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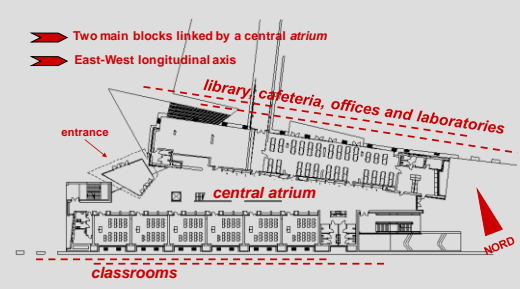

# A ventilative cooling system in a School Building, Imola, Italy

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## Building layout



➤ Two main blocks linked by a central atrium  
 ➤ East-West longitudinal axis

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## Estimate of energy needs

**PRELIMINARY - PHASE 1**

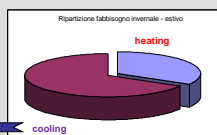
- Focussed simulations of energy strategies and comparison to a benchmark configuration
- Calculation of annual energy needs using simplified tools

**Ripartizione del fabbisogno di riscaldamento**



Data related to the South-West block





**Ripartizione fabbisogno invernale - estivo**



Data related to the South-West block for an occupation period from September to July

attention to ventilation load  
 need to high-performance glazing  
 priority to application of passive cooling systems

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## Estimate of energy needs

**PRELIMINARY - PHASE 2**

- Evaluation of energy-saving benefit related to alternative strategies

	Fabbisogno di energia (kWh/m²-anno)	
	RISCALDAMENTO	RAFFRESCAMENTO
<b>A</b>	13,6	-8,7
<b>B</b>	13,6	-9,9
<b>C</b>	21,1	-41,4
<b>D</b>	21,1	-8,8

**SOLUTION D**  
to optimise yearly energy balance

TECHNOLOGICAL OPTIONS FOR INDOOR CLIMATE CONTROL SYSTEMS

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## Architecture



South view of the School Building

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## Architecture



North view of the School Building

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### Ventilation system

- Hybrid system (controlled natural/mechanical system)
- Controlled natural ventilation (CNV): motorised sensor-driven openings related to IAQ and thermal comfort





**Atrium:**  
 Winter - mechanical  
 Summer - mech. + CNV

**Cafeteria and discontinuous-use spaces:**  
 Winter - mechanical  
 Summer - mechanical

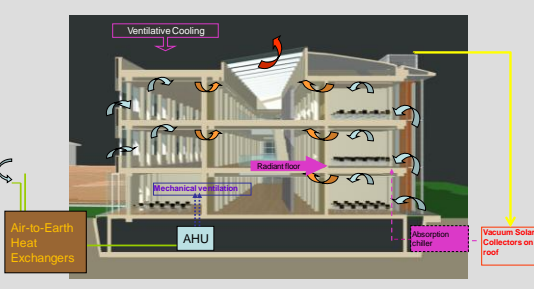
**Classrooms:**  
 Winter - mechanical  
 Summer - mech. (during occupation) + CNV







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### Cooling systems



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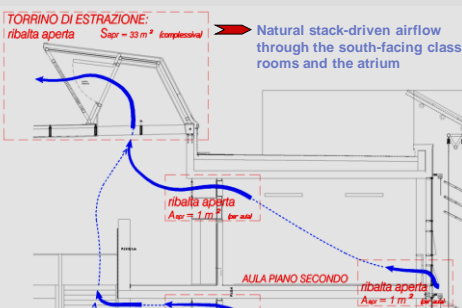





### Ventilative cooling

**TORRINO DI ESTRAZIONE:**  
 ribalta aperta  $S_{ext} = 33 \text{ m}^2$  *imprescindibile* ➤ Natural stack-driven airflow through the south-facing class rooms and the atrium

ribalta aperta  $A_{ext} = 1 \text{ m}^2$  *per aula*

**AULA PIANO SECONDO:**  
 ribalta aperta  $A_{ext} = 1 \text{ m}^2$  *per aula*



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### Ventilative cooling



internal view of the atrium

vented clerestory on the atrium glazed roof

south glazed wall with hopper window openings

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### Isolated suspended-ceiling element integrating lighting, sound adsorption, and air diffusion



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### Isolated suspended-ceiling element integrating lighting, sound adsorption, and air diffusion: laboratory testing of air downdraft distribution



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