URBEM

Urban Reference Buildings for Energy Modelling

Region:	Piedmont	**Archetype code:**	
Building category:	Non-residential buildings – Educational buildings	EDUC_1931-1940_E_PIE	
Period of construction:	1931-1940		
Climatic zone:	E	**Number of records:**	20

Description (the codes associated with walls and slabs refer to the structures described in UNI/TR 11552:2014):

External walls: hollow brick masonry with air gap (cod. MCV01) or solid brick masonry (cod. MLP01).
Roof slabs: pitched wooden roof (cod. CIN05).

Data sources:
EPC databases (100%)

	Data	Symbol	Unit of measure	Mean value	Standard deviation	Q1 (first quartile)	Median value	Q3 (third quartile)
BUILDING GEOMETRY	Number of floors	n_f	-	-	-	-	-	-
	Gross height	H_g	m	-	-	-	-	-
	Footprint area	$A_{footprint}$	m^2	-	-	-	-	-
	Heated gross floor area	$A_{H;g}$	m^2	-	-	-	-	-
	Heated net floor area	$A_{H;n}$	m^2	2654.8	3496.2	526.3	882.2	3336.2
	Heated gross volume	$V_{H;g}$	m^3	13767.3	18413.4	2701.7	4558.9	19507.0
	Heated net volume	$V_{H;n}$	m^3	-	-	-	-	-
	Compactness ratio	$A_{env}/V_{H;g}$	m^{-1}	0.49	0.17	0.37	0.45	0.61
	WWR – North orientation	WWR_N	-	-	-	-	-	-
	WWR – South orientation	WWR_S	-	-	-	-	-	-
	WWR – East orientation	WWR_E	-	-	-	-	-	-
	WWR – West orientation	WWR_W	-	-	-	-	-	-
	Window to useful floor area ratio	A_{wi}/A_{use}	-	0.20	0.07	0.15	0.19	0.23
ENVELOPE	Roof type			-				
	U-value of the roof	$U_{fl;up}$	W/(m^2·K)	-	-	-	-	-
	External walls type			Hollow brick masonry: 35%; Solid Brick masonry: 35%; Unknown: 30%				
	U-value of the wall	U_{wl}	W/(m^2·K)	-	-	-	-	-
	Slab on ground floor type			-				
	U-value of the floor	$U_{fl;lw}$	W/(m^2·K)	-	-	-	-	-
	Windows type			-				
	U-value of the windows	U_W	W/(m^2·K)	3.24	1.40	2.29	2.74	3.86
	Shading system type			-				
GAINS and VENTILATION	Occupancy density *	O_C	person/m^2	UNI EN 16798-1 - Table A.19				
	Lighting power density *	W_L	W/m^2	UNI EN 16798-1 - A.8.3				
	Equipment power density *	W_A	W/m^2	UNI EN 16798-1 - A.8.3				
	Type of ventilation			-				
	Air exchange rate *	n	h^{-1}	-	-	-	-	-
THERMAL SYSTEMS	Heating system type			Autonomous: 100%				
	Heating generator			-				
	Daily operating time of the heating system *	t_H	h	14.00	0.00	14.00	14.00	14.00
	Energy carrier			Natural Gas: 76%; Solid biomass: 14%; Electricity: 5%; LPG: 5%				
	Heating emission sub-system			-				
	Cooling system type			-				
	Daily operating time of the cooling system *	t_C	h	-	-	-	-	-
	Cooling emission sub-system			-				
	DHW system type			Autonomous, detached from heating: 50%; Centralized, coupled with heating: 45%; Autonomous, coupled with heating: 5%				
	DHW generator			-				
	* These values are derived from UNI EN ISO Standards							

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Numerical variables – GEOMETRY

