
URBEM
Urban Reference Buildings for Energy Modelling

Come leggere ed usare gli archetipi URBEM

Politecnico di Milano, Dipartimento di Energia

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Prof. Gianpiero Evola, Università degli Studi di Catania

Obiettivo delle analisi condotte nel progetto URBEM

Archetipi edilizi e *scorecards*

- Analisi statistica di dati relativi alle caratteristiche e alle prestazioni energetiche di **edifici ed impianti termici**:
  - Diverse regioni
  - Diverse zone climatiche
  - Diversi periodi di costruzione
  - Diversi usi degli edifici

- Costruzione delle "***scorecards***", cioè delle schede descrittive degli **archetipi edilizi** da utilizzare ai fini della **simulazione energetica su scala urbana (UBEM)**

Categorie di edifici analizzati

Nomenclatura UNI e nomenclatura URBEM

Categorie UNI — URBEM

#	Building use	Broader category
1	Single-family houses of different types	*Residential*
2	Apartment (in a multi-family block)	
3	Entire multi-family block	
4	Homes for elderly and disabled people	
5	Residence for collective use	
6	Mobile home	
7	Holiday home	
8	Office Short working week	*Offices*
9	Office Long working week	
10	Primary schools short staying	*Schools*
11	Primary schools long staying	
12	Secondary schools short staying	
13	Secondary schools long staying	
14	University classrooms	
15	Hospitals with overnight stay	*Hospitals*
16	Day hospital	

Categorie UNI — URBEM

#	Building use	Broader category
17	Hotels	*Hotels*
18	Restaurants	*Restaurants*
19	Bar	
20	Swimming Pools	*Sport buildings*
11	Sport buildings	
22	Department stores and shopping mall	*Commercial*
23	Retail stores	
24	Factories	*Other*
25	Data centre	
26	Warehouse	
27	Workshops	
28	Agricultural	
29	Cinema, theatres, conference buildings	
30	Museums, exhibition's halls	
31	Religious buildings	
32	Libraries and reading rooms	
33	Dancing halls and discos	

Variabili analizzate

Elenco delle variabili

Variabili categoriche

#	Variable name
1	Roof type
2	External walls type
3	Slab on ground floor type
4	Windows type
5	Shading system type
6	Heating system type
7	Heating generator
8	Energy carrier
9	Heating emission sub-system
10	Cooling system type
11	Cooling emission sub-system
12	DHW system type
13	DHW generator
14	Type of ventilation
15	Energy Class

Variabili numeriche

Variabili numeriche che concorrono alla definizione dell'archetipo

#	Variable name
1	Number of building floors (-)
2	Heated gross floor area (m^2)
3	Heated net floor area (m^2)
4	Heated gross volume (m^3)
5	Heated net volume (m^3)
6	Gross height (m)
7	Footprint area (m^2)
8	Compactness ratio (m^{-1})
9	*WWR* – North Orientation (-) *
10	*WWR* – South Orientation (-) *
11	*WWR* – East Orientation (-) *
12	*WWR* – West Orientation (-) *
13	Windows to useful floor area ratio (-)
14	U-value of the wall ($W \cdot m^{-2} \cdot K^{-1}$)
15	U-value of the floor ($W \cdot m^{-2} \cdot K^{-1}$)
16	U-value of the roof ($W \cdot m^{-2} \cdot K^{-1}$)
17	U-value of the windows ($W \cdot m^{-2} \cdot K^{-1}$)
18	Air exchange rate (h^{-1})
19	Occupancy density ($people \cdot m^{-2}$)
20	Lighting power density ($W \cdot m^{-2}$)
21	Equipment power density ($W \cdot m^{-2}$)
22	Daily operating time of the heating system (h)
23	Daily operating time of the cooling system (h)

Variabili numeriche presentate come "*additional data*"

#	Variable name
24	Total heating power (kW)
25	DHW system power (kW)
26	Total cooling power (kW)
27	Temperature of DHW (°C)

Variabili numeriche che vengono sottoposte ad analisi statistica ma non concorrono alla definizione dell'archetipo

#	Variable name
28	Heating efficiency or COP (-)
29	Cooling efficiency or EER (-)
30	Heating system installation year (-)
31	CO_2 emissions ($kg \cdot m^{-2} \cdot year^{-1}$)
32	Non-renewable primary energy use - Heating ($kWh \cdot m^{-2} \cdot year^{-1}$
33	Non-renewable primary energy use - DHW ($kWh \cdot m^{-2} \cdot year^{-1}$)
34	Non-renewable primary energy use - Total ($kWh \cdot m^{-2} \cdot year^{-1}$)
35	Renewable primary energy use - Heating ($kWh \cdot m^{-2} \cdot year^{-1}$)
36	Renewable primary energy use - DHW ($kWh \cdot m^{-2} \cdot year^{-1}$)

* WWR è assunto uguale in tutte le facciate se non sono disponibili dati specifici

Variabili analizzate

Criteri di analisi e restituzione dei risultati nelle *scorecards*

Variabili numeriche:

Vengono calcolati:

- Valore medio
- Mediana
- Deviazione standard (STD)
- Primo e terzo quartile

→ Nelle *scorecards* si riportano tutti i risultati sopra elencati

Variabili categoriche:

Viene calcolata:

- Distribuzione percentuale delle varie voci

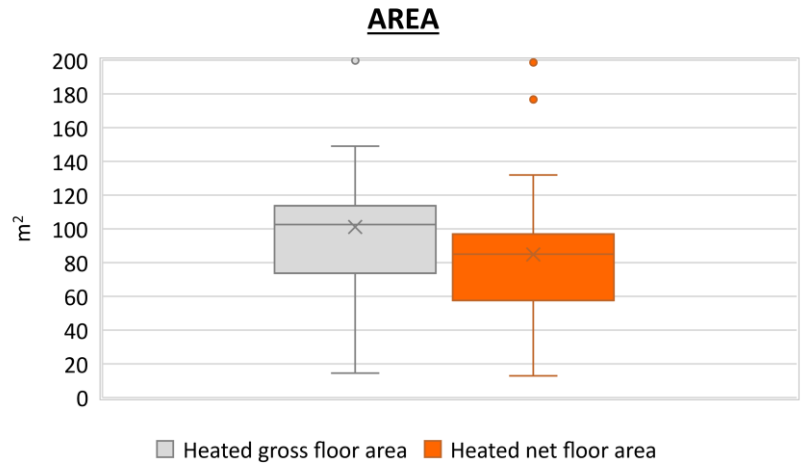
→

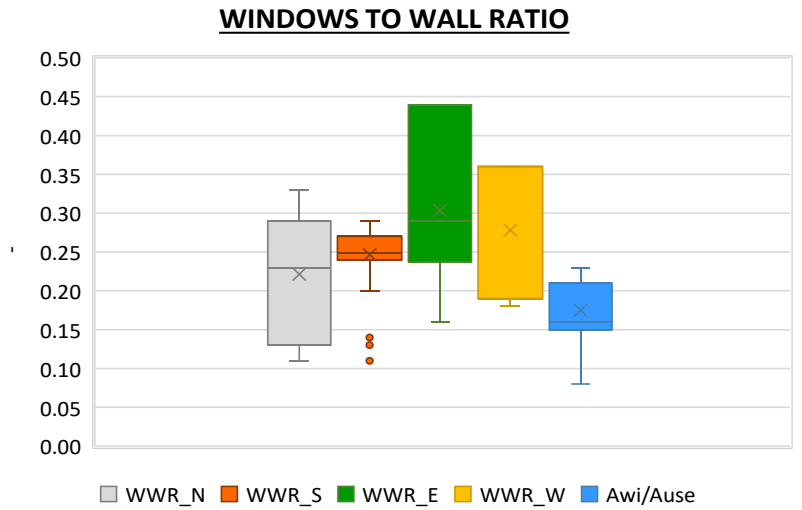
- Nelle *scorecards* si riportano tutte le voci presenti, con la rispettiva percentuale di ricorrenza (arrotondata all'intero)
- Le voci vengono elencate in ordine decrescente

