integrated design and detail for sustainable buildings

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ecological footprint of nations
as published in 'Living Planet Report 2008' by World Wildlife Fund

‘the ecological footprint measures humanity’s demand on the biosphere in terms of the area of biologically productive land and sea required to provide the resources we use and to absorb our waste’.

‘in 2005, the globally available biocapacity was 2.1 global hectares per person’
building industry plays a key role

CO₂-emissions (in Germany)

- traffic
- industry
- buildings
- energy production
what does sustainability look like?
gsw headquarters berlin: section details depicting facade construction and venturi wing
thermal mass - summer
photonic center berlin
environmental agency dessau
structure of office „cells“
clear access and internal courtyard
creation of public and private space and opening to public park
contour to site, existing building
environmental agency dessau: ground floor plan showing the agency building with atrium, entry (forum), cafeteria, auditorium and library
environmental agency dessau: diagram depicting brownfield site with contaminated areas in grey (excavation required to a depth of 10 feet)
environmental agency dessau: diagram depicting daytime mechanical and natural air flow in summer
environmental agency dessau: diagram depicting daytime mechanical air flow in winter
environmental agency dessau: details of acoustic elements for exhaust air flow between office and corridor spaces
environmental agency dessau: diagram depicting air flow during nighttime ventilation in summer
environmental agency dessau: diagram depicting daylight quotients in the atrium space
interior facade: sections and plans

1. Spandrel construction from the inside
gypsum board, mounted onto
chipboard 18 mm
laminated timber substructure
in between cellulose fibre insulation 120 mm
gypsum fibre board 19 mm
on timber substructure
in between melamine resin insulation 50 mm
larch cladding with fire-protection coating on all sides

2. Timber-framed window
larch veneered casement window

3. Casement window
larch veneered timber frame with double-glazing
colour strip inside, colour enamelled screen print outside
integrated opening limiter

4. Glare protection
blinds 36 mm wide, manually operated

5. Exterior skin
single sheet safety glazing 8 mm
colour enamelled screen print on outer surface
vertical substructure
all-round channel fixing

6. Internal window sill and reveal
timber board larch veneered

7. Guard rail
stainless steel tube

8. Separation joint between facade elements

9. Fixing of facade elements
bracket with 30 min. fire-rating on half-channel

10. Radiator

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UBA 56 interior facade: plans
federal environmental agency, desceu
interior facade: elevations

1. spandrel
   larch cladding with fire-protection coating on all sides

2. timber-framed window
   larch veneered, casement window

3. casement window
   larch veneered timber frame with double-glazing
   colour strip inside, colour enameled screen print outside

4. exterior skin
   single sheet safety glazing 6 mm
   colour enameled screen print on outer surface
   all-round channel fixing

5. separation joint between facade elements

6. internal window sill and reveal
   timber board, larch veneered

7. guard rail
   stainless steel tube

8. radiator
exterior facade: sections and planes

1. spandrel construction from the inside
gypsum board 50 mm
timber substructure 63 mm,
metal fixing 27 mm,
in between cellulose fibre insulation 60 mm
fibre (wood / concrete) board 20 mm
timber frame of laminated timber
in between cellulose fibre insulation 100 mm
gypsum fibre board 15 mm
substructure and ventilation gap 40 mm
larch cladding with fire-protection coating on inner side

2. timber-framed window
larch veneered double window composed of a
double glazed casement window (internal)
and single leaf security glazing (external)

3. solar protection
blinds 25 mm wide with light-refraction feature
between casement window and security glazing
manually operated

4. ventilation panel for night cooling
timber framed panel 14 mm, larch veneered
moisture protection
with cellulose fibre insulation 70 mm
automatic operation

5. coloured glass panel
construction same as spandrel, but
ventilation gap 52 mm
single sheet safety glazing 10 mm,
colour enamelled on reverse side
held top and bottom by aluminium u-profiles

6. internal window sill and reveal
timber board, larch veneered

7. external window sill
tin-coated copper

8. external sill of sheet metal
tin-coated copper

9. ventilation grille
powder-coated aluminium
free section allows 70% air transmission

10. window reveal
powder-coated steel plate

11. separation joint between facade elements

12. fixing of facade elements
bracket with 30 min. fire-rating on halfen channel

13. radiator
1. spandrel
   larch cladding with fire-protection coating on inner side

2. timber-framed window
   larch veneered double window composed of a
double glazed casement window (internal)
and single leaf security glazing (external)

3. solar protection
   blinds 25 mm wide with light-refraction feature
   between casement window and security glazing
   manually operated

4. mounting element

5. coloured glass panel
   single sheet safety glazing 10 mm,
   held top and bottom by aluminium u-profiles

