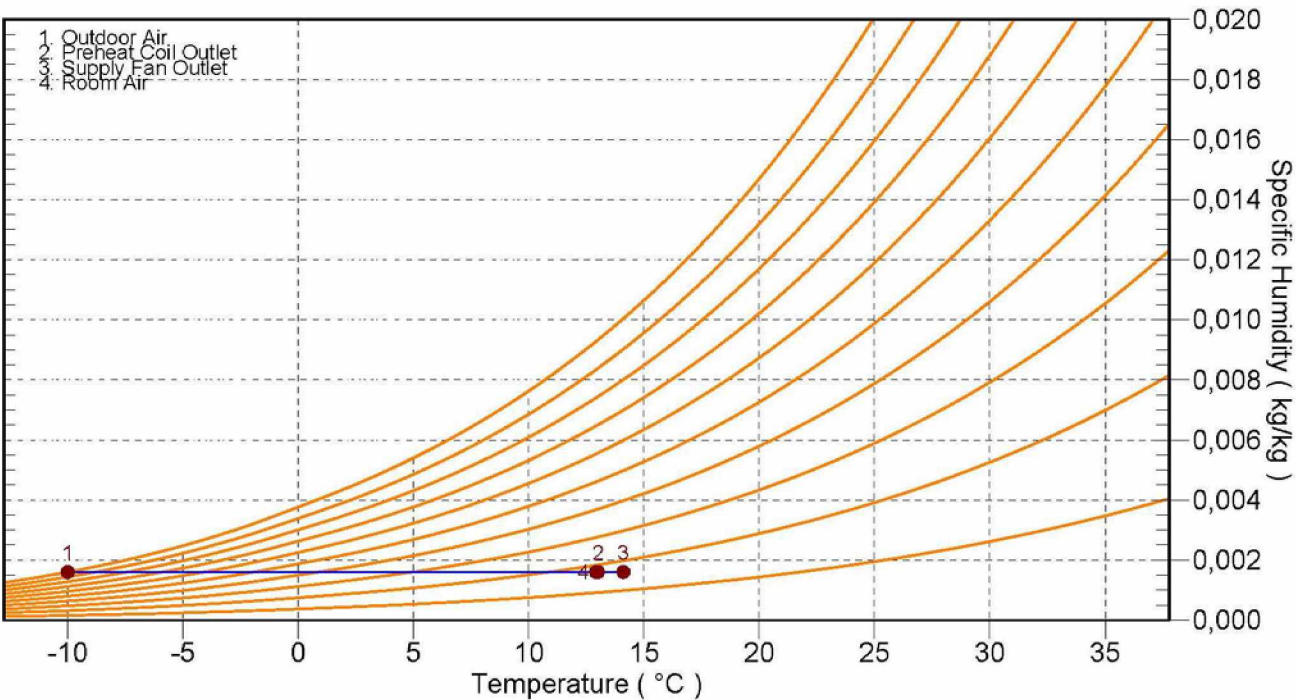
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System Psychrometrics for Fresh air AHU for Labor. rooms

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. Mauro Petriccione

07/14/2021
02:52

Location: Rotterdam, Netherlands
Altitude: 5,0 m.
Data for: WINTER DESIGN HEATING



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5.5. Air system sizing summary – Air handling unit for Technical rooms

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Air System Sizing Summary for AHUs for Technical rooms

 Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
 Prepared by: Ing. 2E

 07/14/2021
 12:49

Air System Information

 Air System Name **AHUs for Technical rooms**
 Equipment Class **CW AHU**
 Air System Type **CAV/RH**

 Number of zones **6**
 Floor Area **310,9** m²
 Location **Rotterdam, Netherlands**

Sizing Calculation Information

 Calculation Months **Jan to Dec**
 Sizing Data **Calculated**

 Zone L/s Sizing **Sum of space airflow rates**
 Space L/s Sizing **Individual peak space loads**

Central Cooling Coil Sizing Data

 Total coil load **69,3** kW
 Sensible coil load **60,3** kW
 Coil L/s at Jul 1500 **5075** L/s
 Max block L/s **5075** L/s
 Sum of peak zone L/s **5075** L/s
 Sensible heat ratio **0,870**
 L/s kW **73,2**
 m²/kW **4,5**
 W/m² **223,0**
 Water flow @ 5,0 K rise **3,32** L/s

 Load occurs at **Jul 1500**
 OA DB / WB **28,0 / 21,0** °C
 Entering DB / WB **24,7 / 18,3** °C
 Leaving DB / WB **14,9 / 14,3** °C
 Coil ADP **13,8** °C
 Bypass Factor **0,100**
 Resulting RH **54** %
 Design supply temp. **16,0** °C
 Zone T-stat Check **6 of 6** OK
 Max zone temperature deviation **0,0** K

