form follows energy
the future of energy efficiency
the energy problem
World energy consumption
ca. 450 EJ
World energy consumption
ca. 450 EJ
world energy consumption 2050
ca. 1700 EJ
(shell prediction for 2050 ca. 1350 EJ)
correlation between economic productivity and energy consumption for various countries
buildings and energy
buildings accountable for 50% of world energy demand (transport 25%)
population growth
250 000 people per day
Strategies for increasing energy efficiency?
energy demand in the building sector
total primary energy demand

typical office building
embodied energy

energy efficiency of
double skin building envelopes
Case Study
Braun HQ in Kronberg
Germany

Prof. Brian Cody

Stuttgart, July 2009
case study
fronius office and laboratory building in wels austria
tall buildings
possible contribution to sustainable development of cities
tall buildings and energy efficiency
tall buildings and natural ventilation
mixed-mode-operation
gsw tower, berlin
quantity and quality
mechanical ventilation
ergy efficiency
compared to natural ventilation in office buildings
what is energy efficiency?
Energy efficiency is the relationship between the quality of the internal thermal environment in a building and the quantity of energy consumption required to maintain this environment.
Building environmental and energy performance

Low Energy
Low Comfort

Low Energy
High Comfort

High Energy
Low Comfort

High Energy
High Comfort

Primary Energy Demand kWh/m²a

% of occupied hours uncomfortable

BEEP curve

COST curve
energy efficient architecture
improving energy efficiency
total primary energy demand

typical office building
architect: coop himmelblau

ecb
European Central Bank
headquarters in Frankfurt

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natural ventilation system

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erste campus vienna
site analysis

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erste campus vienna
floor plan zoning
fast-box
fresh air supply terminal
erne campus vienna
energy supply systems
mocape shenzen china
controlled diffuse daylight via grid roof

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hotel schwarzenberg
vienna
low tech high comfort
systems in hotel sector

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Architect: Schneider + Schumacher

Paulinenstraße
Stuttgart
Integrated façade and HVAC systems
form follows energy
form follows energy
relationship between building form and energy efficiency
case studies
low energy housing, berlin
sunbelt offices, san diego
infineon hq, singapore
case studies

great egyptian museum giza
duales system, expo 2000, hannover
research project
sport building of the future, puconci, slovenia

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"ENERGY ROOF"
SECONDARY ROOF CONSTRUCTION PROVIDING SHADE & PRODUCTION OF ENERGY

CONDITIONED SPACES

COURTYARDS

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museum la reunion

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mcur la reunion
natural ventilation of the
exhibition spaces
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Stuttgart, July 2009

Architect: Coop Himmelblau

Media Hub, Singapore
Building as power plant

Notes:
- Cables located on east & west sides to reduce solar load due to low angle sun.

Diagram:
- Floor plan with labels and annotations.
media hub, singapore
building as power plant
SOLAR BLADES

12 500m² PV
2 300 MWh/a

media hub, singapore
building as power plant
media hub, singapore
building as power plant
COLLECTED RAINWATER
USED FOR IRRIGATION AND
TOILET FLUSHING

media hub, singapore
building as power plant
PV MODULES PROVIDE SHADE & ELECTRICITY

media hub, singapore
building as power plant
MULTI LAYERED SKIN PROVIDES CONTACT WITH EXTERNAL ENVIRONMENT

media hub, singapore
building as power plant
övag headquarters
vienna
bank hq in perimeter block development in inner city

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övag headquarters
vienna
conventional solutions
övag headquarters
vienna
development of a new typology
Unterstützung der Windströmungen im Nebenraum und Nutzung dieser zur Nachtsicht ausgerüstet.

Natürliche gesteuerte Atmung als Pufferzone.

Vegetation im Kern zur Verbesserung der Wärmeabstrahlung des Gebäudes.

Daimler HQ
Stuttgart
Konventionelle Bürogebäudetypologie

Intensive „Kombizone“ muss regionalisch geprägt wirken

Kern

Naturliches Beauftragtes Bürogebäude

Zubereitung der Scherflächen (seitige Räume, Durchgangsflächen, Insulan etc.) im Grundriss festgelegt

Diese Grundrisskonfiguration bestimmt eine natürliche Lüftung samtlicher Bürobereiche (konkrete Abmessungen - Einsparungen)

Ausnahme von Aussengebäuden - Extremen Land und Raum

Development of the Typology

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Stuttgart, July 2009
Daimler HQ
energy concept
cultural center zarautz
natural ventilation of a 600 seat concert hall
cultural center zarautz
natural ventilation of a
600 seat concert hall
landesarchiv nrw, duisburg
passive conditioning of the archive spaces
flexibility and adaptability
usage neutral architecture?
climate change
influence on heating and
cooling energy demand
of buildings
natural ventilation of tall buildings
research project
research project
optimal degree of density
energy model of
austria
bigova bay, montenegro
energy masterplan

prof. brian cody
energy masterplan
resources and demand

prof. brian cody

stuttgart, july 2009
energy masterplan
conventional approach
energy masterplan
proposed solution
energy masterplan
urban and building
design solutions
energy masterplan
energy supply and storage systems
structural changes

teleworking and energy efficiency in society