6. external window sill
   tin-coated copper

7. external sill of sheet metal
   tin-coated copper

8. ventilation grille
   powder-coated aluminium
   free section allows 70% air transmission

9. window reveal
   powder-coated steel plate

10. separation joint between facade elements

11. ventilation panel for night cooling
    timber framed panel 14 mm, larch veneered
    automatic operation

12. cladding
    timber board, larch veneered

13. internal window sill and reveal
    timber board, larch veneered

14. radiator
environmental agency dessau: diagram depicting the infiltration and intensity of noise sources near site (rail, street traffic, industry)
Energieausweis für das UBA Dessau
(Hauptgebäude einschließlich Hörsaal und Bibliothek)

Gesamtbewertung Primärenergiebedarf

Dieses Gebäude
73,1 kWh/(m²a)

Vergleichswert
Neubau
141 kWh/(m²a)

Vergleichswert
modernisierter Altbau
197 kWh/(m²a)

Vergleichswert in Anlehnung an EnEV 2004
Meßtechnik Raum 006-1i, 009-3i
adac headquarters munich
adac headquarters munich: section through foyer space
In den folgenden Grafiken ist das Klima- und Lüftungskonzept von Foyer und ADAC Welt dargestellt.

Abbildung 12: Klima- und Lüftungskonzept Foyer / ADAC Welt

Abbildung 64: CFD Halle – Sommerfall 1: Lufttemperaturen

Abbildung 62: CFD Halle – Winterfall: Oberflächentemperaturen Boden und Fassaden

Abbildung 65: CFD Halle – Sommerfall 1: Empfundene Raumtemperaturen

adac headquarters munich: diagrams depicting air conditioning and ventilation concept and simulation results, foyer
adac headquarters munich: roof elevation, foyer
adac headquarters munich: detail depicting glass roof, ventilation openings and shading elements, foyer
adac headquarters munich: detail depicting glass roof, ventilation openings and shading elements, foyer
adac headquarters munich: detail depicting glass roof, ventilation openings and shading elements, foyer
Total displacements (Utot)

Extrem Utot 11,76 x 10^3 m

ADAC Endzustand Verscheibungen Tunnelröhren

Project description

2D BK107 pfah... 130 22.05.07 Dr. -Ing. Georg Ulrich

Version 8.5.0.1133
ADAC 2D FE Modell mit Lastverteilung

2D BK107 pfahlp... 22.05.2007  Dr. -Ing. Georg Ulrich
adac headquarters munich: diagram depicting the network of thermo-active piles
adac headquarters munich: diagram depicting the network of thermo-active piles
museum brandhorst münchen
daylighting

thermal insulation

 thermo-active construction

soundabsorption and reflection
thermo-active construction
brandhorst museum munich: detail of facade construction
brandhorst museum munich: detail of facade construction
Brandhorst Museum Munich: Detail of facade construction
langelinie
towards 0 carbon-emission

energy consumption
kWh / m²

- BR 2008: 95
- BR 2012: 70
- BR 2015: 50
- Project: 44
- Wind turbines: 35
- BR 2020: 18
- + pv
0-energy-concept

- windturbines (optional)
- external solar shading
- double layered facade
- waste heat recovery
- thermo-active slabs
- photovoltaic panels (optional)
- daylight optimization
- natural ventilation
- sea water cooling
thermo-active slab
thermo-active slab

With little advice from an experienced engineer, the tubes can be mounted on to the reinforcement by a local team.

**Cross Section of Reinforced Concrete Slab**
- with integrated cooling
- cast: separate center level

**Distance Tube** - tube: 150 mm
Pattern: small
hybrid-ventilation
daylighting

fig. 01. 3rd floor plan with daylight factors

fig. 02. 3rd floor section with daylight factors

fig. 03. typical section; artificial lighting concept
daylighting
kfw bank frankfurt
leeward side
negative pressure

windward side
positive pressure

main wind direction south/west

creation of an equalised pressure ring within the cavity of the double facade

natural ventilation within the office space, central air exhaust

direct ventilation of the double facade in summer

kfw bank frankfurt: diagrams depicting the pressure ring facade
1 primary facade
2 vertical element joint
3 vertical sliding window
4 secondary facade
5 shading
6 ventilation opening
7 structural panel

kfw bank frankfurt: detail depicting the pressure ring facade (horizontal section)
1 structural bracket and metal flooring
2 heating unit with air vent
3 shading
4 secondary facade
5 attachment to concrete slab
6 vertical sliding window opening
7 spandrel with acoustic and thermal insulation
8 horizontal element joint

kfw bank frankfurt: detail depicting the pressure ring facade (horizontal section)
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