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The cases in this book are selected from architectures located in tens of countries and regions, representing various techniques. Their design concepts are well explicated with accurate information, rigorous sketches and exquisite photos. From the inspiration source to project site planning, from the design development to construction and completion, you can see the thorough process of each case dissected in a good way here.

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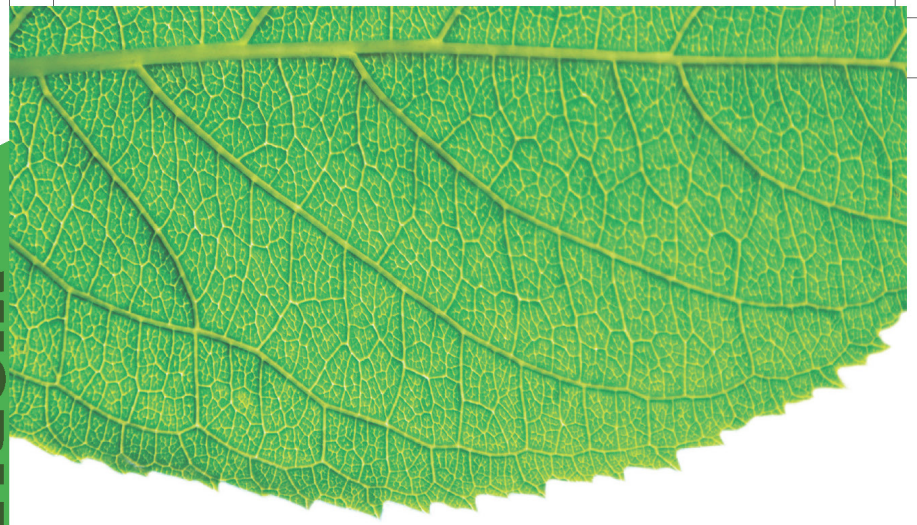
WORLD CLASSIC ECOLOGICAL ARCHITECTURE

Phoenix



# ECO WORLD CLASSIC LOGICAL Architecture

IFENGSPACE · BEIJING EDIT

Phoenix

# PREFACE

"What was has always been. What is has always been. What will be has always been." stated the great American architect Louis I. Kahn. (Louis I. Kahn in Tyng, 1984:127)

Here in the early years of a new and virgin century – a century that will, among other things, witness the end of our abundance of fossil fuels – the society is coming to appreciate Kahn's ecological advocacy in ways which were unimaginable at the end of the postmodern/fossil fuel-dependent 20th century.

How might Kahn's awareness relate to the societal relevance of the ecological element in architecture and the relationship between human and nature?

"What **was** has always been..."
From immemorial time until the discovery of non-renewable fossil fuels, ecologically-sensitive building design was the only architectural method possible. The forms and materials used in building were intimately tied to local resources, and resulted in what is described today as "vernacular" architecture. In vernacular architecture, the impact on the immediate environment is of great consequence; cutting down a tree to use in a nearby structure must only be done after thoughtful consideration of the impact this would have on the local environment. How would this effect natural shading, the microclimate, water inventory and aesthetics in the surrounding area?

"What **is** has always been..."
The discovery and use of fossil fuel in the 19th and 20th centuries drastically changed "what has always been" in most areas of life, including architecture. Global capitalism and an assumed abundance of fossil fuels distorted the historically-balanced relationship between man and nature. Cutting down a tree became simply a means of making a profit. It would be shipped a great distance using fossil fuels to build non-insulated, fossil fuel-powered tract homes where, as if it were something to be ashamed of, the wood would be plastered over and never seen again.

"What **will be** has always been..."
The economic and ecological awakening triggered by the early 21st century's "global green recession" has the potential to bring about a radical change in the relationship between man and nature and will be reflected in architecture.

Today, as social consciousness shifts from assuming resources are unlimited to an appreciation of the importance of energy conservation, people are realizing that the most environmental-friendly building is the building that already exists. 90% of the buildings which will stand in 2030 (the target year of the carbon neutrality challenge) are standing today. Because of the energy required to construct a building, improving existing buildings can significantly reduce the carbon footprint of the built environment.