Preheat Coil Sizing Data

 Max coil load **30,0** kW
 Coil L/s at Des Htg **5075** L/s
 Max coil L/s **5075** L/s
 Water flow @ 5,0 K drop **1,44** L/s

 Load occurs at **Des Htg**
 Ent. DB / Lvg DB **9,1 / 14,0** °C

Supply Fan Sizing Data

 Actual max L/s **5075** L/s
 Standard L/s **5072** L/s
 Actual max L/(s·m²) **16,32** L/(s·m²)

 Fan motor BHP **8,53** BHP
 Fan motor kW **6,77** kW
 Fan static **800** Pa

Outdoor Ventilation Air Data

 Design airflow L/s **1055** L/s
 L/(s·m²) **3,39** L/(s·m²)

 L/s/person **211,00** L/s/person

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Zone Sizing Summary for AHUs for Technical rooms

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E

07/14/2021
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Air System Information

Air System Name **AHUs for Technical rooms**
Equipment Class **CW AHU**
Air System Type **CAV/RH**

Number of zones **6**
Floor Area **310,9 m²**
Location **Rotterdam, Netherlands**

Sizing Calculation Information

Calculation Months **Jan to Dec**
Sizing Data **Calculated**

Zone L/s Sizing **Sum of space airflow rates**
Space L/s Sizing **Individual peak space loads**

Zone Terminal Sizing Data

Zone Name	Design Supply Airflow (L/s)	Minimum Supply Airflow (L/s)	Zone L/(s·m²)	Reheat Coil Load (kW)	Reheat Coil Water L/s @ 5,0 K	Zone Htg Unit Coil Load (kW)	Zone Htg Unit Water L/s @ 5,0 K	Mixing Box Fan Airflow (L/s)
Battery room 1	215	215	11,94	0,0	0,00	0,0	0,00	0
Battery room 2	215	215	11,94	0,0	0,00	0,0	0,00	0
Instrument Rack room	2758	2758	34,73	0,0	0,00	0,0	0,00	0
MCC room	1027	1027	10,50	0,0	0,00	0,0	0,00	0
Local Control room	505	505	6,69	0,0	0,00	0,0	0,00	0
UPS room	355	355	15,98	0,0	0,00	0,0	0,00	0

Zone Peak Sensible Loads

Zone Name	Zone Cooling Sensible (kW)	Time of Peak Sensible Cooling Load	Zone Heating Load (kW)	Zone Floor Area (m²)
Battery room 1	0,5	Jul 2300	0,3	18,0
Battery room 2	0,5	Jul 2300	0,3	18,0
Instrument Rack room	23,3	Jun 0100	1,6	79,4
MCC room	17,4	Jul 2300	1,3	97,8
Local Control room	4,3	Jun 0000	1,7	75,5
UPS room	3,0	Jul 0000	1,2	22,2

Space Loads and Airflows

Zone Name / Space Name	Mult.	Cooling Sensible (kW)	Time of Peak Sensible Load	Air Flow (L/s)	Heating Load (kW)	Floor Area (m²)	Space L/(s·m²)
Battery room 1							
Battery room 1	1	0,5	Jul 2300	215	0,3	18,0	11,94
Battery room 2							
Battery room 2	1	0,5	Jul 2300	215	0,3	18,0	11,94
Instrument Rack room							
Instrument Rack room	1	23,3	Jun 0100	2758	1,6	79,4	34,73
MCC room							
MCC room	1	17,4	Jul 2300	1027	1,3	97,8	10,50
Local Control room							
Local Control room	1	4,3	Jun 0000	505	1,7	75,5	6,69
UPS room							
UPS room	1	3,0	Jul 0000	355	1,2	22,2	15,98

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Ventilation Sizing Summary for AHUs for Technical rooms

Project Name: Rotterdam RDCG - OPB and Laboin MNA 13-07-21
Prepared by: 

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1. Summary

Ventilation Sizing Method: Sum of Space OA Airflows
Design Ventilation Airflow Rate: 1055 L/s

2. Space Ventilation Analysis

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Battery room 1									
Battery room 1	1	18,0	0,0	215,0	0,00	0,00	215,0	0,0	215,0
Battery room 2									
Battery room 2	1	18,0	0,0	215,0	0,00	0,00	215,0	0,0	215,0
Instrument Rack room									
Instrument Rack room	1	79,4	0,0	2757,8	0,00	0,00	314,0	0,0	314,0
MCC room									
MCC room	1	97,8	0,0	1027,2	0,00	0,00	117,0	0,0	117,0
Local Control room									
Local Control room	1	75,5	5,0	504,8	14,00	0,00	0,0	0,0	70,0
UPS room									
UPS room	1	22,2	0,0	354,8	0,00	0,00	124,0	0,0	124,0
Totals (incl. Space Multipliers)				5074,8					1055,0

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Air System Design Load Summary for AHUs for Technical rooms

 Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
 Prepared by: IZE

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ZONE LOADS	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 28,0 °C / 21,0 °C			HEATING OA DB / WB -10,0 °C / -10,0 °C		
	Details	Sensible (W)	Latent (W)	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	1 m²	184	-	1 m²	-	-
Wall Transmission	234 m²	264	-	234 m²	2581	-
Roof Transmission	311 m²	328	-	311 m²	1753	-
Window Transmission	1 m²	13	-	1 m²	124	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	29 m²	18	-	29 m²	326	-
Floor Transmission	311 m²	0	-	311 m²	1034	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	3864 W	3864	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	38750 W	38748	-	0	0	-
People	5	359	300	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	4378	30	10%	582	0
>> Total Zone Loads	-	48157	330	-	6401	0
Zone Conditioning	-	48315	330	-	6117	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Return Fan Load	5075 L/s	0	-	5075 L/s	0	-
Ventilation Load	1055 L/s	5229	8672	1055 L/s	30683	0
Supply Fan Load	5075 L/s	6766	-	5075 L/s	-6766	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	-	60311	9002	-	30034	0
Central Cooling Coil	-	60311	9007	-	0	0
Preheat Coil	-	0	-	-	30034	-
>> Total Conditioning	-	60311	9007	-	30034	0
Key:	Positive values are clg loads Negative values are htg loads			Positive values are htg loads Negative values are clg loads		

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Space Design Load Summary for AHUs for Technical rooms

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: IZE

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12:49

TABLE 1.1.A. Component Loads For Space "Battery room 1" In Zone "Battery room 1"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 2300 COOLING OA DB / WB 20,9 °C / 18,8 °C OCCUPIED T-STAT 22,0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 10,0 °C		
		Sensible (W)	Latent (W)		Sensible (W)	Latent (W)
SPACE LOADS	Details			Details		
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	8 m²	40	-	8 m²	72	-
Roof Transmission	18 m²	42	-	18 m²	80	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	5 m²	0	-	5 m²	48	-
Floor Transmission	18 m²	0	-	18 m²	51	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	180 W	180	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	180 W	180	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	44	0	10%	25	0
>> Total Zone Loads	-	486	0	-	276	0

TABLE 1.1.B. Envelope Loads For Space "Battery room 1" In Zone "Battery room 1"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
S EXPOSURE						
WALL	8	0,442	-	40	-	72
DOOR	5	0,500	-	0	-	48
H EXPOSURE						
ROOF	18	0,223	-	42	-	80

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Space Design Load Summary for AHUs for Technical rooms

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: IZE

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12:49

TABLE 2.1.A. Component Loads For Space "Battery room 2" In Zone "Battery room 2"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 2300 COOLING OA DB / WB 20,9 °C / 18,8 °C OCCUPIED T-STAT 22,0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 10,0 °C		
		Sensible (W)	Latent (W)		Sensible (W)	Latent (W)
SPACE LOADS	Details			Details		
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	8 m²	40	-	8 m²	72	-
Roof Transmission	18 m²	42	-	18 m²	80	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	5 m²	0	-	5 m²	48	-
Floor Transmission	18 m²	0	-	18 m²	51	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	180 W	180	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	180 W	180	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	44	0	10%	25	0
>> Total Zone Loads	-	486	0	-	276	0

TABLE 2.1.B. Envelope Loads For Space "Battery room 2" In Zone "Battery room 2"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
S EXPOSURE						
WALL	8	0,442	-	40	-	72
DOOR	5	0,500	-	0	-	48
H EXPOSURE						
ROOF	18	0,223	-	42	-	80

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Space Design Load Summary for AHUs for Technical rooms

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: IZE

07/14/2021
12:49

TABLE 3.1.A. Component Loads For Space "Instrument Rack room" In Zone "Instrument Rack room"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0100 COOLING OA DB / WB 19,4 °C / 18,5 °C OCCUPIED T-STAT 23,0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 22,0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	41 m²	201	-	41 m²	574	-
Roof Transmission	79 m²	185	-	79 m²	567	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	5 m²	-6	-	5 m²	77	-
Floor Transmission	79 m²	0	-	79 m²	270	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	794 W	794	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	20000 W	19999	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	2117	0	10%	149	0
>> Total Zone Loads	-	23290	0	-	1637	0

TABLE 3.1.B. Envelope Loads For Space "Instrument Rack room" In Zone "Instrument Rack room"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
W EXPOSURE						
WALL	41	0,442	-	201	-	574
DOOR	5	0,500	-	-6	-	77
H EXPOSURE						
ROOF	79	0,223	-	185	-	567

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Space Design Load Summary for AHUs for Technical rooms