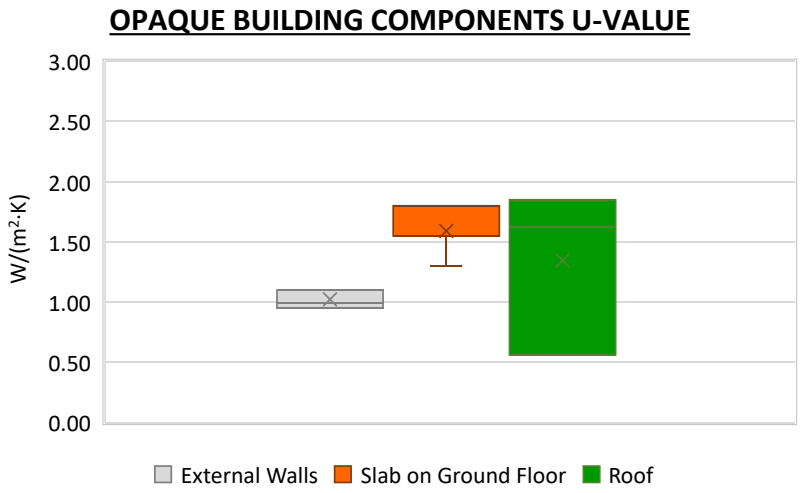
Caratteristiche dell'involucro:
In ciascuna scheda, oltre al range di variazione della trasmittanza termica, si riporterà una sintetica descrizione tipologica (e.g., "*non-insulated hollow brick wall*") richiamando il codice della corrispondente struttura descritta nella UNI/TR 11552:2014).

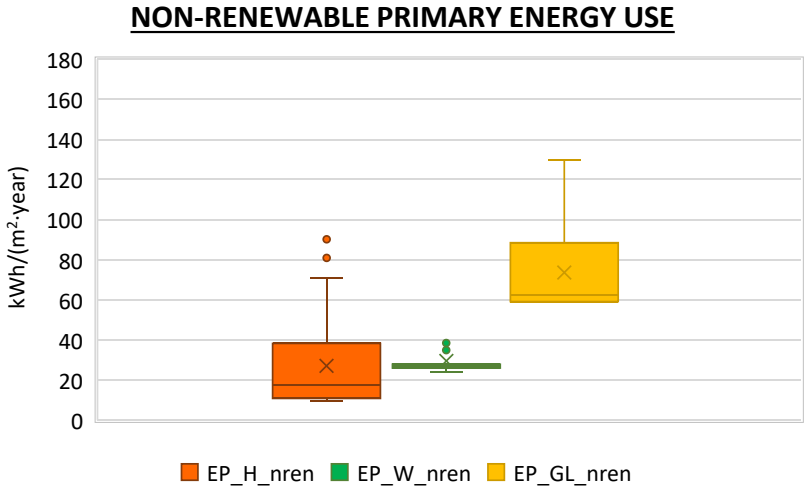
Variabili analizzate

Modalità di rappresentazione: boxplot delle variabili numeriche









Analisi e filtraggio dati

Data cleaning e quality check

- Se è presente ≤ 1 errore: eliminare il singolo valore
- Se è presente > 1 errore: eliminare intero record

Per evitare che il database analizzato contenga valori errati, sono stati eseguiti alcuni controlli:

Variabili numeriche:

- Volume lordo / superficie = Altezza ± 10 cm
- Rapporto volume netto / lordo = 0,55 – 0,85
- *Compactness ratio* (S/V) = 0,2 – 1,2 m^{-1}
- *Windows-to-wall ratio* (WWR) < 1
- U tetto / pavimento < 3,0 $W \cdot m^{-2} \cdot K^{-1}$
- U muri perimetrali < 2,8 $W \cdot m^{-2} \cdot K^{-1}$
- U serramenti = 0,7 – 6,5 $W \cdot m^{-2} \cdot K^{-1}$
- Tasso di infiltrazione > 0,25 h^{-1}

Variabili categoriche:

- Se "Tipo di impianto di riscaldamento" è "assente", anche tutte le altre voci corrispondenti ("Tipo di generatore di calore", "Terminale emissione", "Potenza termica totale", "COP / rendimento") devono essere nulle!
- Se "Tipo di impianto di raffrescamento" è "assente", anche tutte le altre voci corrispondenti ("Terminale emissione", "Potenza di raffreddamento") devono essere nulle!
- Se "Generatore ACS" è "assente", allora "Potenza impianto ACS" = 0 (o campo vuoto)!

Identificazione degli archetipi

Struttura del codice identificativo

Ciascun archetipo è identificato tramite un codice costituito da 5 identificativi: **ID1_ID2_ID3_ID4_ID5**

- **ID1 = uso dell'edificio**
  - RES = Residenziale
  - OFF = Uffici
  - EDUC = Scuole
  - COMM = Commerciale
  - CATR = Ristorazione
- **ID2 = tipo di edificio**
  - APPBLOCK = blocchi di appartamenti
  - SINGLE = singoli appartamenti
  - TEMP = alloggi temporanei
  - BLDGS = intero edificio residenziale
  - DEPT = centro commerciale
- **ID3 = periodo di costruzione**
  - 1961-1970 = dal 1961 al 1970
  - -1900 = prima del 1900
  - 2005- = dopo il 2005
- **ID4 = zona climatica**
  - B
  - C
  - D
  - E
  - F
- **ID5 = area geografica**
  - SIC = Sicilia
  - CAL = Calabria
  - LOM = Lombardia
  - PIE = Piemonte
  - …
  - ITA = territorio nazionale

La struttura delle scorecards

Descrizione di una scheda tipo RESIDENZIALE (1/4)

URBEM

Numero di **unità analizzate** (≥ 5)

Region:	Sicily		**Archetype code:** RES_APPBLOCK_ 1961-1970_B_SIC
Building category:	Residential buildings – Apartments (in multifamily blocks)		
Period of construction:	1961-1970		
Climatic zone:	B	**Number of records:** 92	

Description (the codes associated with walls and slabs refer to the structures described in UNI/TR 11552:2014):
External walls: double layer of hollow bricks (8 cm + 12 cm) with uninsulated air gap (cod. MCV01).
Roof slabs: reinforced brick-concrete slab (22 cm) plus uninsulated concrete screed (4 cm) (cod. SOL04)

Data sources:
Survey data (40%)
Expert assumptions (35%)
Municipal database (11%)
Others (14%) #

	Data	Symbol	Unit of measure	Mean value	Standard deviation	Q1 (first quartile)	Median value	Q3 (third quartile)
BUILDING GEOMETRY	Number of floors	n_f	-	7.63	2.11	6.00	6.00	7.00
	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	-	-	-	-	-
	Heated gross volume	$V_{H,g}$	m^3	-	-	-	-	-
	Heated net volume	$V_{H,n}$	m^3	-	-	-	-	-
	Compactness ratio	$A_{env}/V_{H,g}$	m^{-1}	0.38	0.15	0.27	0.33	0.39
	WWR – North orientation	WWR_N	-	0.22	0.08	0.13	0.23	0.29
	WWR – South orientation	WWR_S	-	0.25	0.03	0.24	0.25	0.27
	WWR – East orientation	WWR_E	-	0.27	0.12	0.20	0.29	0.36
	WWR – West orientation	WWR_W	-	0.18	0.04	0.13	0.22	0.22
	Window to useful floor area ratio	A_w/A_{use}	-	0.17	0.04	0.15	0.16	0.21

Periodi di costruzione

1850-1930	1971-1980
1931-1940	1981-1990
1941-1950	1991-2000
1951-1960	2001-2010
1961-1970	2011-2020