An analogy can be found in the German-born "cash for clunkers" program where the government paid people to scrap old cars to replace them with gradually more fuel efficient new ones. The problem is that until renewable energy replaces carbon-based energy in automotive manufacturing, the energy required to build a new car exceeds that which would have been used by the older car had it been left on the road.

An alternative to simply junking older cars has been developed by rock music legend Neil Young, who initiated the "Linc-Volt project" which replaced the engine in his 1959 Lincoln Continental with a highly efficient hybrid motor. Not only does such an approach promise significant ecological benefits, it has the potential to bring Detroit back to work, replacing the engines in the majority of the American fossil fuel fleet.

This innovative approach – the creative, adaptive re-use of that which already exists – can serve as a model for rejuvenating the architectural discipline.

In situations, though, where adaptive re-use is not an option, new buildings must be designed with the greatest possible carbon neutrality in mind. This restricts energy use to the construction phase; the building itself should be designed to consume no additional energy over its life cycle.

Because the ecological architectural attempts of the



# PREFACE

20th Century tragically led to stigmatization which prevented them from being embraced by the masses, the principles of pop culture appeal need to be incorporated into post-fossil architecture. A relevant example can be found in the "Heidiklumization of Birkenstockitecture". Birkenstock shoes -- the healthiest in the world – were only embraced by nurses and "tree huggers" until this German company asked Heidi Klum to rethink the marketing of their shoes, leading to an explosion in sales. The underlying sustainability of the shoes was already present but its "surface" – the way it was understood by the public – was redefined with astonishing results.

While living in balance with nature was an undeniable necessity for most of the long span of human culture, this understanding has been lost. To be accepted as a means of overcoming the impending loss of fossil fuel convenience, ecological design must adapt to the expectations of pop culture and package environmentally responsible architecture in a "sexy" way. Existing methods of crafting beauty around fossil fuel dependence must evolve into creating equal or greater appeal around renewable energy design requirements.

It is hard to impact the global intertwining of intercultural capitalism in most areas of life, where the low price of jeans comes with the high carbon footprint resulting from shipping them around the world. Yet, creating zero - energy buildings within the local cultural context using largely regional materials is not rocket science and stands today as the global architectural community's most exciting challenge.

And though the thermally optimized enclosure (surface) of buildings undoubtedly deserves the most energy-saving attention, the architecture's concern for human well-being (substance) needs to be strategically reintegrated into a renewed environmental balance. "Planet – and people – friendliness" is an immensely promising opportunity for the architectural profession. Making a building independent of the power grid is simply the first step in using the unique and comprehensive skills of an architect to make a building's users happy and healthy through the right choice of space and materials.

Such an approach brings architecture full circle: from the ecologically balanced pre-fossil times, through the imbalances of the fossil fuel age, and into the once-again-balanced post-fossil era where successful building design incorporates what "was" and what "is always been" into "what will be".

**Martin Despang**

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# POSTFOSSIL GÖTTINGEN UNIVERSITY KINDERGARTEN

The project of a new postfossil kindergarten for the University of Göttingen is Despang Architekten's most current case study in the sequence of typological prototypes for educational design, as the typology with the biggest potential for societal progression and improvements by means of multi-plication of experienced architectural and ecological qualities through the youngest terrestrial advocates. The area of education, hopefully consequently as well in its built manifestation, has most recently in the USA and Germany been identified as a societal core value which is supported with stimulus funding support.

According to Wikipedia, "Göttingen is for Germany, what Cambridge is for the UK and Yale for the USA, very provincially located, no one ends up there if not for research, studies and the professors, who therefore swear it being the middle of the universe".

To as least as possible sacrifice the flora and fauna of the green campus through a new structure, the project after an investigative analysis and various iterations has been placed next to an existing 1970's dormitory and a fairly new laboratory building. Instrumental in the negotiations was as well the "ordinary prairie dog", who as an endangered species in that area has settled around the site.