NUMBER OF FLOORS

GROSS HEIGHT

AREA

☐ Heated gross floor area ■ Heated net floor area

VOLUME
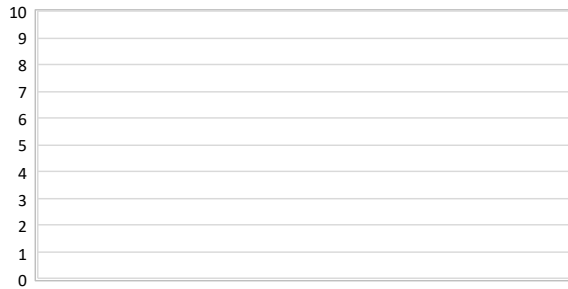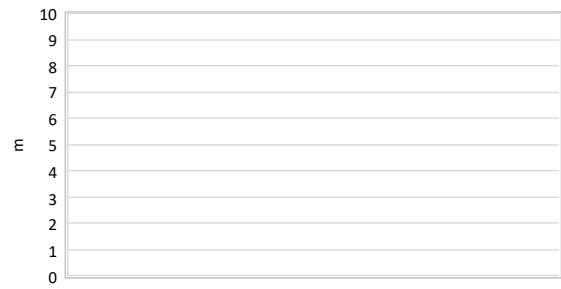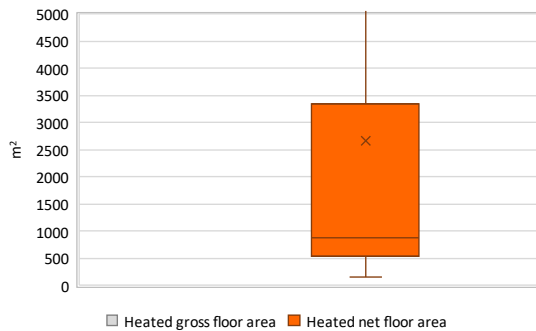
☐ Heated gross volume ■ Heated net volume
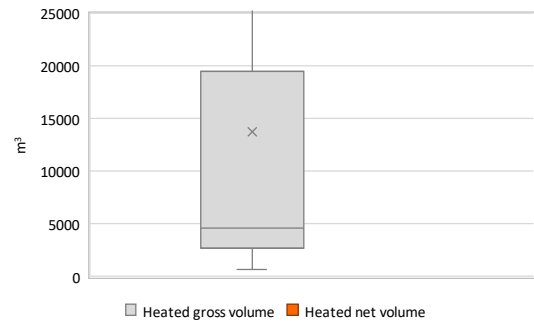
COMPACTNESS RATIO

WINDOWS TO WALL RATIO

☐ WWR_N ■ WWR_S ■ WWR_E ■ WWR_W ■ Awi/Ause
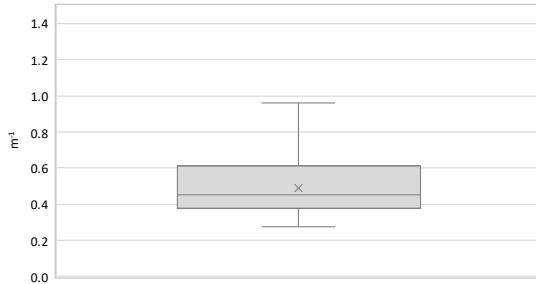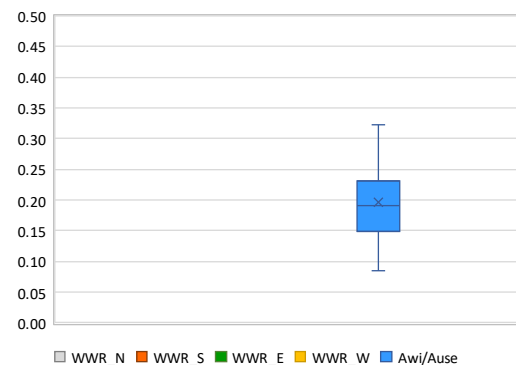
Numerical variables – ENVELOPE