ENVELOPE	Roof type	Reinforced brick-concrete slab: 100%						
	U-value of the roof	$U_{f,up}$	W/(m²·K)	1.34	0.60	0.56	1.62	1.85
	External walls type	Hollow brick masonry: 100%						
	U-value of the wall	U_{wl}	W/(m²·K)	1.02	0.07	0.95	0.99	1.10
	Slab on ground floor type	Reinforced brick-concrete slab: 100%						
	U-value of the floor	$U_{f,bw}$	W/(m²·K)	1.55	0.00	1.55	1.55	1.55
	Windows type	Single glazing, aluminium frame: 50%, Double glazing, aluminium frame with thermal break: 44%, Double glazing, PVC frame: 3%, Double glazing, aluminium frame, no thermal break: 3%						
	U-value of the windows	U_W	W/(m²·K)	4.70	1.18	3.60	4.30	5.92
	Shading system type	Shutter: 100%						
GAINS and VENTILATION	Occupancy density *	O_C	person/m²	UNI EN 16798-1 - Table A.19				
	Lighting power density *	W_L	W/m²	UNI EN 16798-1 - A.8.3				
	Equipment power density *	W_A	W/m²	UNI EN 16798-1 - A.8.3				
	Type of ventilation	Natural: 100%						
	Air exchange rate *	n	h^{-1}	0.30	0.00	0.30	0.30	0.30
THERMAL SYSTEMS	Heating system type	Autonomous: 72%, Absent: 28%						
	Heating generator	Traditional boiler: 68%, Air source heat pump: 32%						
	Daily operating time of the heating system *	t_H	h	8.00	0.00	8.00	8.00	8.00
	Energy carrier	Natural gas: 68%, Electricity: 32%						
	Heating emission sub-system	Radiators: 68%, Fan coil: 32%						
	Cooling system type	Air-cooled chiller: 70%, Absent: 30%						
	Daily operating time of the cooling system *	t_C	h	8.00	0.00	8.00	8.00	8.00
	Cooling emission sub-system	Fan coil: 100%						
	DHW system type	Autonomous - coupled with heating: 50%, Autonomous - detached from heating: 50%						
	DHW generator	Natural gas boiler: 52%, Electric boiler: 48%						

Standards (13%), Simulation (1%).
* These values were not available in the considered sources, and are thus derived from UNI EN Standards

Pagina 1:

- **Dati identificativi e fonti utilizzate**
- Dati geometrici riferiti all'intero edificio

Others = standards (13%), simulazioni (1%)

La struttura delle scorecards

Descrizione di una scheda tipo RESIDENZIALE (1/4)

URBEM

Urban Reference Buildings for Energy Modelling

Region:	Sicily		**Archetype code:** RES_APPBLOCK_ 1961-1970_B_SIC
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Period of construction:	1961-1970		
Climatic zone:	B	**Number of records:** 92	
Description (the codes associated with walls and slabs refer to the structures described in UNI/TR 11552:2014): External walls: double layer of hollow bricks (8 cm + 12 cm) with uninsulated air gap (cod. MCV01). Roof slabs: reinforced brick-concrete slab (22 cm) plus uninsulated concrete screed (4 cm) (cod. SOL04)			**Data sources:** Survey data (40%) Expert assumptions (35%) Municipal database (11%) Others (14%) #

	Data	Symbol	Unit of measure	Mean value	Standard deviation	Q1 (first quartile)	Median value	Q3 (third quartile)
BUILDING GEOMETRY	Number of floors	n_f	-	7.63	2.11	6.00	6.00	7.00
	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	-	-	-	-	-
	Heated gross volume	$V_{H,g}$	m^3	-	-	-	-	-
	Heated net volume	$V_{H,n}$	m^3	-	-	-	-	-
	Compactness ratio	$A_{env}/V_{H,g}$	m^{-1}	0.38	0.15	0.27	0.33	0.39
	WWR – North orientation	WWR_N	-	0.22	0.08	0.13	0.23	0.29
	WWR – South orientation	WWR_S	-	0.25	0.03	0.24	0.25	0.27
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	WWR – West orientation	WWR_W	-	0.18	0.04	0.13	0.22	0.22
	Window to useful floor area ratio	A_{w}/A_{use}	-	0.17	0.04	0.15	0.16	0.21

ENVELOPE	Roof type	Reinforced brick-concrete slab: 100%						
	U-value of the roof	$U_{f,up}$	W/(m²·K)	1.34	0.60	0.56	1.62	1.85
	External walls type	Hollow brick masonry: 100%						
	U-value of the wall	U_{wl}	W/(m²·K)	1.02	0.07	0.95	0.99	1.10
	Slab on ground floor type	Reinforced brick-concrete slab: 100%						
	U-value of the floor	$U_{f,low}$	W/(m²·K)	1.55	0.00	1.55	1.55	1.55
	Windows type	Single glazing, aluminium frame: 50%, Double glazing, aluminium frame with thermal break: 44%, Double glazing, PVC frame: 3%, Double glazing, aluminium frame, no thermal break: 3%						
	U-value of the windows	U_W	W/(m²·K)	4.70	1.18	3.60	4.30	5.92
	Shading system type	Shutter: 100%						
GAINS and VENTILATION	Occupancy density *	O_C	person/m²	UNI EN 16798-1 - Table A.19				
	Lighting power density *	W_L	W/m²	UNI EN 16798-1 - A.8.3				
	Equipment power density *	W_A	W/m²	UNI EN 16798-1 - A.8.3				
	Type of ventilation	Natural: 100%						
	Air exchange rate *	n	h^{-1}	0.30	0.00	0.30	0.30	0.30
THERMAL SYSTEMS	Heating system type	Autonomous: 72%, Absent: 28%						
	Heating generator	Traditional boiler: 68%, Air source heat pump: 32%						
	Daily operating time of the heating system *	t_H	h	8.00	0.00	8.00	8.00	8.00
	Energy carrier	Natural gas: 68%, Electricity: 32%						
	Heating emission sub-system	Radiators: 68%, Fan coil: 32%						
	Cooling system type	Air-cooled chiller: 70%, Absent: 30%						
	Daily operating time of the cooling system *	t_C	h	8.00	0.00	8.00	8.00	8.00
	Cooling emission sub-system	Fan coil: 100%						
	DHW system type	Autonomous - coupled with heating: 50%, Autonomous - detached from heating: 50%						
	DHW generator	Natural gas boiler: 52%, Electric boiler: 48%						

Standards (13%), Simulation (1%).
* These values were not available in the considered sources, and are thus derived from UNI EN Standards

Pagina 1:

- Dati identificativi e fonti utilizzate
- **Dati geometrici riferiti all'intero edificio**

La struttura delle scorecards

Descrizione di una scheda tipo RESIDENZIALE (1/4)

URBEM

Riferimento a **UNI/TR 11552:2014**

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Climatic zone:	B	**Number of records:** 92	
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	Data	Symbol	Unit of measure	Mean value	Standard deviation	Q1 (first quartile)	Median value	Q3 (third quartile)
BUILDING GEOMETRY	Number of floors	n_f	-	7.63	2.11	6.00	6.00	7.00
	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	-	-	-	-	-
	Heated gross volume	$V_{H,g}$	m^3	-	-	-	-	-
	Heated net volume	$V_{H,n}$	m^3	-	-	-	-	-
	Compactness ratio	$A_{env}/V_{H,g}$	m^{-1}	0.38	0.15	0.27	0.33	0.39
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	WWR – West orientation	WWR_W	-	0.18	0.04	0.13	0.22	0.22
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	Cooling system type	Air-cooled chiller: 70%, Absent: 30%						
	Daily operating time of the cooling system *	t_C	h	8.00	0.00	8.00	8.00	8.00
	Cooling emission sub-system	Fan coil: 100%						
	DHW system type	Autonomous - coupled with heating: 50%, Autonomous - detached from heating: 50%						
	DHW generator	Natural gas boiler: 52%, Electric boiler: 48%						

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Pagina 1:

- **Dati relativi alle prestazioni dell'involucro**
- Apporti gratuiti e ventilazione

La struttura delle scorecards

Descrizione di una scheda tipo RESIDENZIALE (pagina 1/4)