**Architectural Design:** Despang Architekten
Dresden, Munich, Hannover Germany + Honolulu / University of Hawaii at Manoa USA
**Architects:** Günther and Martin Despang
**Location:** Göttingen, Germany
**Area:** 512 m²
**Cost:** 1,300,000 €
**Completion Time:** 2010
**Copyright Photographs:** Olaf Baumann, Jochen Stüber
**Energy Consumption Every Year:** 19 kWh / ($m^2$·a)







Regarding the requirements for passive house / postfossil design in that climate zone as orientation (open to the south, closed to the north) and insulation (wrapped all way around) , the building was negotiated with the client and the prairie dogs as a hybrid of landscape and architecture, with the working title of "Dr. Urban and Mr Hide" as the double faced notion of being building to the south and landscape through berming to the west and the north.

The building is accessed from the east and synergistically uses the existing infrastructure around the two existing buildings for the intensification of pedestrian frequency. Opening up the building to this side strategically uses the shading properties of the adjacent dormitory for solar overheating protection in the summer morning hours. In return, the intensive green roof of the "prairie dog kindergarten" secures the balance of the micro climate for the dormitory and the laboratory in preventing the "heat island effect" of a conventional hardscape roof.

In the sense of the understanding of architecture as the spatial expression of event and activity, which only after materializes as form, the aspect of materialization, customized to the specific circumstances, has in all previous typological investigations always been of special importance. Despang Architekten's very first kindergarten answering to an unpredictable demographic development with a steel skeleton with reversible brick skin with mortar less stacked bond, the ILMASI school tailored to the necessity of multi-sensatory addressing of the mentally disabled children with solid wood tectonics, the Ilsede school with a thermally regulative concrete exoskeleton externally and internally as thermal massing filled with bricksand most recently the postfossil kindergarten for the city of Hannover in cellulose insulated wood frame tectonics with further development of the ILMASI Thermowood façade.

The kindergarten in Göttingen is influenced by the sensitivity towards the aspect of thermal mass, resulting in a critical reflection of the previous prototypes on the one hand, on the other by the geographical relocation of the architects besides Munich to the warmer "Elb-Florence" Dresden and the office blocks away from the life / work place of Karl May and synchronized the research platform in Tucson Arizona USA, where the animal world in the green desert over the day hiding underground exemplifies the potential of geothermal cooling for the human being.

## Ecological idea:

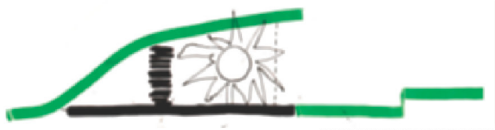
*The site being a flora and fauna rich campus of Germany's most traditional university and the US research platforms of Despang Architekten in Nebraska (home of the sod house) and Arizona (Montezuma Castle) made the architects look into the most indigenous ways of animal and human dwelling in direct interaction with and integration into nature.*

*The result was a hybrid of nature and architecture being hermed to the cold north and summer overheating problematic west orientations and excessively opening to the southern sun and the being entered from the east in sharing the infrastructure of adjacent 4 – to – 6 story buildings.*

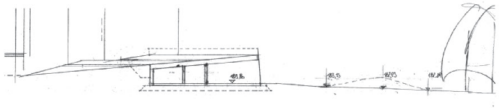
*Being the follow up project of the previous postfossil ecococolbox kindergarten, lacking the natural tree shading that one had, concrete frames in front of the south faced hold movable textile shading which keeps the views into the outdoors unobstructed. The multi-functional frames serve as balustrades and their geometry encourages stack effect cooling of the façade and occupation of the children as they are as deep as the children tall so that they lounge in them.*

*The concrete continues in the inside where it is the left exposed prefabricated construction material, which helps to heat in the winter by storing the solarly harvested energy and cool the building in the summer through flushing it with the cooler night air.*

