FIRST MULTICOMFORT OFFICE BUILDING IN ROMANIA

ARCHITECT SERGIU PETREA
ENGINEER MIHAELA MUSCOIU
MULTICOMFORT CONSULTANT GABRIEL GOLUMBEANU

THERMAL COMFORT
EFFECTS ON WORK PERFORMANCE

The perceived thermal comfort has a direct effect over human body performances

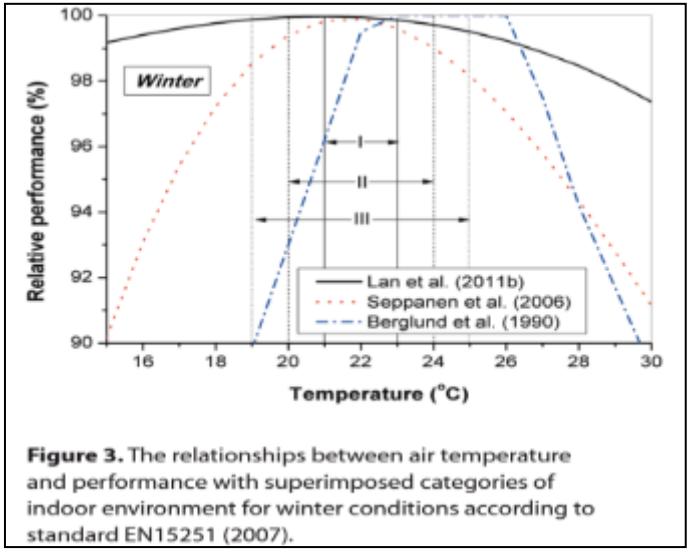


Figure 3. The relationships between air temperature and performance with superimposed categories of indoor environment for winter conditions according to standard EN15251 (2007).

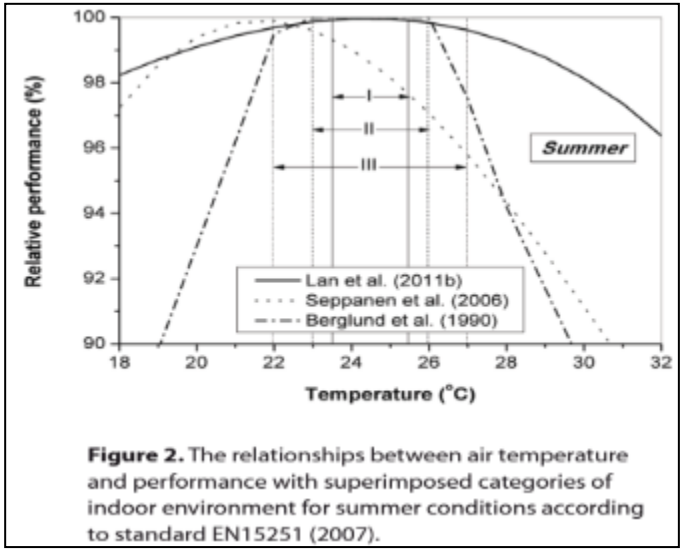
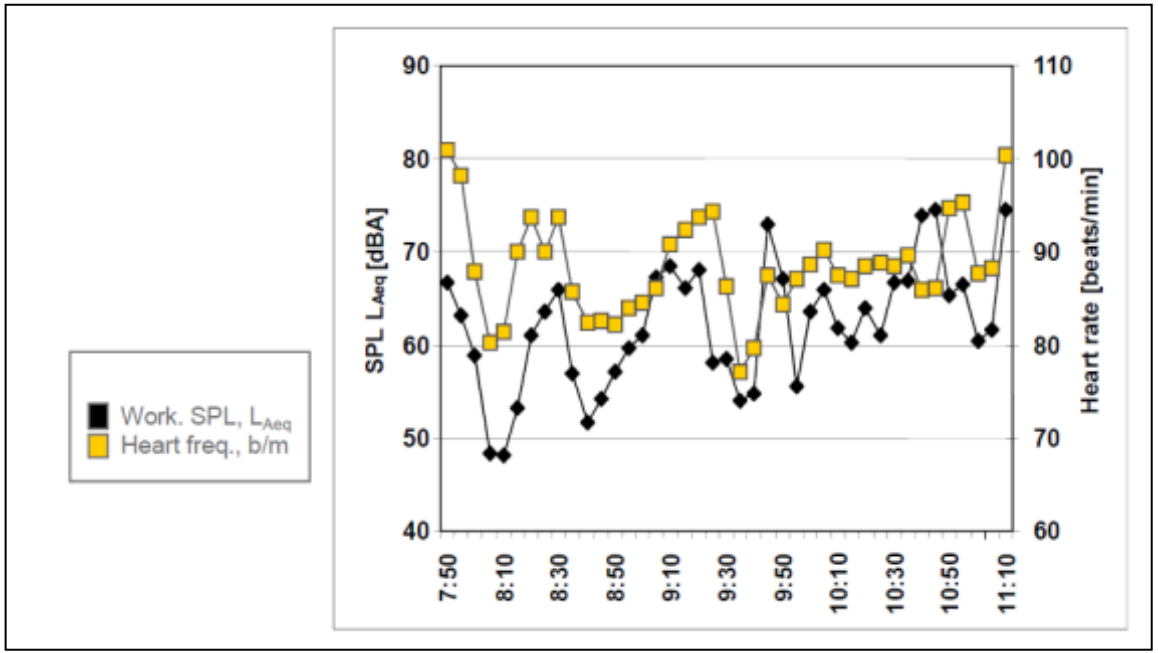


Figure 2. The relationships between air temperature and performance with superimposed categories of indoor environment for summer conditions according to standard EN15251 (2007).