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	Heated gross floor area	$A_{H,g}$	m^2	-	-	-	-	-
	Heated net floor area	$A_{H,n}$	m^2	-	-	-	-	-
	Heated gross volume	$V_{H,g}$	m^3	-	-	-	-	-
	Heated net volume	$V_{H,n}$	m^3	-	-	-	-	-
	Compactness ratio	$A_{env}/V_{H,g}$	m^{-1}	0.38	0.15	0.27	0.33	0.39
	WWR – North orientation	WWR_N	-	0.22	0.08	0.13	0.23	0.29
	WWR – South orientation	WWR_S	-	0.25	0.03	0.24	0.25	0.27
	WWR – East orientation	WWR_E	-	0.27	0.12	0.20	0.29	0.36
	WWR – West orientation	WWR_W	-	0.18	0.04	0.13	0.22	0.22
	Window to useful floor area ratio	A_{w}/A_{use}	-	0.17	0.04	0.15	0.16	0.21

Riferimento a **UNI EN 16798-1** (Appendice Nazionale)

ENVELOPE	Roof type	Reinforced brick-concrete slab: 100%						
	U-value of the roof	$U_{f,up}$	W/(m²·K)	1.34	0.60	0.56	1.62	1.85
	External walls type	Hollow brick masonry: 100%						
	U-value of the wall	U_{wl}	W/(m²·K)	1.02	0.07	0.95	0.99	1.10
	Slab on ground floor type	Reinforced brick-concrete slab: 100%						
	U-value of the floor	$U_{f,bw}$	W/(m²·K)	1.55	0.00	1.55	1.55	1.55
	Windows type	Single glazing, aluminium frame: 50%, Double glazing, aluminium frame with thermal break: 44%, Double glazing, PVC frame: 3%, Double glazing, aluminium frame, no thermal break: 3%						
	U-value of the windows	U_W	W/(m²·K)	4.70	1.18	3.60	4.30	5.92
	Shading system type	Shutter: 100%						
GAINS and VENTILATION	Occupancy density *	O_C	person/m²	UNI EN 16798-1 - Table A.19				
	Lighting power density *	W_L	W/m²	UNI EN 16798-1 - A.8.3				
	Equipment power density *	W_A	W/m²	UNI EN 16798-1 - A.8.3				
	Type of ventilation	Natural: 100%						
	Air exchange rate *	n	h⁻¹	0.30	0.00	0.30	0.30	0.30
THERMAL SYSTEMS	Heating system type	Autonomous: 72%, Absent: 28%						
	Heating generator	Traditional boiler: 68%, Air source heat pump: 32%						
	Daily operating time of the heating system *	t_H	h	8.00	0.00	8.00	8.00	8.00
	Energy carrier	Natural gas: 68%, Electricity: 32%						
	Heating emission sub-system	Radiators: 68%, Fan coil: 32%						
	Cooling system type	Air-cooled chiller: 70%, Absent: 30%						
	Daily operating time of the cooling system *	t_C	h	8.00	0.00	8.00	8.00	8.00
	Cooling emission sub-system	Fan coil: 100%						
	DHW system type	Autonomous - coupled with heating: 50%, Autonomous - detached from heating: 50%						
	DHW generator	Natural gas boiler: 52%, Electric boiler: 48%						

Standards (13%), Simulation (1%).
* These values were not available in the considered sources, and are thus derived from UNI EN Standards

Pagina 1:

- Dati relativi alle prestazioni dell'involucro
- **Apporti gratuiti e ventilazione**

La struttura delle scorecards

Descrizione di una scheda tipo RESIDENZIALE (pagina 1/4)

URBEM

Urban Reference Buildings for Energy Modelling

Region:	Sicily		**Archetype code:** RES_APPBLOCK_ 1961-1970_B_SIC
Building category:	Residential buildings – Apartments (in multifamily blocks)		
Period of construction:	1961-1970		
Climatic zone:	B	**Number of records:** 92	
Description (the codes associated with walls and slabs refer to the structures described in UNI/TR 11552:2014): External walls: double layer of hollow bricks (8 cm + 12 cm) with uninsulated air gap (cod. MCV01). Roof slabs: reinforced brick-concrete slab (22 cm) plus uninsulated concrete screed (4 cm) (cod. SOL04)			**Data sources:** Survey data (40%) Expert assumptions (35%) Municipal database (11%) Others (14%) #

	Data	Symbol	Unit of measure	Mean value	Standard deviation	Q1 (first quartile)	Median value	Q3 (third quartile)
BUILDING GEOMETRY	Number of floors	n_f	-	7.63	2.11	6.00	6.00	7.00
	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	-	-	-	-	-
	Heated gross volume	$V_{H,g}$	m^3	-	-	-	-	-
	Heated net volume	$V_{H,n}$	m^3	-	-	-	-	-
	Compactness ratio	$A_{env}/V_{H,g}$	m^{-1}	0.38	0.15	0.27	0.33	0.39
	WWR – North orientation	WWR_N	-	0.22	0.08	0.13	0.23	0.29
	WWR – South orientation	WWR_S	-	0.25	0.03	0.24	0.25	0.27
	WWR – East orientation	WWR_E	-	0.27	0.12	0.20	0.29	0.36
	WWR – West orientation	WWR_W	-	0.18	0.04	0.13	0.22	0.22
	Window to useful floor area ratio	A_{w}/A_{use}	-	0.17	0.04	0.15	0.16	0.21

ENVELOPE	Roof type	Reinforced brick-concrete slab: 100%						
	U-value of the roof	U_{flup}	W/(m²·K)	1.34	0.60	0.56	1.62	1.85
	External walls type	Hollow brick masonry: 100%						
	U-value of the wall	U_{wl}	W/(m²·K)	1.02	0.07	0.95	0.99	1.10
	Slab on ground floor type	Reinforced brick-concrete slab: 100%						
	U-value of the floor	$U_{fl,bw}$	W/(m²·K)	1.55	0.00	1.55	1.55	1.55
	Windows type	Single glazing, aluminium frame: 50%, Double glazing, aluminium frame with thermal break: 44%, Double glazing, PVC frame: 3%, Double glazing, aluminium frame, no thermal break: 3%						
	U-value of the windows	U_W	W/(m²·K)	4.70	1.18	3.60	4.30	5.92
	Shading system type	Shutter: 100%						
GAINS and VENTILATION	Occupancy density *	O_C	person/m²	UNI EN 16798-1 - Table A.19				
	Lighting power density *	W_L	W/m²	UNI EN 16798-1 - A.8.3				
	Equipment power density *	W_A	W/m²	UNI EN 16798-1 - A.8.3				
	Type of ventilation	Natural: 100%						
	Air exchange rate *	n	h⁻¹	0.30	0.00	0.30	0.30	0.30
THERMAL SYSTEMS	Heating system type	Autonomous: 72%, Absent: 28%						
	Heating generator	Traditional boiler: 68%, Air source heat pump: 32%						
	Daily operating time of the heating system *	t_H	h	8.00	0.00	8.00	8.00	8.00
	Energy carrier	Natural gas: 68%, Electricity: 32%						
	Heating emission sub-system	Radiators: 68%, Fan coil: 32%						
	Cooling system type	Air-cooled chiller: 70%, Absent: 30%						
	Daily operating time of the cooling system *	t_C	h	8.00	0.00	8.00	8.00	8.00
	Cooling emission sub-system	Fan coil: 100%						
	DHW system type	Autonomous - coupled with heating: 50%, Autonomous - detached from heating: 50%						
	DHW generator	Natural gas boiler: 52%, Electric boiler: 48%						

Standards (13%), Simulation (1%).
* These values were not available in the considered sources, and are thus derived from UNI EN Standards

Pagina 1:

- **Tipi di impianti termici e tempi di utilizzo**
- **Generatori e sistemi di emissione**

La struttura delle scorecards

Descrizione di una **scheda tipo RESIDENZIALE** (pagina 2/4)