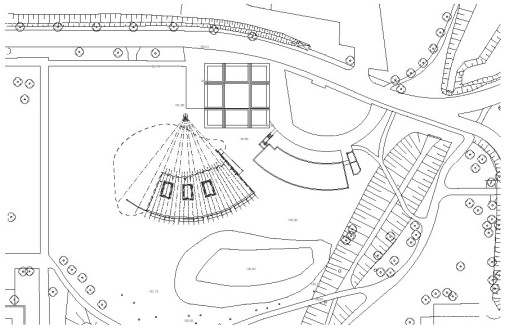
*The extensive green roof over thick insulation helps to thermally comfort the building and the direct neighboring buildings by preventing a heat island effect and offers itself to the children to grow their own vegetables on their building.*



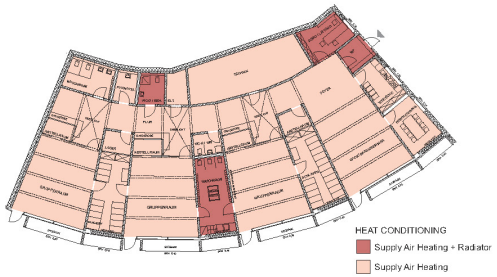
PRECEDENT FRANK LLOYD WRIGHT JACOBS HOUSE II

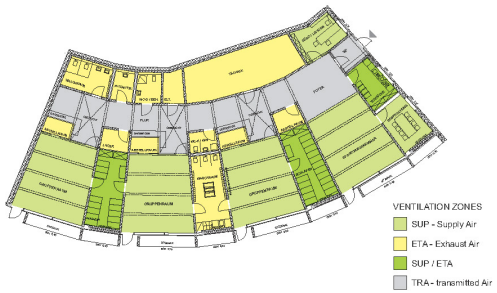


PRELIMINARY NAPKIN SKETCH SECTION



SITE & ROOF PLAN




Le Corbusier's research of the "monol houses" came back to the memory of the architects as his investigation of an ephemeral live in / with nature as the "female house under the cloudy skies", which he researched parallel to the more known "domino house" as the ethereal principle of the "male house under the Mediterranean sun" .

In harmony with the specific external factors the project was supposed to be a building, which acts natural and bioclimatic and besides the existential exposure to the sun feels solid and comfy as thermally self-regulating by the winter-wise solarly harvested and in the summer through night cooling captured energy which it gains, stores and releases in a delayed way.

To make this principal didactically compre-hensible, the architects looked for a tecto-nic system / materiality which with most minimal budgetcreates the most maximized architec-tonical and environmental performance, which was found in a stereotomic prefab concrete system with exposed air distribution ducts.

As a kid of parts the prefabricated walls and ceilings have been assembled on site in a manner that there are no production and very few element joints, which gives the inner surfaces of the walls an amazingly abstract quality, which distinguishes them from the rough cast in place concrete of the pioneering years of the campus.

Light, as the classic element in architecture to make monolithic buildings feel lighter, has been used in form of a sequence of skylights in the hallway to accentuate the entrances to the playrooms as a natural method of wayfinding to optimize orientation and to let the light wash down the concrete and make the concrete appear velvety.

The sequence of rooms is classic in its arrangement regarding the effective zoning and intent to make a virtue out of the given challenge of a tight budget by means of layering of space, which with increasing room





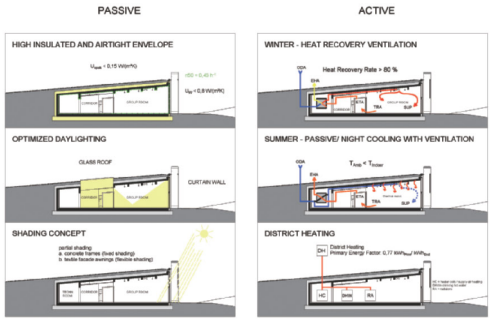


heights beginning with the serving rooms as for Administration, Passive House technology and restrooms, over the connecting linear circulation hallway multi-used as transmitting physical activity space to the served narrow / high sleeping and bathrooms and wide / high "living rooms" which with their floor to ceiling glazing blur the boundaries between inside and outside.