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: IZE

07/14/2021
12:49

TABLE 4.1.A. Component Loads For Space "MCC room" In Zone "MCC room"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 2300 COOLING OA DB / WB 20,9 °C / 18,8 °C OCCUPIED T-STAT 30,0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 5,0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	86 m²	113	-	86 m²	568	-
Roof Transmission	98 m²	55	-	98 m²	328	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	10 m²	-42	-	10 m²	77	-
Floor Transmission	98 m²	0	-	98 m²	246	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	978 W	978	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	14670 W	14669	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	1577	0	10%	122	0
>> Total Zone Loads	-	17350	0	-	1340	0

TABLE 4.1.B. Envelope Loads For Space "MCC room" In Zone "MCC room"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
E EXPOSURE						
WALL	19	0,442	-	20	-	126
DOOR	7	0,500	-	-28	-	51
S EXPOSURE						
WALL	67	0,442	-	93	-	442
DOOR	3	0,500	-	-14	-	26
H EXPOSURE						
ROOF	98	0,223	-	55	-	328

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Space Design Load Summary for AHUs for Technical rooms

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: IZE

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12:49

TABLE 5.1.A. Component Loads For Space "Local Control room" In Zone "Local Control room"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jun 0000 COOLING OA DB / WB 19,8 °C / 18,6 °C OCCUPIED T-STAT 23,0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 22,0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	1 m²	134	-	1 m²	-	-
Wall Transmission	42 m²	209	-	42 m²	595	-
Roof Transmission	76 m²	173	-	76 m²	539	-
Window Transmission	1 m²	-8	-	1 m²	124	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	76 m²	0	-	76 m²	256	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	1510 W	1510	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	1500 W	1500	-	0	0	-
People	5	359	300	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	388	30	10%	151	0
>> Total Zone Loads	-	4263	330	-	1666	0

TABLE 5.1.B. Envelope Loads For Space "Local Control room" In Zone "Local Control room"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
W EXPOSURE						
WALL	42	0,442	-	209	-	595
WINDOW 1	1	3,723	0,792	-8	134	124
H EXPOSURE						
ROOF	76	0,223	-	173	-	539

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Space Design Load Summary for AHUs for Technical rooms

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: IZE

07/14/2021
12:49

TABLE 6.1.A. Component Loads For Space "UPS room" In Zone "UPS room"						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 0000 COOLING OA DB / WB 20,4 °C / 18,6 °C OCCUPIED T-STAT 23,0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB -10,0 °C / -10,0 °C OCCUPIED T-STAT 22,0 °C		
		Sensible (W)	Latent (W)		Sensible (W)	Latent (W)
SPACE LOADS	Details			Details		
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	50 m²	237	-	50 m²	700	-
Roof Transmission	22 m²	49	-	22 m²	159	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	5 m²	-4	-	5 m²	77	-
Floor Transmission	22 m²	0	-	22 m²	161	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	222 W	222	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	2220 W	2220	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	272	0	10%	110	0
>> Total Zone Loads	-	2997	0	-	1206	0

TABLE 6.1.B. Envelope Loads For Space "UPS room" In Zone "UPS room"						
	Area (m²)	U-Value (W/(m²·K))	Shade Coeff.	COOLING	COOLING	HEATING
				TRANS (W)	SOLAR (W)	TRANS (W)
S EXPOSURE						
WALL	16	0,442	-	69	-	225
DOOR	5	0,500	-	-4	-	77
W EXPOSURE						
WALL	34	0,442	-	168	-	475
H EXPOSURE						
ROOF	22	0,223	-	49	-	159

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE
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System Psychrometrics for AHUs for Technical rooms

 Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
 Prepared by: ZE

 07/14/2021
 12:49

July DESIGN COOLING DAY, 1500
TABLE 1: SYSTEM DATA

Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Ventilation Air	Inlet	28,0	0,01272	1055	400	5229	8672
Vent - Return Mixing	Outlet	24,7	0,01051	5075	458	-	-
Preheat Coil	Outlet	24,7	0,01051	5075	458	0	-
Central Cooling Coil	Outlet	14,9	0,00991	5075	458	60311	9007
Supply Fan	Outlet	16,0	0,00991	5075	458	6766	-
Cold Supply Duct	Outlet	16,0	0,00991	5075	458	-	-
Zone Air	-	23,9	0,00993	5075	473	48315	330
Return Plenum	Outlet	23,9	0,00993	5075	473	0	-

Air Density x Heat Capacity x Conversion Factor: At sea level = 1,207; At site altitude = 1,206 W/(L/s-K)
Air Density x Heat of Vaporization x Conversion Factor: At sea level = 2947,6; At site altitude = 2945,8 W/(L/s)
Site Altitude = 5,0 m
TABLE 2: ZONE DATA