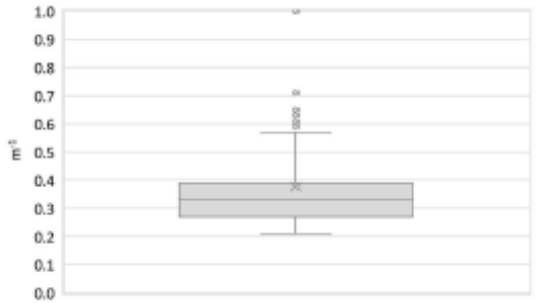
URBEM

Urban Reference Buildings for Energy Modelling

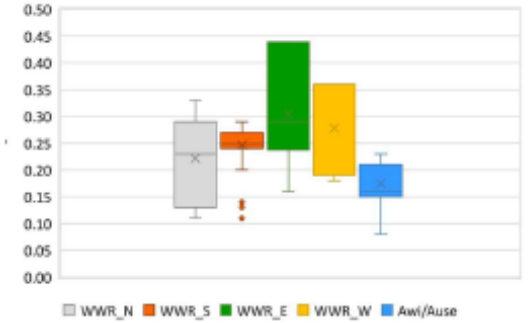
Region:	Sicily			Archetype code:
Building category:	Residential buildings – Apartments (in multifamily blocks)			RES_APPBLOCK_ 1961-1970_B_SIC
Period of construction:	1961-1970			
Climatic zone:	B	Number of records:	92	

Numerical variables – GEOMETRY

COMPACTNESS RATIO

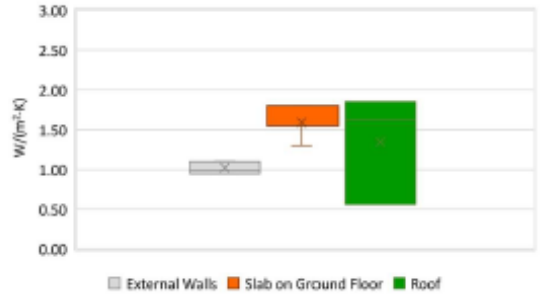


WINDOWS TO WALL RATIO

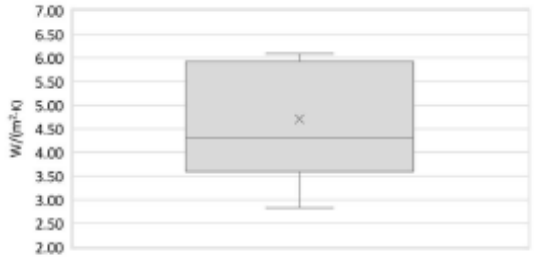


Numerical variables – ENVELOPE

OPAQUE BUILDING COMPONENTS U-VALUE



WINDOWS U-VALUE



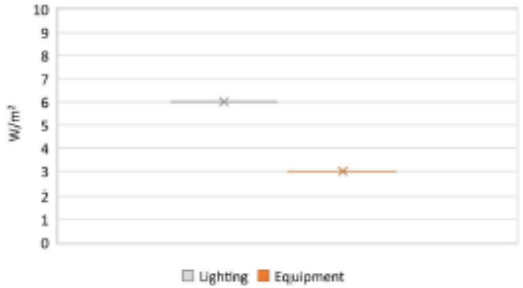
Pagina 2: rappresentazione grafica

Numerical variables – GAINS, VENTILATION and SYSTEMS USAGE

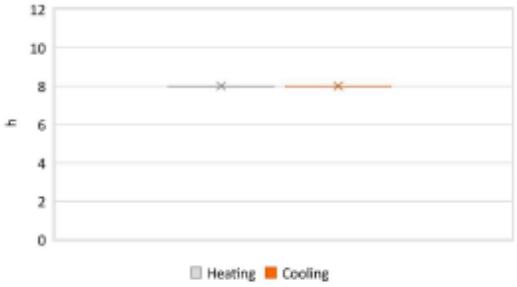
AIR EXCHANGE RATE

OCCUPANCY DENSITY

INTERNAL GAINS POWER DENSITY



DAILY OPERATING TIME



La struttura delle scorecards

Descrizione di una **scheda tipo RESIDENZIALE** (pagina 3/4)

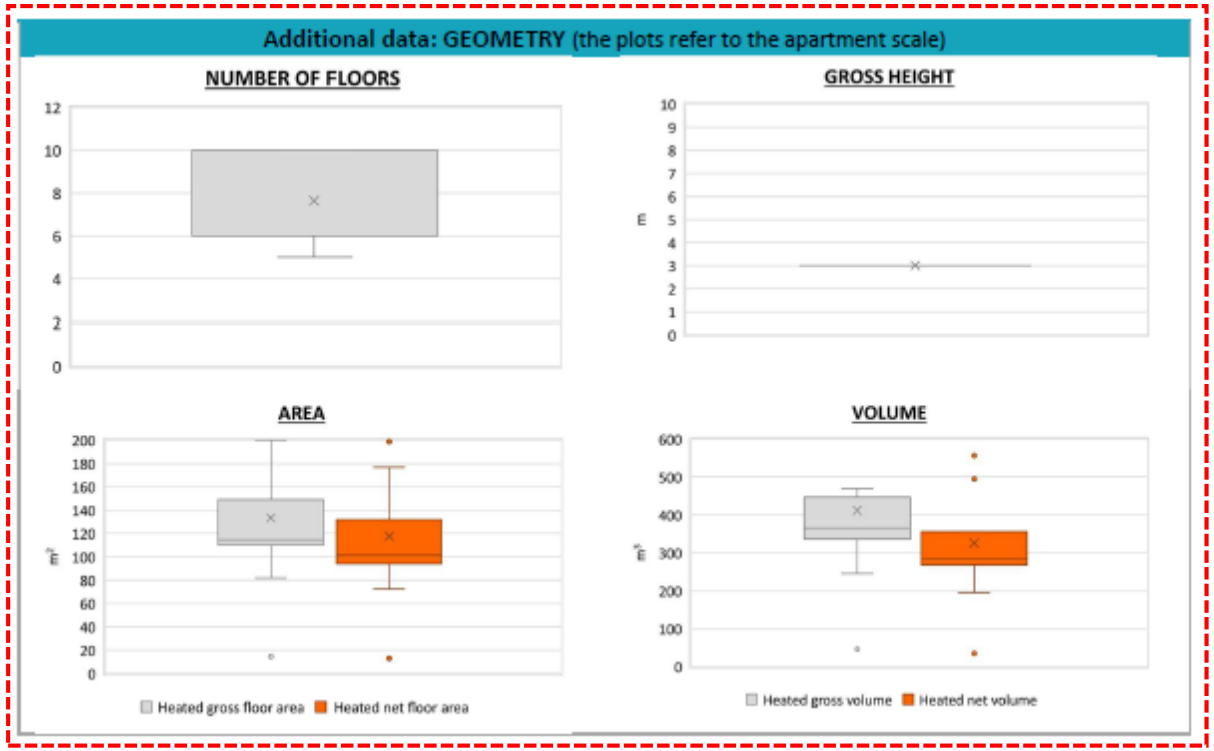
URBEM

Urban Reference Buildings for Energy Modelling

				Archetype code:
Region:	Sicily			RES_APPBLOCK_ 1961-1970_B_SIC
Building category:	Residential buildings – Apartments (in multifamily blocks)			
Period of construction:	1961-1970			
Climatic zone:	B	Number of records:	92	

ADDITIONAL DATA

	Data	Symbol	Unit of measure	Mean value	Standard deviation	Q1 (first quartile)	Median value	Q3 (third quartile)
GEOMETRY: apartments	Inter-storey height	H_n	m	3.01	0.00	3.00	3.00	3.10
	Heated gross floor area	$A_{H,g}$	m²	133.33	45.52	110.00	114.55	149.10
	Heated net floor area	$A_{H,n}$	m²	117.57	40.47	94.00	101.30	131.87
	Heated gross volume	$V_{H,g}$	m³	412.39	143.16	336.60	365.55	447.30
	Heated net volume	$V_{H,n}$	m³	325.81	114.63	267.95	283.64	356.12
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	15.75	7.17	9.20	20.00	20.00
	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	3.48	2.72	2.30	2.30	13.80
	Temperature of DHW	θ_W	°C	40.00	0.00	40.00	40.00	40.00
	DHW system power *	$P_{W,gen}$	kW	10.81	9.45	1.20	10.00	20.00
	* These values refer to the apartment scale							



Pagina 3:

- **dati geometrici riferiti alle singole unità (con rappresentazione grafica)**
- dati addizionali sugli impianti termici