OPAQUE BUILDING COMPONENTS U-VALUE

☐ External Walls ■ Slab on Ground Floor ■ Roof

WINDOWS U-VALUE

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ADDITIONAL DATA

	Data	Symbol	Unit of measure	Mean value	Standard deviation	Q1 (first quartile)	Median value	Q3 (third quartile)
THERMAL SYSTEMS	Heating efficiency or *COP*	$\eta_{H;gen}$ or $COP_{H;gen}$	-	This value has to be retrieved from suitable datasheets				
	Total heating power	$P_{H;gen}$	kW	405.8	541.1	92.9	204.0	493.3
	Cooling efficiency or *EER*	$\eta_{C;gen}$ or $EER_{C;gen}$	-	This value has to be retrieved from suitable datasheets				
	Total cooling power	$P_{C;gen}$	kW	-	-	-	-	-
	Temperature of DHW	ϑ_W	°C	40.0	0.0	40.0	40.0	40.0
	DHW system power	$P_{W;gen}$	kW	156.9	246.9	1.8	7.2	179.8

Numerical variables – GAINS, VENTILATION and SYSTEMS USAGE

AIR CHANGE RATE

OCCUPACY DENSITY

INTERNAL GAINS POWER DENSITY

DAILY OPERATING TIME

☐ Heating ☐ Cooling

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Additional data: other numerical variables that are not included in the archetype
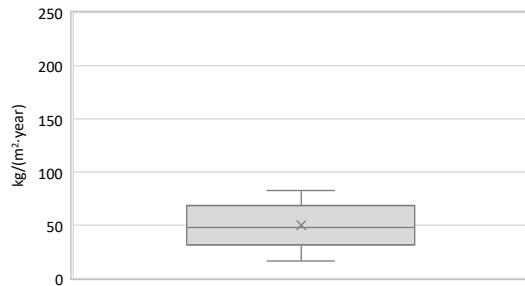
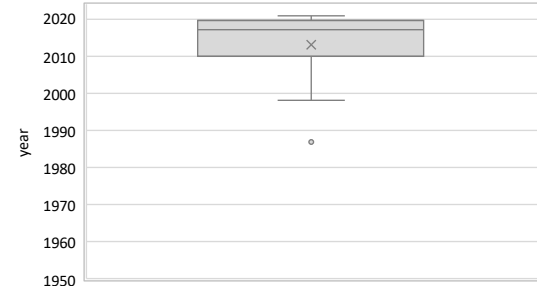### DHW SUPPLY TEMPERATURE
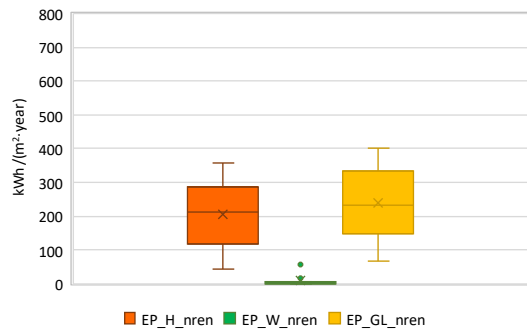

SYSTEM POWER
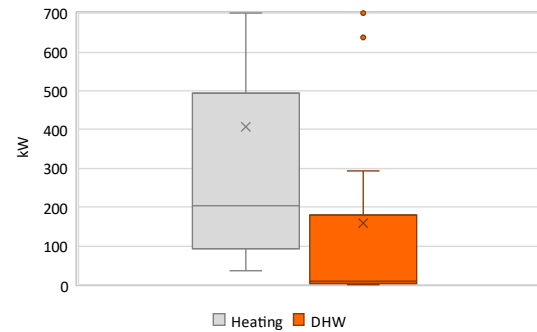
CO₂ EMISSION

HEATING SYSTEM INSTALLATION YEAR

NON-RENEWABLE PRIMARY ENERGY USE

RENEWABLE PRIMARY ENERGY USE

Non-residential buildings – Educational buildings – 1931-1940 – Zone E – Piedmont