Source :REHVA Journal – January 2012/ Optimal thermal environment improves performance of office work, Wargocki/Lan/Lian

ACOUSTIC COMFORT
EFFECTS ON WORK PERFORMANCE

Working SPL (sound pressure level) and average Heart Rate 5min of the teacher



Source: Multi Comfort House Students Contest 2017 Online Acoustic Training

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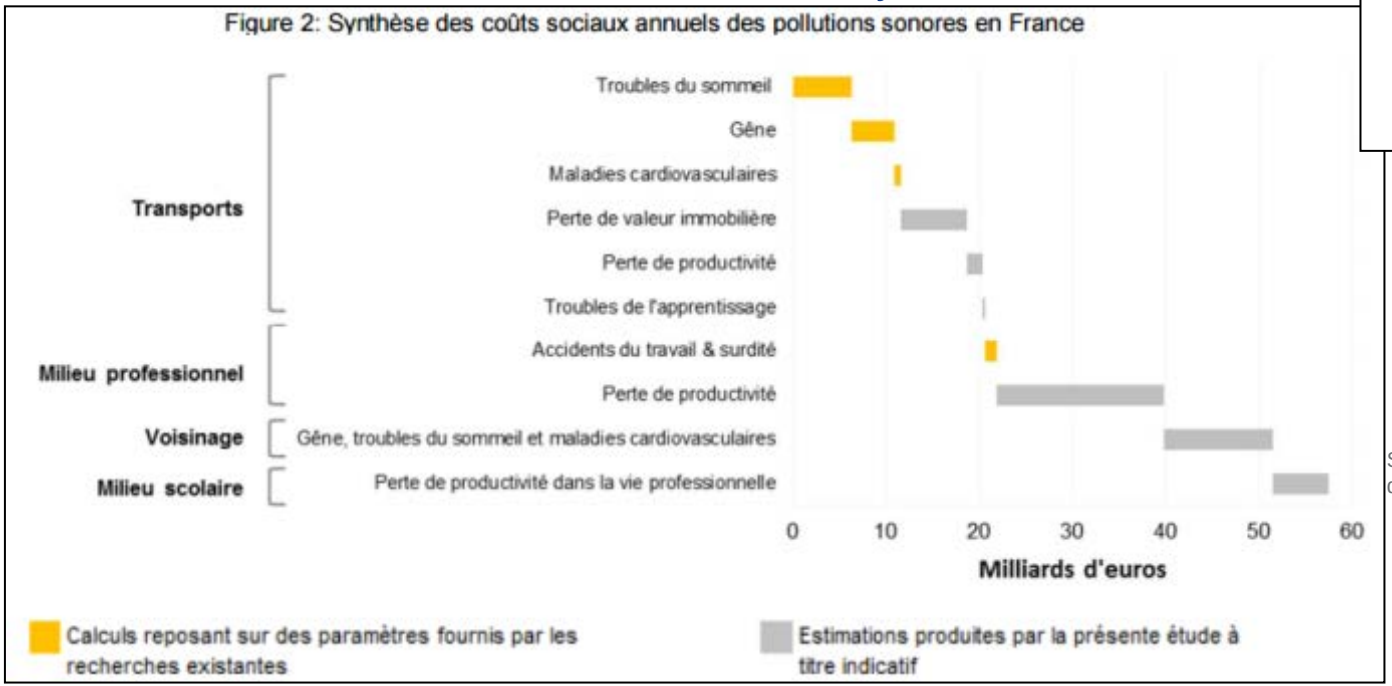
ACOUSTIC COMFORT
SOCIAL COSTS

Social cost of noise in France : 57 Billions EURO/year



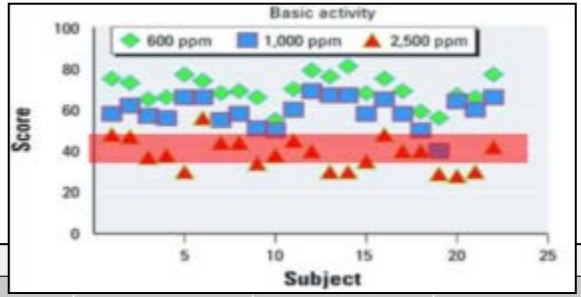

ANALYSE BIBLIOGRAPHIQUE DES TRAVAUX FRANÇAIS ET EUROPEENS

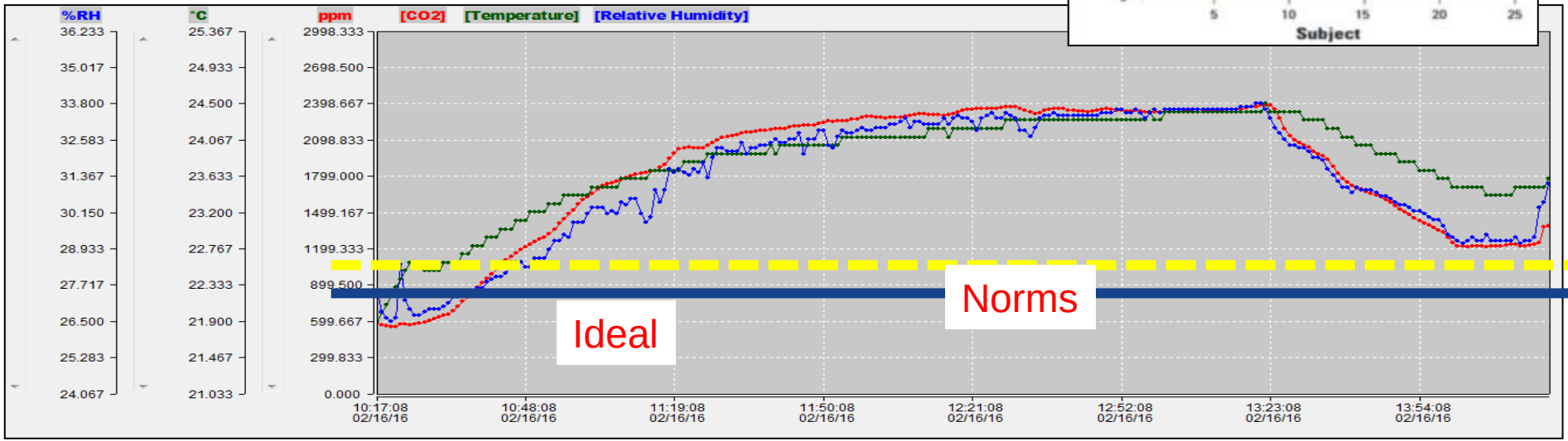
LE COÛT SOCIAL DES POLLUTIONS SONORES

Source: ADEME, Le cout social des polution sonores in France

INDOOR AIR QUALITY

CO2 MEASUREMENTS – MEETING ROOM





Source: Gabriel Golumbeanu, Office measurements in France

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SAINT-GOBAIN

SAINT-GOBAIN MULTI COMFORT PROGRAM

COMFORT DIMENSIONS IN FOCUS OF THE PROGRAM

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CRITERIA

			HOUSING	
			Cold & Moderate	Hot
HEATING ENERGY DEMAND (kWh/m²a)			New < 15 ; Renovation < 25 (1) or future next local regulation level	
COOLING ENERGY DEMAND (kWh/m²a)			New < 15 ; Renovation < 25 or future next local regulation level	
AIR-TIGHTNESS n50 (V/h)			0.6	1.0
DAYLIGHTING (Daylight autonomy %)			60% (3)	
			Min.	Targeted
SUMMER COMFORT (overheating % of season)			10% (2)	5% (2)
ACOUSTICS	Between dwellings	***Airborne*** - $D_{nT,w}$+C(dB)	≥58dB	≥ 63dB
		Impact - $L'_{nT,w}$+CI(dB)	≤ 45dB	≤ 40dB
	Between rooms of one dwelling	***Airborne*** - $D_{nT,w}$+C(dB)	≥ 45dB (4)	≥ 48dB (4)
		Impact - $L'_{nT,w}$+CI(dB)	≤ 50dB	≤ 45dB
	From exterior noise	Rural & Urban – L_{den}	25 dB	20 dB
SUSTAINABILITY			EPD for all SG products	

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SAINT-GOBAIN MULTI COMFORT PROGRAM

COMFORT INTERACTIONS

Insulation material

Windows reveal/ Glazing surface

Airtightness and natural ventilation

Mechanical ventilation

Glazing surface

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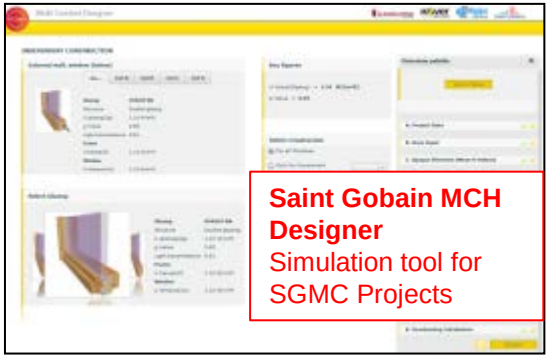
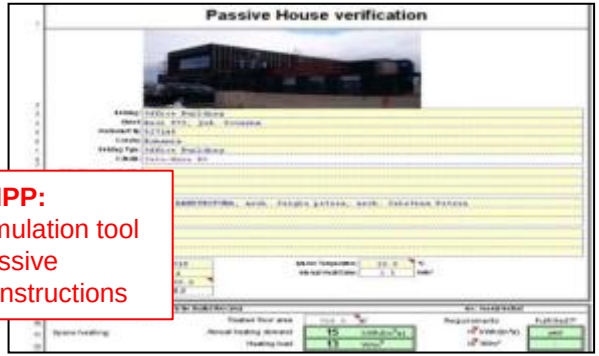
SAINT-GOBAIN MULTI COMFORT PROGRAM

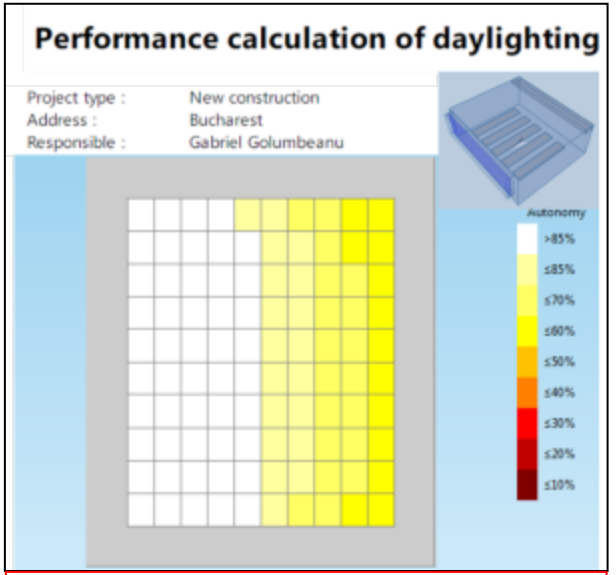
COMFORT SIMULATIONS



Saint Gobain MCH Designer
Simulation tool for SGMC Projects

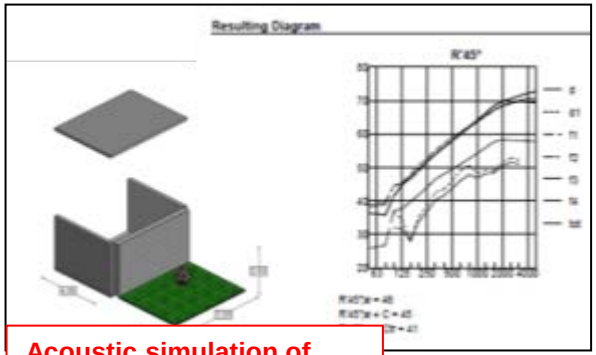


PHPP:
Simulation tool Passive Constructions



Acoustic simulation of visual comfort

Acoustic simulation for sound reduction index of different components



Acoustic simulation of building behaviour

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FIRST MULTI COMFORT OFFICE BUILDING IN ROMANIA

FROM IDEA TO REALITY

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FIRST MULTI COMFORT OFFICE BUILDING IN ROMANIA

FROM IDEA TO REALITY

Finalised: 2015

Location: Reci, Jud. Covasna, ROMANIA

Climatic zone: V

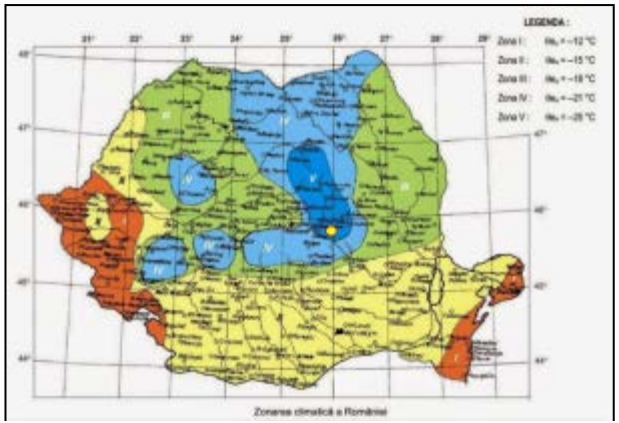
Proiectant general/arhitectura: Tecto Arhitectura

Locul II la categoria Inovatie si Dezvoltare durabila la Saint- Gobain Gypsum International Trophy, Lisabona 2018

Premiul Bienalei de Arhitectura 2018, Sectiunea Arhitectura verde si energii alternative

Locul II la categoria Energy & Temperate Climates Awards, Green Solutions Awards, Katowice 2018

Office rendering



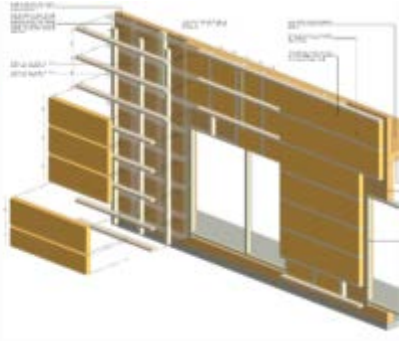
Climatic zone Romania

FIRST MULTI COMFORT OFFICE BUILDING IN ROMANIA
FROM IDEA TO REALITY

Construction type

Cross laminated solid wood panels (CLT)

Biggest project of this type in SE Europe



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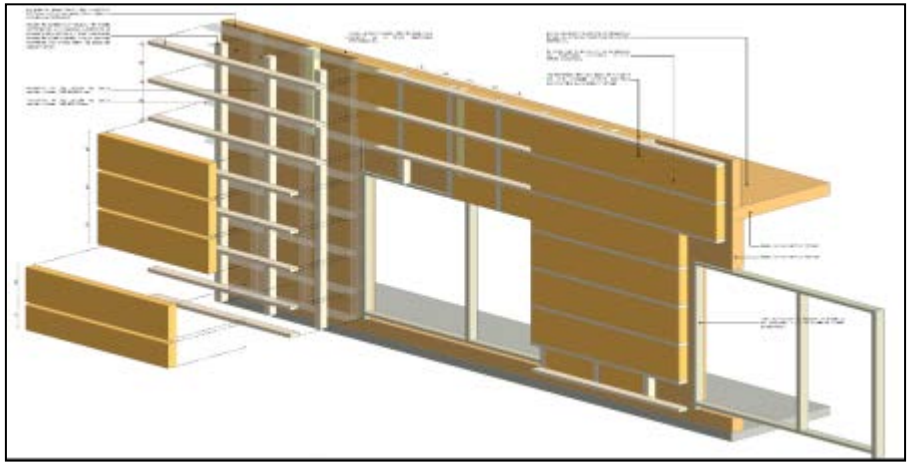
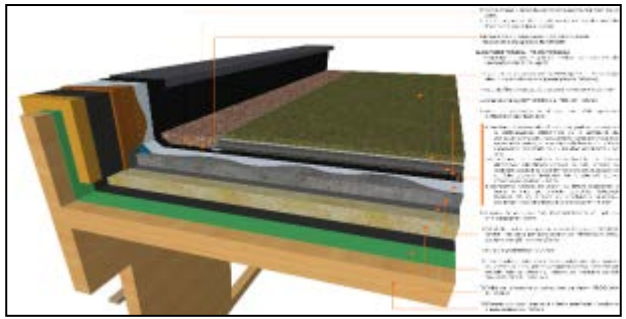
FROM IDEA TO REALITY





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FROM IDEA TO REALITY

Timber is the only truly renewable construction material, with the lowest energy consumption of any building material across its lifecycle. The use of timber in the construction of buildings aims to achieve negative net CO2 emissions.