La struttura delle scorecards

Descrizione di una **scheda tipo RESIDENZIALE** (pagina 3/4)

URBEM

Urban Reference Buildings for Energy Modelling

				Archetype code:
Region:	Sicily			RES_APPBLOCK_ 1961-1970_B_SIC
Building category:	Residential buildings – Apartments (in multifamily blocks)			
Period of construction:	1961-1970			
Climatic zone:	B	Number of records:	92	

ADDITIONAL DATA

	Data	Symbol	Unit of measure	Mean value	Standard deviation	Q1 (first quartile)	Median value	Q3 (third quartile)
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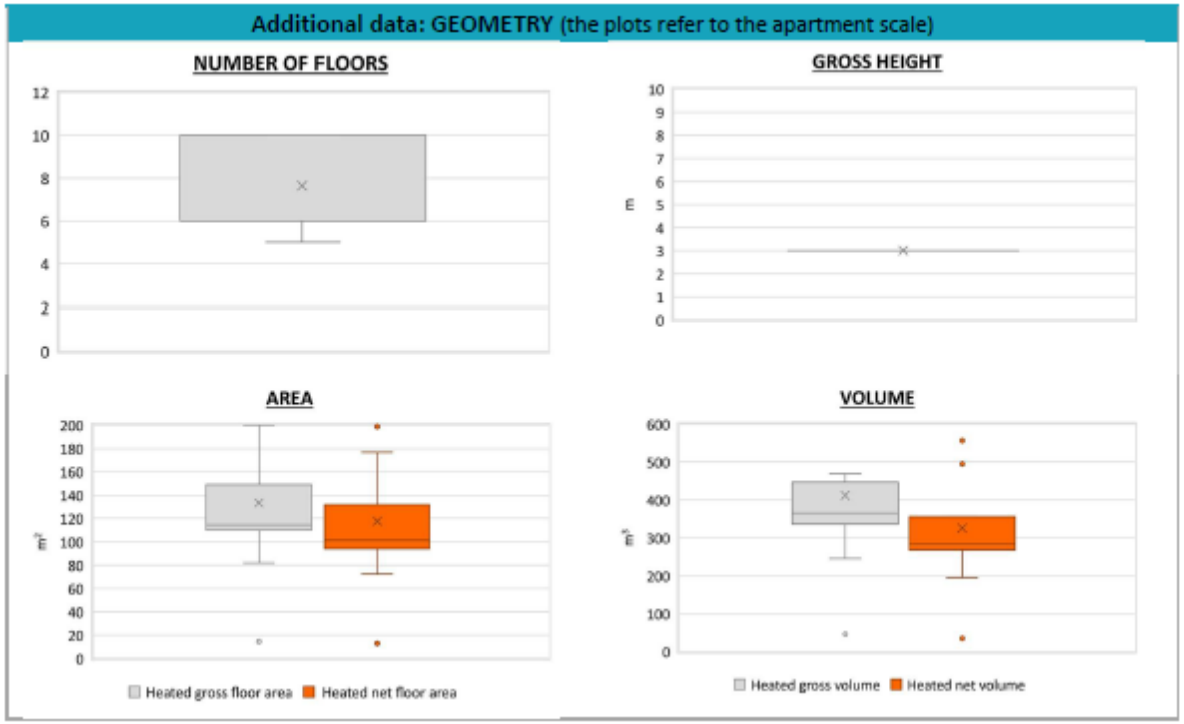
	Heated net floor area	$A_{H,n}$	m²	117.57	40.47	94.00	101.30	131.87
	Heated gross volume	$V_{H,a}$	m³	412.39	143.16	336.60	365.55	447.30
	Heated net volume	$V_{H,n}$	m³	325.81	114.63	267.95	283.64	356.12
THERMAL SYSTEMS	Heating efficiency or *COP*	$\eta_{H,gen}$ or $COP_{H,gen}$	-	This value has to be retrieved from suitable datasheets				
	Total heating power *	$P_{H,gen}$	kW	15.75	7.17	9.20	20.00	20.00
	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	3.48	2.72	2.30	2.30	13.80
	Temperature of DHW	θ_W	°C	40.00	0.00	40.00	40.00	40.00
	DHW system power *	$P_{W,gen}$	kW	10.81	9.45	1.20	10.00	20.00
	* These values refer to the apartment scale							



Pagina 3:

- dati geometrici riferiti alle singole unità (con rappresentazione grafica)
- **dati addizionali sugli impianti termici**

La struttura delle scorecards

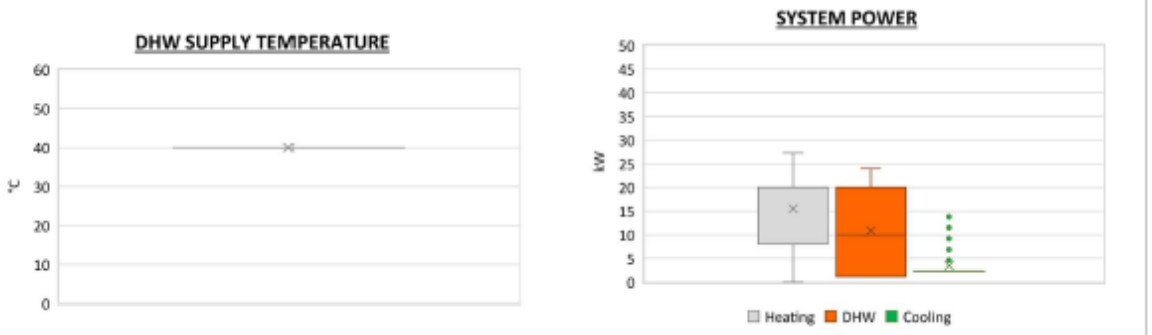
Descrizione di una **scheda tipo RESIDENZIALE** (pagina 4/4)

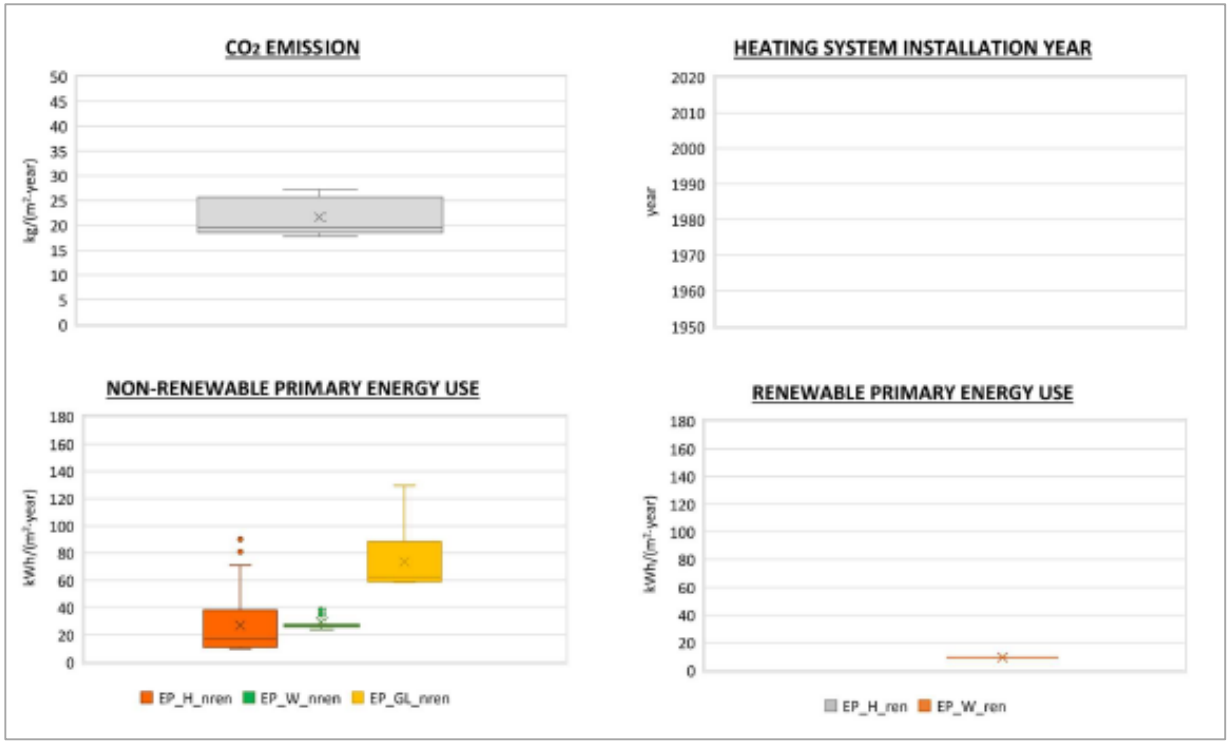
URBEM

Urban Reference Buildings for Energy Modelling

Region:	Sicily			Archetype code:
Building category:	Residential buildings – Apartments (in multifamily blocks)			RES_APPBLOCK_ 1961-1970_B_SIC
Period of construction:	1961-1970			
Climatic zone:	B	Number of records:	92	

