Examples of Application of Integrated Building Concepts

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Content

- What are Integrated Building Concepts (IBC)?
- Annex 44 State-of-the-art review of IBC
- 3 examples of buildings with IBC
- Lessons learned and the way forward
What are Integrated Building Concepts (IBC)?

“Integrated design solutions where responsive building elements together with service functions are integrated into one system to reach an optimal environmental and cost performance”

- An IBC has elements that **react** to changing internal and external environment
- An IBC has elements that **communicate** with technical systems for control of the energy usage and indoor environment

**External conditions**
- seasonal variations
- diurnal variations
- weather changes

**Internal conditions**
- occupant intervention

**Elements**
- facades
- roofs
- foundation
- storage
- rooms

**Services**
- ventilation
- heating
- cooling

**Performance**
- energy/environment
- cost
Annex 44 State-of-the-art Review of IBC

Content:

- Building Applications
  - climate and context, energy systems, performance (indoor environment, energy, cost), architectural issues, design and construction process, lessons learned.
- Process methods and guidelines
- Design and simulation tools
- Barriers and opportunities for implementation

Annex 44
Integrating Environmentally Responsive Elements in Buildings

B1: Integrated Building Concepts
State-of-the-Art Review Working Report

Editors:
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Examples of Responsive Building Elements

- Active Integrated Facades
- Thermal Mass Activation
- Earth Coupling
- Phase Change Materials
- Breathing Walls
- 21 buildings
- 8 countries
MIVA Office Building, Austria

Passive and active elements live together in perfect harmony.....

Location: Stadl-Paura, Upper Austria
Owner: MIVA
Net conditioned area: 1215 m2

Start of operation: 2003
Architect: Böhm&Frohnwieser
Engineering: AEE INTEC, Gleisdorf

Inger Andresen
MIVA Office Building, Austria

Passive and active elements live together in perfect harmony

- Super insulation and air tightness (passive house)
- Earth coupling: buried pipes coupled to HP
- Thermal mass activation (night ventilation)
- Committed client and integrated design from the start of project
- Energy use: 25% of standard new (measured)
- Construction cost: 7% higher than standard new
The Lowry, UK

Theatre with earth coupled and building integrated ventilation

Location: Salford, UK
Owner: The Lowry Centre Trust
Net conditioned area: 23 930 m²

Start of operation: 2000
Architect: Jim Stirling and Michael Wilford
Engineering: Buro Happold
The Lowry, UK

Theatre with earth coupled and building integrated ventilation

- Concrete earth tube and plenum provides 4°C cooling
- Project was within budget
- Monitoring program to be carried out by Brunel University / Buro Happold
- Control strategies will be optimised
Kanden Office Building, Japan

Low energy skyscraper in hot and humid climate

Location: Okinawa, Japan
Owner: Kanden Industries Inc
Net conditioned area: 60 000 m²
Start of operation: 2005
Architect: Nikken Sekkei Ltd
Engineering: Takenaka etc., Kinden etc., Sanki etc., Sanko etc.
Kanden Office Building, Japan

Low energy skyscraper in hot and humid climate

- "Eco-Frame" columns and beams integrate solar shading and natural ventilation openings
- Thermal mass activation by night flushing
- Automated "climber blinds"
- Task ventilation
- 30% less energy use than conventional building (estimated). To be monitored.
Lessons learned and way forward

- Committed client and dedicated inter-disciplinary cooperation from the start of the project
- Prediction tools need to be improved
- Standardized components need to be developed
- Performance need to be documented by measurements
- Design guidelines
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