Zone Name	Zone Sensible Load (W)	T-stat Mode	Zone Cond (W)	Zone Temp (°C)	Zone Airflow (L/s)	CO2 Level (ppm)	Terminal Heating Coil (W)	Zone Heating Unit (W)
Battery room 1	466	Deadband	507	18,0	215	468	0	0
Battery room 2	466	Deadband	507	18,0	215	468	0	0
Instrument Rack room	23102	Deadband	23117	22,9	2758	468	0	0
MCC room	17138	Deadband	17165	29,9	1027	468	0	0
Local Control room	4141	Deadband	4149	22,8	505	524	0	0
UPS room	2844	Deadband	2869	22,7	355	468	0	0

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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System Psychrometrics for AHUs for Technical rooms

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: ZE

07/14/2021
12:49

WINTER DESIGN HEATING

TABLE 1: SYSTEM DATA

Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Ventilation Air	Inlet	-10,0	0,00160	1055	400	-30683	0
Vent - Return Mixing	Outlet	9,1	0,00160	5075	431	-	-
Preheat Coil	Outlet	14,0	0,00160	5075	431	30034	-
Central Cooling Coil	Outlet	14,0	0,00160	5075	431	0	0
Supply Fan	Outlet	15,1	0,00160	5075	431	6766	-
Cold Supply Duct	Outlet	15,1	0,00160	5075	431	-	-
Zone Air	-	14,1	0,00160	5075	439	-6117	0
Return Plenum	Outlet	14,1	0,00160	5075	439	0	-

Air Density x Heat Capacity x Conversion Factor: At sea level = 1,207; At site altitude = 1,206 W/(L/s-K)

Air Density x Heat of Vaporization x Conversion Factor: At sea level = 2947,6; At site altitude = 2945,8 W/(L/s)

Site Altitude = 5,0 m

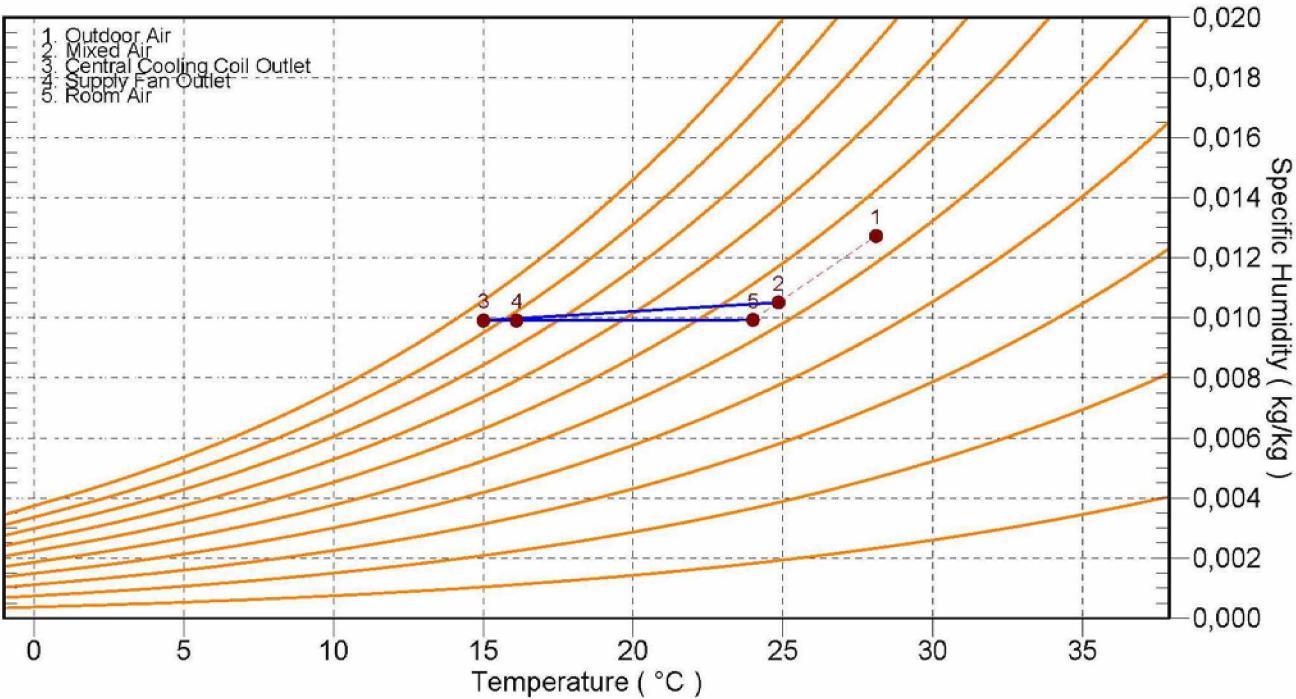
TABLE 2: ZONE DATA

Zone Name	Zone Sensible Load (W)	T-stat Mode	Zone Cond (W)	Zone Temp (°C)	Zone Airflow (L/s)	CO2 Level (ppm)	Terminal Heating Coil (W)	Zone Heating Unit (W)
Battery room 1	-276	Deadband	-316	13,9	215	439	0	0
Battery room 2	-276	Deadband	-316	13,9	215	439	0	0
Instrument Rack room	-1637	Deadband	-1357	14,7	2758	439	0	0
MCC room	-1340	Deadband	-1913	13,6	1027	439	0	0
Local Control room	-1666	Deadband	-1276	13,0	505	439	0	0
UPS room	-1206	Deadband	-938	12,9	355	439	0	0

Location: Rotterdam, Netherlands

Altitude: 5,0 m.