Additional data: other numerical variables that are not included in the archetype





Pagina 4:

- **Rappresentazione grafica dati addizionali**
- Rappresentazione grafica prestazioni energetiche

La struttura delle scorecards

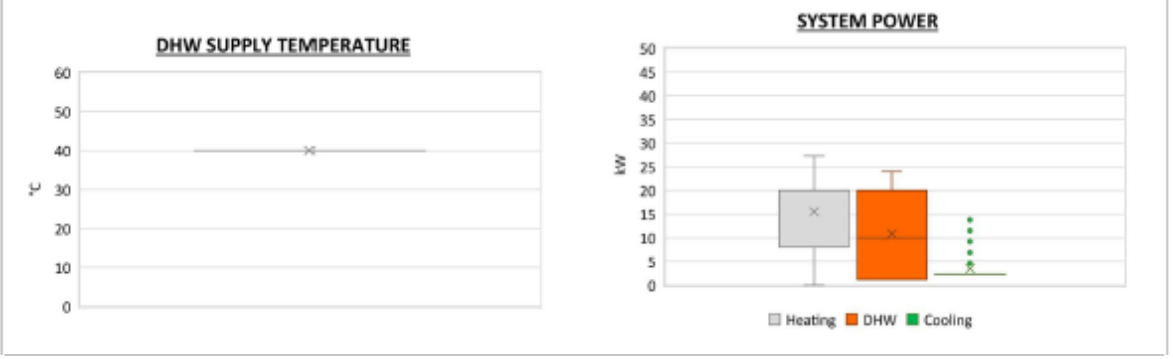
Descrizione di una **scheda tipo RESIDENZIALE** (pagina 4/4)

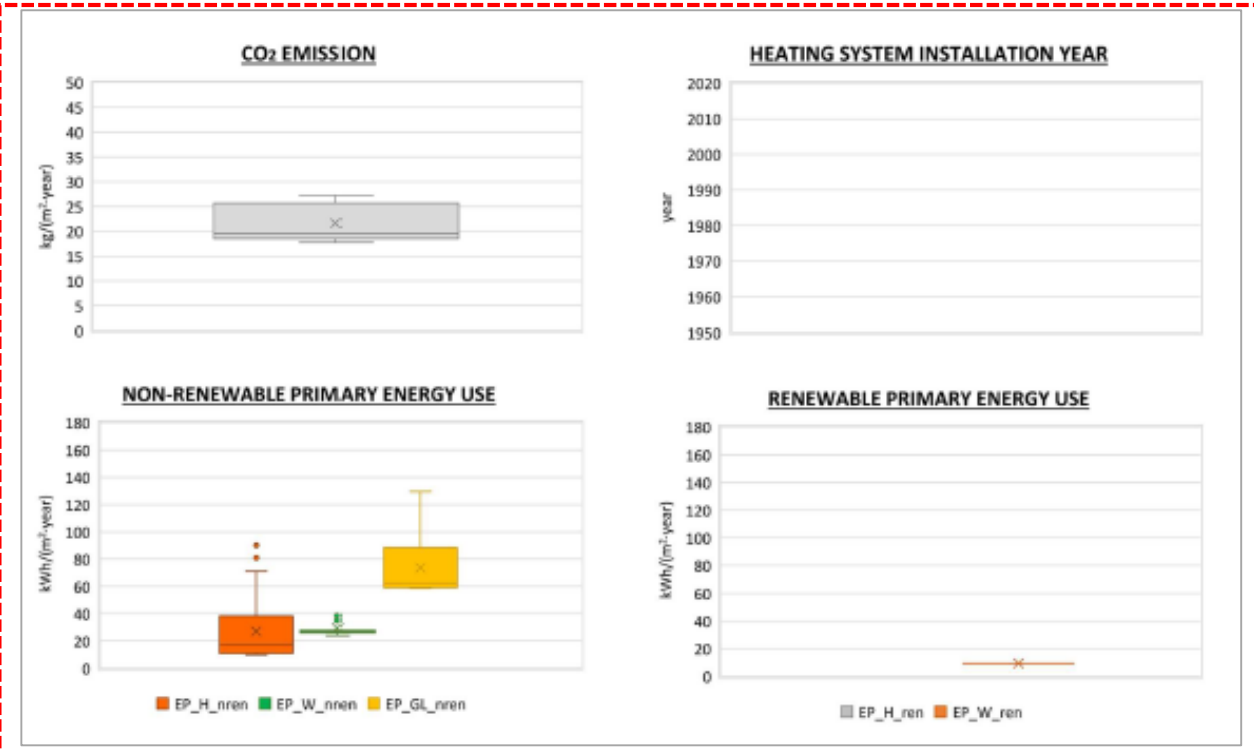
URBEM

Urban Reference Buildings for Energy Modelling

Region:	Sicily			Archetype code:
Building category:	Residential buildings – Apartments (in multifamily blocks)			RES_APPBLOCK_ 1961-1970_B_SIC
Period of construction:	1961-1970			
Climatic zone:	B	Number of records:	92	

Additional data: other numerical variables that are not included in the archetype





Pagina 4:

- Rappresentazione grafica dati addizionali
- **Rappresentazione grafica prestazioni energetiche**

Scorecards prodotte

Distribuzione per regione e per uso dell'edificio

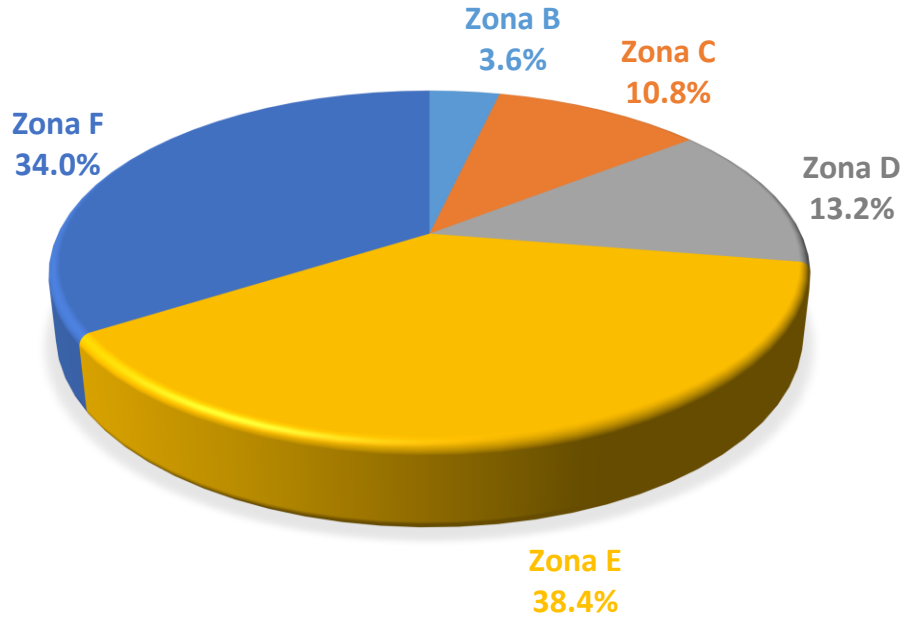
Totale Scorecards
380

	Residenziale	Commerciale	Scuole	Uffici	Ristoranti
Lombardia	8	-	1	3	-
Piemonte	40	-	13	15	-
Valle d'Aosta	32	-	6	7	-
Trentino	60	23	19	21	19
Liguria	81	-	-	-	-
Toscana	4	-	-	-	-
Lazio	2	-	-	-	-
Puglia	-	-	1	-	-
Calabria	18	-	-	-	-
Sicilia	5	1	1	-	-
TOTALE	250	24	41	46	19