The timber used for the construction of the office building stores approx. 750 tones of carbon for the life of the building.

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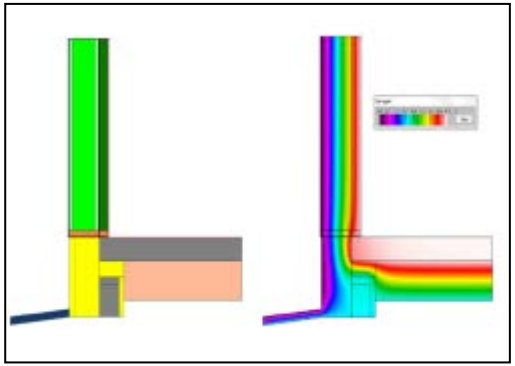
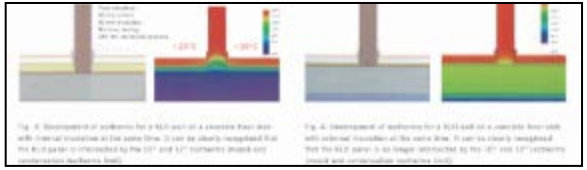
FROM IDEA TO REALITY





FIRST MULTI COMFORT OFFICE BUILDING IN ROMANIA

FROM IDEA TO REALITY

A vast 1000 sqm green roof improves thermal performance, preventing rapid temperature fluctuations and overheating effects throughout the day

It also protects against dust, acts as a buffer for heavy rains and completes the landscape because of the use of local plants and by returning to nature the footprint of the building.

FIRST MULTICOMFORT OFFICE BUILDING IN ROMANIA

FROM IDEA TO REALITY

				Requirements	Fulfilled?
	Treated floor area	708.0	m²		
Space heating	Annual heating demand	15	kWh/(m²a)	15 kWh/(m²a)	yes
	Heating load	13	W/m²	10 W/m²	-
Space cooling	Overall specific space cooling demand		kWh/(m²a)	-	-
	Cooling load		W/m²	-	-
	Frequency of overheating (> 25 °C)		%	-	-
Primary Energy	cooling, household electricity	87	kWh/(m²a)	120 kWh/(m²a)	yes
	DHW, space heating and auxiliary electricity	87	kWh/(m²a)	-	-
	Specific primary energy reduction through solar electricity		kWh/(m²a)	-	-
Airtightness	Pressurization test result n_{50}	0.6	1/h	0.6 1/h	yes
Building envelope average U-Values	Exterior insulation to ambient air	0.12	W/(m²K)	-	-
	Exterior insulation underground	0.11	W/(m²K)	-	-
	Interior insulation to ambient air		W/(m²K)	-	-
	Interior insulation underground		W/(m²K)	-	-
	Thermal bridges ΔU	0.00	W/(m²K)	-	-
	Windows	0.69	W/(m²K)	-	-
	External doors	0.00	W/(m²K)	-	-
Ventilation System	Effective heat recovery efficiency	84	%	-	-

PHPP simulations

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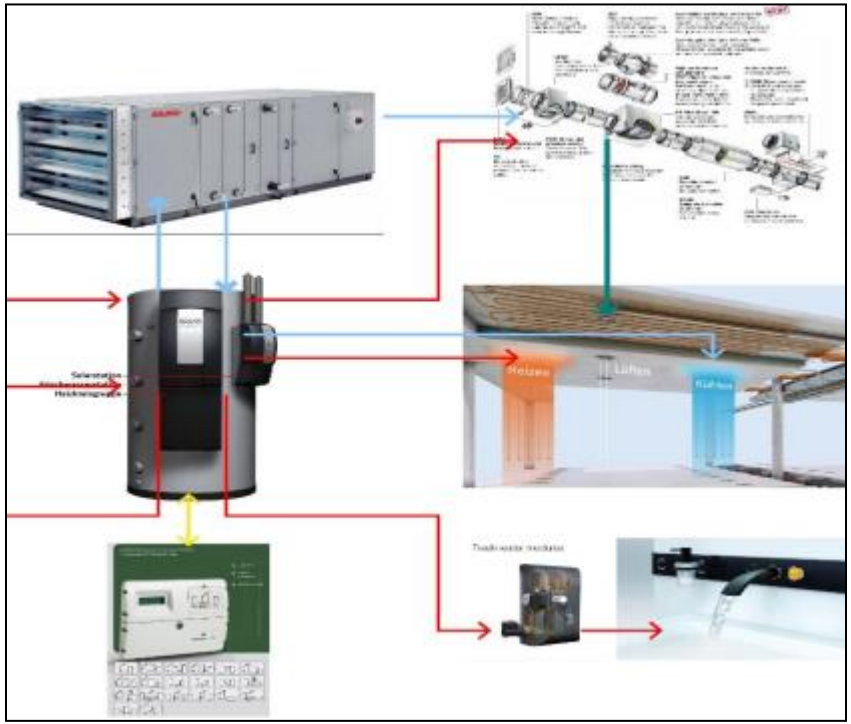
FIRST MULTI COMFORT OFFICE BUILDING IN ROMANIA
FROM IDEA TO REALITY

ENERGY STRATEGY:

- CLEAN ELECTRICITY AND HEAT – BIOMASS COGENERATION PLANT
- HEAT PUMP
- FLOOR HEATING / COOLING
- HOT FRESH WATER MODULES
- HEAT STORAGE
- VENTILATION WITH HEAT RECOVERY
- CENTRAL AUTOMATIZATION



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FROM IDEA TO REALITY

HLC SYSTEM SPS (BMS)

FREE PROGRAMMING

Systems are fully programmable and are suitable to be used to manage almost all services and ancillary functions.

They can be used for integrated management of energy system (interior climate and lighting), to irrigate green spaces and automatic shading control.

They can be customized for alternative usage scenarios and run simulations in real time.

They can store information for monitoring and have remote control functions

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FROM IDEA TO REALITY

DESIGN STAGE

EXISTING STAGE

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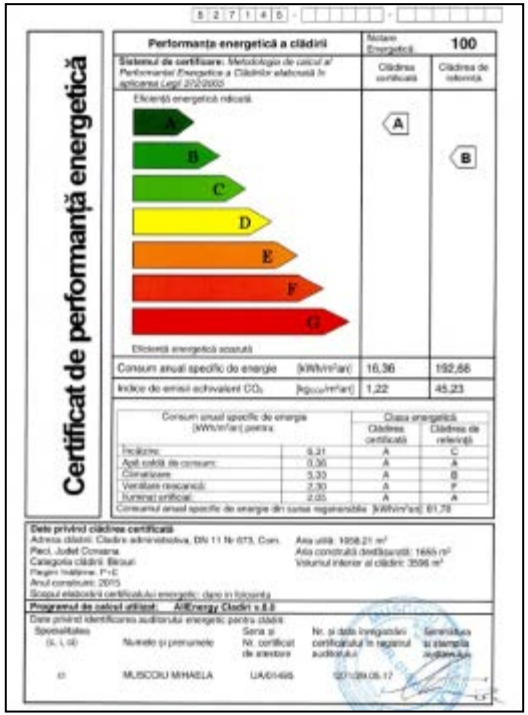
THERMAL COMFORT

Saint-Gobain Triple Glazing,
Saint-Gobain ISOVER Mineral Wool
Saint-Gobain Rigips Plasterboard
Saint-Gobain Weber Hydro insulation



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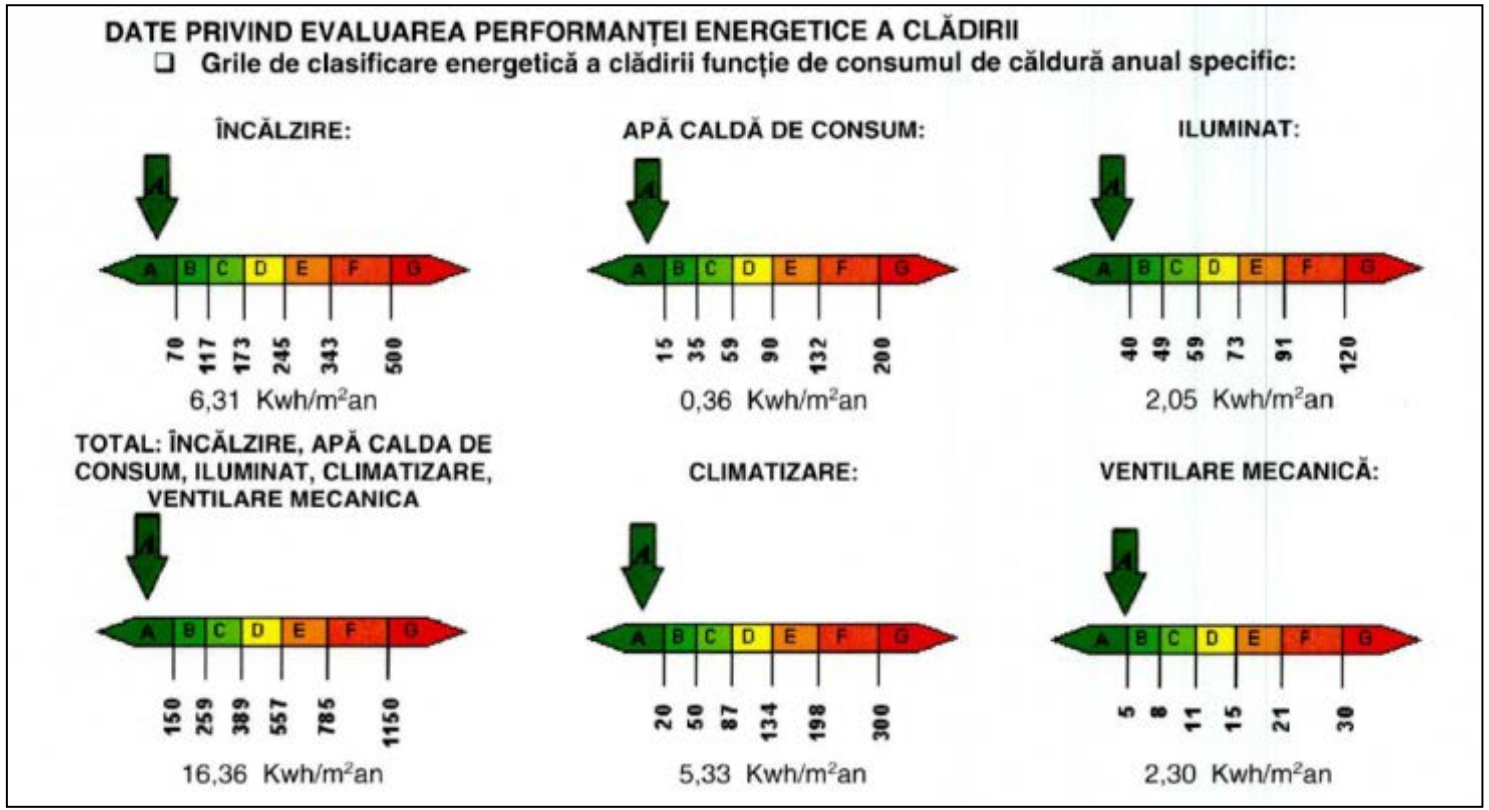
THERMAL COMFORT



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THERMAL COMFORT

Construction type	R’ [m^2K/W]	Surface [m^2]
External walls	3,752 ÷ 4,626	586,24
Windows	1,37	269,06
Green roof	8,078	959,85
First floor slab (console)	5,118	291,1
Sky light	1,5	50,6
Ground slab	5,321	711,03
Ae	4,564	2867,86

FIRST MULTI COMFORT OFFICE BUILDING IN ROMANIA

THERMAL COMFORT - HEATING, HOT WATER, COOLING

Heating

Day: Primary thermal agent from its own thermal power station - cogeneration - Average flow temperature 82 ° C, Wood biomass fuel

Night: 2 reversible soil-water heat pumps P=2x 80 kW, 36 wells L = 62 m EER = 6 ÷ 7, (75 W/m drilling), COP =3,3 ÷5.

Hot water

Biomass cogeneration plant (wood biomass waste), P late heat exchanger and storage V = 2000l,

Water recirculation, 12 consumption points

Cooling

Passive cooling, 2 reversible soil-water heat pumps P=2x 80 kW, 36 wells L = 62 m EER = 6 ÷ 7,

Electricity produced on site-

Radiant floor, Fan coil unit, Cooling batteries

FIRST MULTI COMFORT OFFICE BUILDING IN ROMANIA

THERMAL COMFORT - VENTILATION, LIGHT, BMS

Mechanical ventilation:

- Office – ventilation with heat recuperation 80%, humidity control,
- Electrical energy supply – produced on site,
- Electricity onsite production – Biomass cogeneration plant – recycling wood

Interior lighting:

- LED
- Automatization: natural light sensor, human presence sensor
- Electricity onsite production – Biomass cogeneration plant – recycling wood

BMS

- Interior temperature for each room
- Ventilation rate (max difference interior – exterior 400ppm)
- Sun shades position – control solar radiation

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VISUAL COMFORT

Saint-Gobain Triple Glazing,
Transmittance: 62 %

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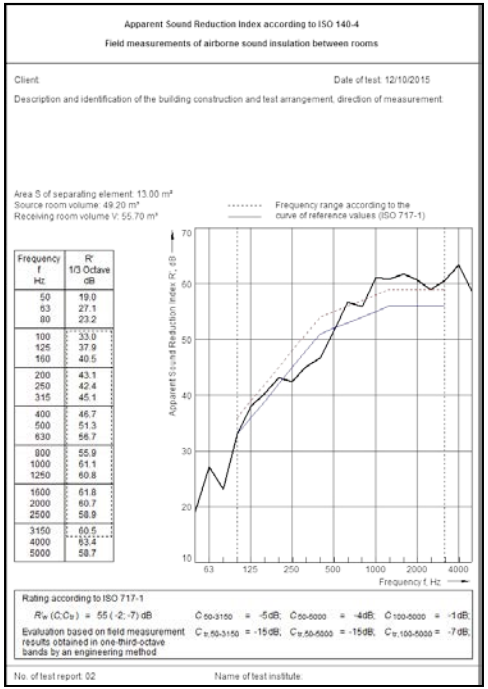
ACOUSTIC COMFORT

Saint-Gobain ISOVER Akusto
Saint Gobain Rigips® Fonic



Apparent Sound Reduction Index according to ISO 140-4

Field measurements of airborne sound insulation between rooms

Client: Date of test: 12/10/2015

Description and identification of the building construction and test arrangement, direction of measurement:

Area S of separating element: 13.00 m²
Source room volume: 49.20 m³
Receiving room volume V: 55.70 m³

Frequency range according to the curve of reference values (ISO 717-1)

Frequency f Hz	R' 1/3 Octave dB
50	19.0
63	27.1
80	23.2
100	33.0
125	37.9
160	40.5
200	43.1
250	42.4
315	45.1
400	46.7
500	51.3
630	56.7
800	55.9
1000	61.1
1250	60.8
1600	61.8
2000	60.7
2500	58.9
3150	60.5
4000	63.4
5000	58.7

Rating according to ISO 717-1

$R'_w (C;C_{tr})$ = 55 (-2; -7) dB

$C_{50\text{-}3150}$ = -5dB; $C_{50\text{-}5000}$ = -4dB; $C_{100\text{-}5000}$ = -1dB;

Evaluation based on field measurement results obtained in one-third-octave bands by an engineering method

$C_{tr,50\text{-}3150}$ = -15dB; $C_{tr,50\text{-}5000}$ = -15dB; $C_{tr,100\text{-}5000}$ = -7dB;

No. of test report: 02 Name of test institute:

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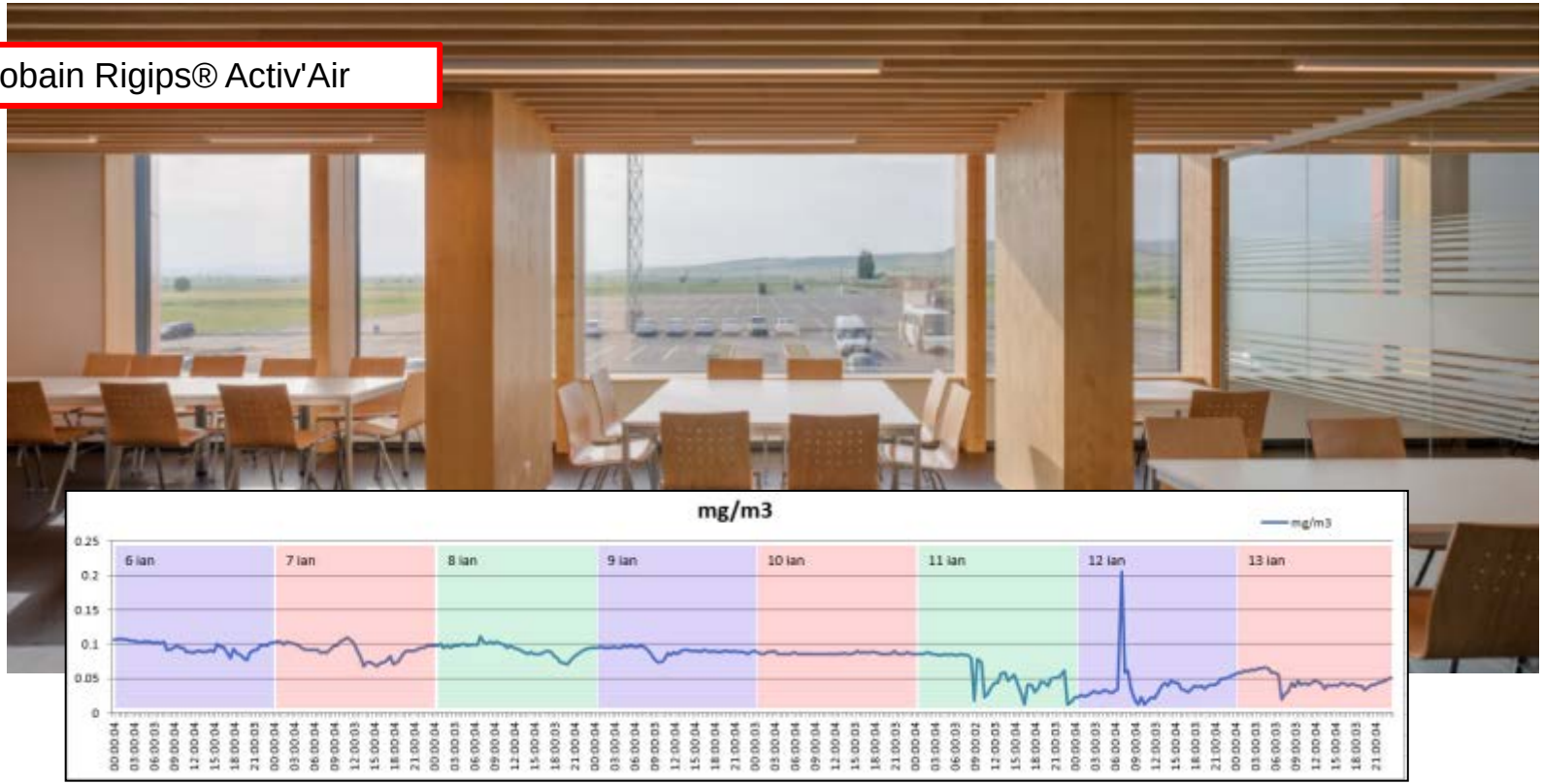
INDOOR ARI QUALITY

Saint Gobain Rigips® Activ'Air



FIRST OFFICE BUILDING IN MULTICOMFORT STANDARD IN ROMANIA. ARCHITECT, FROM ROMANIA, ARCHITECT SERGIU PETREA, ENGINEER MIHAELA MUSCOIU, MULTI COMFORT CONSULTANT GABRIEL GOLUMBEANU, XIIITH NATIONAL CONFERENCE AAECR "ENERGY EFFICIENCY IN BUILDINGS - OLD AND NEW REQUIREMENTS IMPOSED BY EPBD 3

FIRST MULTI COMFORT OFFICE BUILDING IN ROMANIA

RESULTS

Criteria	Multi Comfort Criteria	Measured / Registered / Simulated	Measurement Simulation	Fulfilled (Y/N)
Thermal comfort • Heating energy demand • Cooling energy demand • Summer comfort – overheating	<15Kwh/m2 <15Kwh/m2 <10%	6.3Kwh/m2 7.2Kwh/m2 <10%	3rd party Energy Efficiency audit	OK
Acoustic comfort • Airborne sound insulation between offices • Reverb time offices • Airborne sound insulation from exterior noise	>46dB <0.8s <35dB	55dB 0.47s 20dB	3rd party measurement after completion	OK
Visual comfort • Day Light Autonomy	> 60%	62%	Saint Gobain Simulations	OK
IAQ • Formaldehyde concentration µg/m3	<100	70	Saint Gobain Measurements	OK

FIRST MULTI COMFORT OFFICE BUILDING IN ROMANIA
FROM IDEA TO REALITY

Saint-Gobain MultiComfort
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