Data for: July DESIGN COOLING DAY, 1500

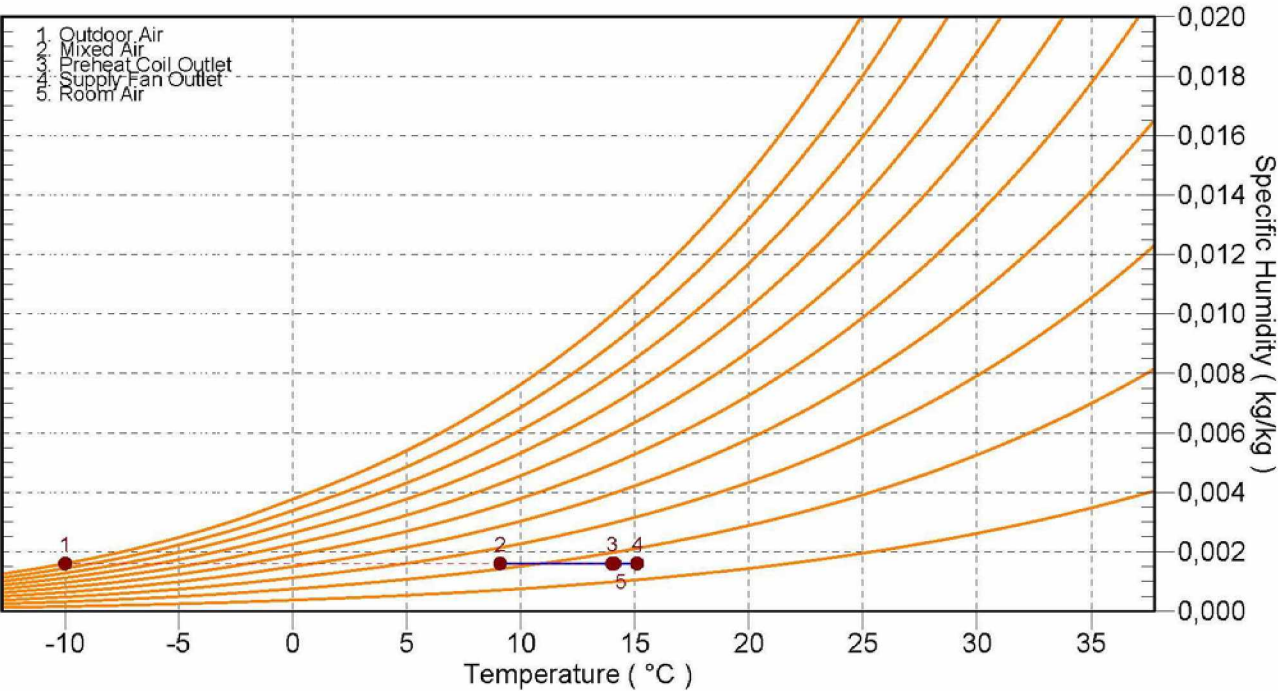


System Psychrometrics for AHUs for Technical rooms

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. Mauro Petriccione

07/14/2021
12:49

Location: Rotterdam, Netherlands
Altitude: 5,0 m.
Data for: WINTER DESIGN HEATING



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5.6. Air system sizing summary – Split system units for Fire command center

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Dedicated Outdoor Air System (DOAS) Sizing Summary for Split system for Fire Command

 Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
 Prepared by: **2E**

 07/14/2021
 03:04
Air System Information
 Air System Name **Split system for Fire Command**
 Equipment Class **TERM**
 Air System Type **SPLT-FC**

 Number of zones **1**
 Floor Area **33,6 m²**
 Location **Rotterdam, Netherlands**
Sizing Calculation Information
 Calculation Months **Jan to Dec**
 Sizing Data **Calculated**

 Zone L/s Sizing **Sum of space airflow rates**
 Space L/s Sizing **Individual peak space loads**

NOTE: No other data is applicable for a Terminal Units air system without a Dedicated Outdoor Air System (DOAS).

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Zone Sizing Summary for Split system for Fire Command

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: Ing. 2E

07/14/2021
03:04

Air System Information

Air System Name Split system for Fire Command
Equipment Class TERM
Air System Type SPLT-FC

Number of zones 1
Floor Area 33,6 m²
Location Rotterdam, Netherlands

Sizing Calculation Information

Calculation Months Jan to Dec
Sizing Data Calculated

Zone L/s Sizing Sum of space airflow rates
Space L/s Sizing Individual peak space loads

Terminal Unit Sizing Data - Cooling

Zone Name	Total Coil Load (kW)	Sens Coil Load (kW)	Coil Entering DB / WB (°C)	Coil Leaving DB / WB (°C)	Water Flow @ 5,0 K (L/s)	Time of Peak Coil Load	Zone L/(s·m²)
Fire Command Center	14,9	14,4	24,6 / 18,1	15,3 / 14,7	-	Jul 1500	38,42

Terminal Unit Sizing Data - Heating, Fan, Ventilation

Zone Name	Heating Coil Load (kW)	Heating Coil Ent/Lvg DB (°C)	Htg Coil Water Flow @ 5,0 K (L/s)	Fan Design Airflow (L/s)	Fan Motor (BHP)	Fan Motor (kW)	OA Vent Design Airflow (L/s)
Fire Command Center	2,4	21,1 / 22,6	-	1291	0,163	0,129	56

Zone Peak Sensible Loads

Zone Name	Zone Cooling Sensible (kW)	Time of Peak Sensible Cooling Load	Zone Heating Load (kW)	Zone Floor Area (m²)
Fire Command Center	14,0	Jun 0200	0,3	33,6

Space Loads and Airflows

Zone Name / Space Name	Mult.	Cooling Sensible (kW)	Time of Peak Sensible Load	Air Flow (L/s)	Heating Load (kW)	Floor Area (m²)	Space L/(s·m²)
<i>Fire Command Center</i>							
Fire Command Center	1	14,0	Jun 0200	1291	0,3	33,6	38,42

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Ventilation Sizing Summary for Split system for Fire Command

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: 

07/14/2021
03:04

1. Summary

Ventilation Sizing Method Sum of Space OA Airflows

2. Space Ventilation Analysis

2.1 Zone: Fire Command Center

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/s-m²)	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Fire Command Center									
Fire Command Center	1	33,6	0,0	1290,8	0,00	0,00	56,0	0,0	56,0
Totals (incl. Space Multipliers)				1290,8					56,0

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Air System Design Load Summary for Split system for Fire Command

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: IZE

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ZONE LOADS	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500			HEATING DATA AT DES HTG		
	COOLING OA DB / WB 28,0 °C / 21,0 °C			HEATING OA DB / WB -10,0 °C / -10,0 °C		
	Details	Sensible (W)	Latent (W)	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	0 m²	0	-	0 m²	0	-
Roof Transmission	34 m²	44	-	34 m²	240	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	34 m²	0	-	34 m²	0	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	672 W	672	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	12000 W	11999	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	1272	0	10%	24	0
>> Total Zone Loads	-	13987	0	-	264	0
Zone Conditioning	-	14025	0	-	376	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Exhaust Fan Load	0 L/s	0	-	0 L/s	0	-
Ventilation Load	56 L/s	248	419	56 L/s	2189	0
Ventilation Fan Load	0 L/s	0	-	0 L/s	0	-
Space Fan Coil Fans	-	129	-	-	-129	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	-	14403	419	-	2436	0
Terminal Unit Cooling	-	14403	455	-	0	0
Terminal Unit Heating	-	0	-	-	2436	-
>> Total Conditioning	-	14403	455	-	2436	0
Key:	Positive values are clg loads Negative values are htg loads			Positive values are htg loads Negative values are clg loads		

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Space Design Load Summary for Split system for Fire Command

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21
Prepared by: IZE

07/14/2021
03:04

TABLE 1.1.A. Component Loads For Space "Fire Command Center" In Zone "Fire Command Center"						
	Details	DESIGN COOLING		DESIGN HEATING		
		Sensible	Latent	Sensible	Latent	
		(W)	(W)	(W)	(W)	
COOLING DATA AT Jun 0200						
COOLING OA DB / WB 18,9 °C / 18,3 °C						
OCCUPIED T-STAT 24,0 °C						
HEATING DATA AT DES HTG						
HEATING OA DB / WB -10,0 °C / -10,0 °C						
OCCUPIED T-STAT 22,0 °C						
SPACE LOADS	Details	Sensible	Latent	Sensible	Latent	
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	0 m²	0	-	0 m²	0	-
Roof Transmission	34 m²	72	-	34 m²	240	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	34 m²	0	-	34 m²	0	-
Partitions	0 m²	0	-	0 m²	0	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	672 W	672	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	12000 W	11999	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	1274	0	10%	24	0
>> Total Zone Loads	-	14017	0	-	264	0

TABLE 1.1.B. Envelope Loads For Space "Fire Command Center" In Zone "Fire Command Center"						
	Area	U-Value	Shade	COOLING	COOLING	HEATING
				TRANS	SOLAR	TRANS
	(m²)	(W/(m²·K))	Coeff.	(W)	(W)	(W)
H EXPOSURE						
ROOF	34	0.223	-	72	-	240

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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System Psychrometrics for Split system for Fire Command

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21

07/14/2021

Prepared by: Ing. 2E 2E

03:04

July DESIGN COOLING DAY, 1500

TABLE 1: SYSTEM DATA

Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Ventilation Air	Inlet	28,0	0,01272	56	400	248	419
Vent - Return Mixing	Outlet	-17,8	0,00000	0	0	-	-
Ventilation Fan	Outlet	-17,8	0,00000	0	0	0	-
Zone Air	-	24,3	0,01018	1291	0	14025	0
Return Plenum	Outlet	-17,8	0,01018	1291	0	0	-

Air Density x Heat Capacity x Conversion Factor: At sea level = 1,207; At site altitude = 1,206 W/(L/s-K)

Air Density x Heat of Vaporization x Conversion Factor: At sea level = 2947,6; At site altitude = 2945,8 W/(L/s)

Site Altitude = 5,0 m

TABLE 2: ZONE DATA

Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Fire Command Center (Cooling)							
Ventilation Air	-	-	-	56	-	-	-
Cooling Coil Inlet	-	24,6	0,01030	1291	0	-	-
Cooling Coil Outlet	-	15,3	0,01018	1291	0	14403	455
Heating Coil Inlet	-	15,3	0,01018	1291	0	-	-
Heating Coil Outlet	-	15,3	0,01018	1291	0	0	-
Zone Air	-	24,3	0,01018	1291	0	14025	-

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

NESTE

System Psychrometrics for Split system for Fire Command

Project Name: Rotterdam RDCG - OPB and Labo in MNA 13-07-21

07/14/2021

Prepared by: Ing. 2E 2E

03:04

WINTER DESIGN HEATING

TABLE 1: SYSTEM DATA

Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Ventilation Air	Inlet	-10,0	0,00160	56	400	-2189	0
Vent - Return Mixing	Outlet	-17,8	0,00000	0	0	-	-
Ventilation Fan	Outlet	-17,8	0,00000	0	0	0	-
Zone Air	-	22,4	0,00161	1291	0	-376	0
Return Plenum	Outlet	-17,8	0,00161	1291	0	0	-

Air Density x Heat Capacity x Conversion Factor: At sea level = 1,207; At site altitude = 1,206 W/(L/s-K)

Air Density x Heat of Vaporization x Conversion Factor: At sea level = 2947,6; At site altitude = 2945,8 W/(L/s)

Site Altitude = 5,0 m

TABLE 2: ZONE DATA

Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Fire Command Center (Deadband)							
Ventilation Air	-	-	-	56	-	-	-
Cooling Coil Inlet	-	21,1	0,00161	1291	0	-	-
Cooling Coil Outlet	-	21,1	0,00161	1291	0	0	0
Heating Coil Inlet	-	21,1	0,00161	1291	0	-	-
Heating Coil Outlet	-	22,6	0,00161	1291	0	2436	-
Zone Air	-	22,4	0,00161	1291	0	-376	-

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5.7. Air system sizing summary – Chilled and Hot water systems

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RDCG (Rotterdam Capacity Growth) – DEFINITION PHASE

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Plant Sizing Summary for Chilled water system

Rotterdam RDCG - OPB and Labo in MNA 13-07-21

07/15/2021

Ing. 2E 2E

09:17

1. Plant Information:

Plant Name Chilled water system
 Plant Type Generic Chilled Water
 Design Weather Rotterdam, Netherlands

2. Cooling Plant Sizing Data:

Maximum Plant Load 367,6 kW
 Load occurs at Jul 1500
 m²/kW 5,4 m²/kW
 Floor area served by plant 1981,1 m²

3. Coincident Cooling Loads for Jul 1500

Air System Name	Mult.	System Cooling Coil Load [kW]
Fresh air AHU for Labor. rooms	1	237,8
AHUs for Technical rooms	1	69,3
Offices - Fresh air & fan coils	1	60,5

Air system loads are for coils whose cooling source is 'Chilled Water' or 'Any'.

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Plant Sizing Summary for Hot water - heat pumps

 Rotterdam RDCG - OPB and Labo in MNA 13-07-21
 Ing. Mauro Petriccione

 07/15/2021
 09:21

1. Plant Information:

 Plant Name Hot water - heat pumps
 Plant Type Generic Hot Water
 Design Weather Rotterdam, Netherlands

2. Heating Plant Sizing Data:

 Maximum Plant Load 348,4 kW
 W/m² 175,9 W/m²
 Floor area served by plant 1981,1 m²

3. Coincident Heating Loads for Winter Design

Air System Name	Mult.	System Heating Coil Load [kW]
AHUs for Technical rooms	1	30,0
Fresh air AHU for Labor. rooms	1	243,7
Offices - Fresh air & fan coils	1	74,7

Air system loads are for coils whose heating source is ' Hot Water ' or ' Any '.