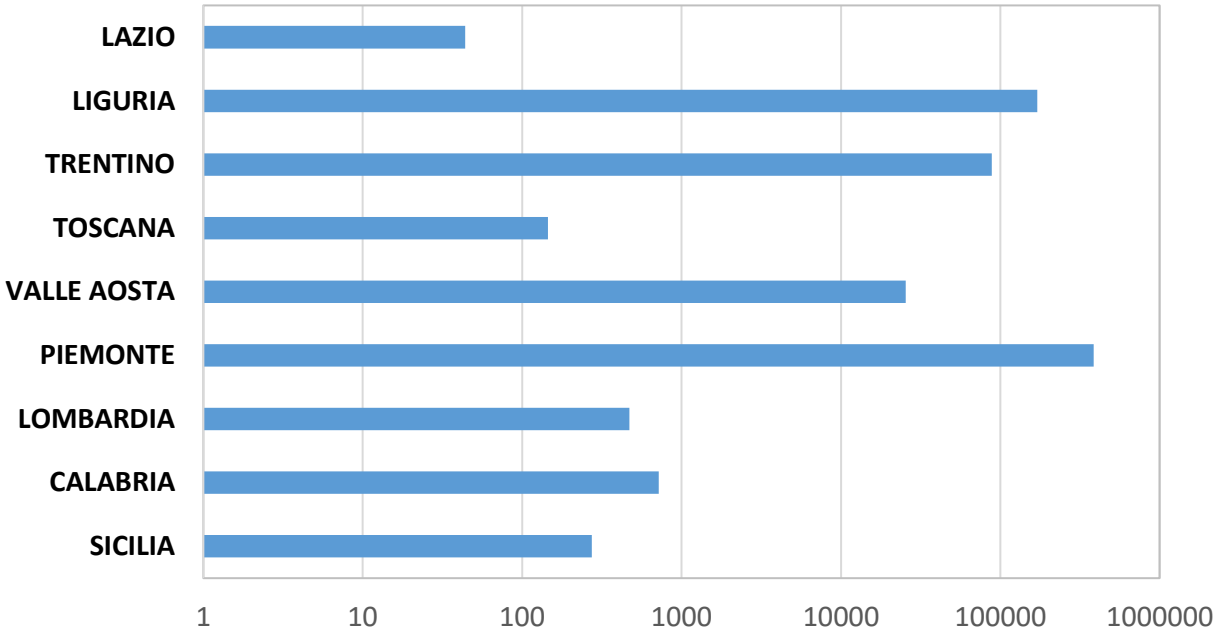
Scorecards prodotte

Rappresentatività: settore RESIDENZIALE

Distribuzione schede per zona climatica



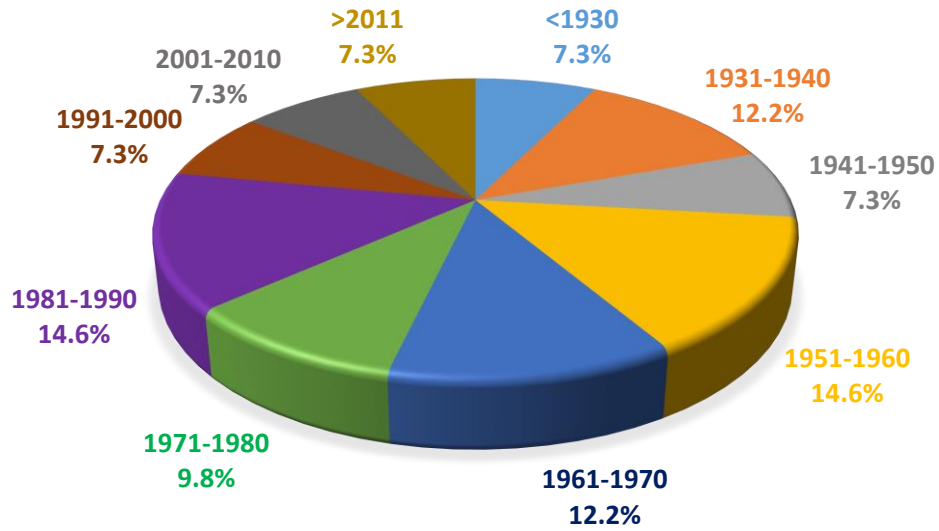
Numero di unità residenziali analizzate



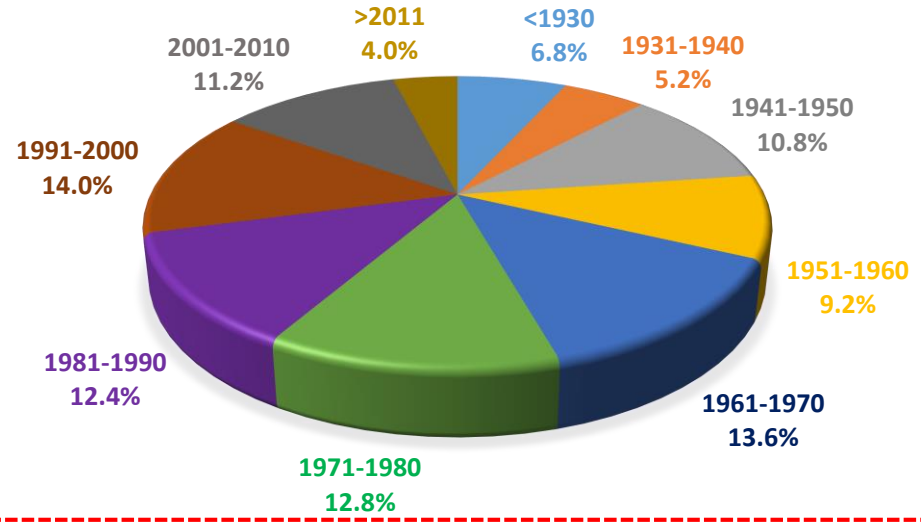
Scorecards prodotte

Rappresentatività: PERIODI di COSTRUZIONE

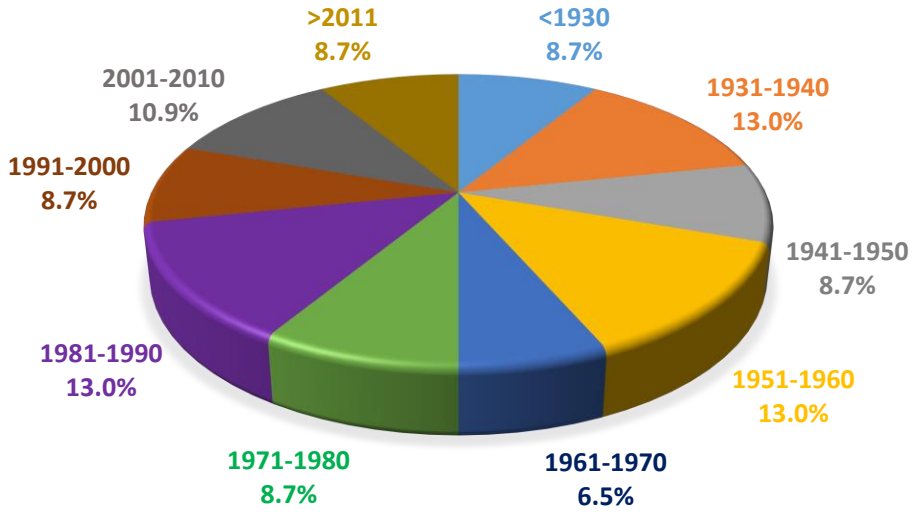
Edifici SCOLASTICI



Edifici RESIDENZIALI



Edifici per UFFICI



Università partner di progetto:

Università partner associate: