INTRODUCTION

- Extremely stringent requirements: airtight and insulating envelopes
- Elevated internal thermal gains

Morphological analysis:
The influence of the shape on the thermal demand results negligible if compared with potential reduction deriving from the use of a proper low energy strategy
Different nature of the relation between heating and cooling demand and the shape

Increased need for cooling

HEATING Demand

COOLING Demand

Total demand
- Is the shape freer?

- On which canons is based the aesthetic of the project and the definition of the appropriate shape?

- What is the need for cooling suggesting?
INTRODUCTION

- Heating and cooling degree hours
- Szokolay. **Potential of strategy** - increase in the number of hours spent within the comfort zone of each month (defined using the CPZ – control potential zone).

- Maximization of solar heat gain and minimization of thermal losses

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**Oslo, (59 55° N, 10 45 E)**

1. Passive Solar Heating
2. Thermal Mass
   - Thermal Mass + Night Purge Ventilation
   - Natural Ventilation
   - Direct Evaporative Cooling
   - Indirect Evaporative Cooling
   - Solar Shading

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**CLIMATE/COMFORT** - The basis of sustainable design

- Maximization of solar heat gain and minimization of thermal losses
CLIMATE/COMFORT
The basis of sustainable design

INTRODUCTION

- Interior: comfort; internal thermal loads
- The skin: climatic moderator; technological development
- Exterior: climate change

- Affecting the traditional approach for the definition of the appropriate strategy to adopt
- Altering the potential of the different strategies
The basis of sustainable design

- A certain grade of uncertainty is arisen by climate change predictions
- Significant increase in the mean temperature and precipitation
- OSL-CPH, Less rigid winters and longer warm seasons

Source: RegClim
INTRODUCTION

- Significantly lower number of HDH but not cooling ones
- Longer overheated period
- Relatively increased potential of the strategies for cooling and natural ventilation.
Deviation between the comfort zones and the distribution of the climatic conditions during the whole year.

- Does not suggest the use of different strategies.
- Results clash empirical experience of increased need for cooling

quantifying the spontaneous shift of temperatures due to the combination of airtight envelopes and elevated internal loads
No HVAC system

Working every day from 8 p.m. to 20 p.m.

Internal gains: 25-14 W/m²
The more stringent the envelope’s technical requirements, the larger the increase of temperature.
• Need of using a different strategy
RESULTS

- Significantly increased number of **cooling degree hours**
- Significantly increased potential of the strategies for cooling and natural ventilation.
In order to define an efficient strategy for coping with the increased cooling demand is necessary to include in the climate/comfort comparison the spontaneous shift of temperatures due to internal gains.

The spontaneous increase of temperatures is strictly related to the specific characteristics of the envelope.

The more stringent the envelope the higher the number of cooling degree hours and the potential of the strategies for cooling and natural ventilation.
- A force strong enough to completely upset the whole architectural concept of the building.
DISCUSSION

- Thermal comparison is split into two different steps: climate-microclimate-comfort

- Is not calling TEK07 and LE requirements into question

- Environmental adaptability to changing conditions and use of the potentially positive shift of temperatures

- The use of in-between spaces
In-between spaces can be as thin as a blade – double skin facades – as thick as plazas – atrium.

Jourda & Perraudin
Akademie Mont Cenis
In-between spaces represent the physical registration of the tension between the form defined from the exterior as climate moderator and the internal functional program.
Gerkan, Mard and partner
Zhongguancun tower
Gerkan, Mard and partner

**CYTS tower**
They are the most evident implication of the dissociation between the environmental and functional performances into different architectural components.
In-between spaces permit the coexistence of different shapes, solving apparent contradictions internal to sustainable design.
The use of in-between spaces is conceptually identified with environmental sensitivity of the form

- The form is not freer but physical expression of the low energy strategy adopted
• The conception of a form bounded to the physical dimensions of the environment starting from the exterior contradict the dogma of modern architecture that wants the form as direct physical expression of the internal functional program

• Leading architectural design of cold climates office buildings into a new complexity

• New inedited architectural scenarios