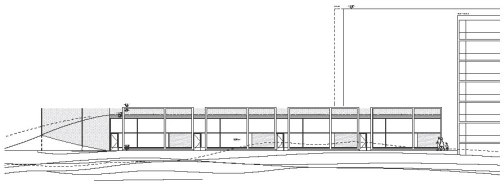
The transitioning between inside and outside is being supported through the extension of the 20 cm thick monolithic concrete walls to the outside, which is framed by the insertion of a top and bottom beam of equal dimension. The elements are multi-functional: seating alcoves at the bottom, balustrades and guardrails at the top and carrier of a dynamic textile shading screen, which mounted flush with the front of the frames are with that spaced from the thermally conditioning triple pane Passive House glazing and which control the summer overheating through stack effect supported cooling with shades down which then still maintain the unobstructed view of the children into their outdoor garden space.

The floor plan arrangement is slightly subtly radial to support the similar dynamic move in section and geometrically helps for most parts with the acoustics in compensating for the hard surfaces of the solar glazing and the thermal massing concrete walls. As additional acoustical support, the ceilings are clad with left natural wood-wool panels.

Wood in form of oiled spruce is the unified material for all the interior insertions. Doors

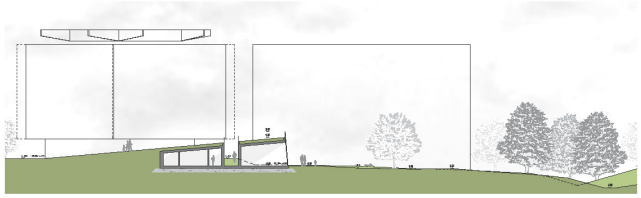



ENERGY DIAGRAM

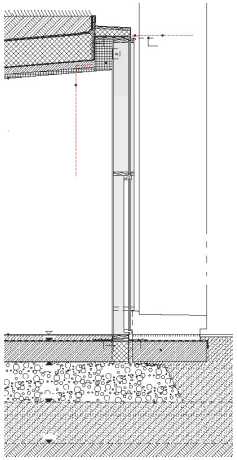


SOUTH ELEVATION

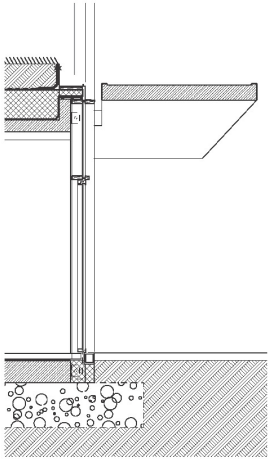
are set in flush with the concrete walls and all the glass touches the concrete in a frameless way to support the notion of a continuous flow of space.



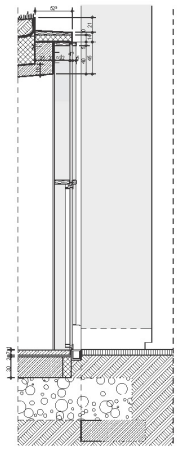
SCHEMATIC SECTION



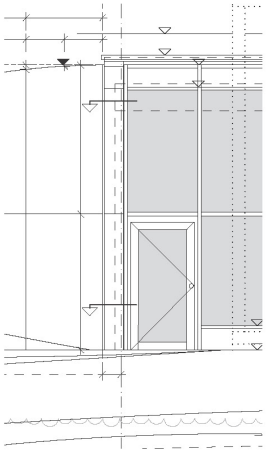
GENERAL SECTION OF SOUTH FAÇADE



ENTRANCE SECTION EAST FAÇADE CANOPY



SECTION SOUTH OF DOOR FAÇADE



DETAILS JOINT OF RETAINING WALL SOUTHEAST FAÇADE

The spaces are grounded on a floor of a new spin of the classic kindergarten floor material of Linoleum, which DLW Armstrong as the vintage manufacturer of the Bauhaus linoleum created the product LinoArt and the chosen model of “Firmament Black” creates the impression of a star sprinkled sky reflecting in a lake at night, on which the colorful individual carpets with child activities feel like creative islands.

In inspiration and interpretation of R.M. Schindler’s “Kings Road House”, all surfaces show their authentic textures and colors without “make-up” to best explain to the child users the different and specific functions of the building components, as the storage of warmth in the winter and coolness in the summer in the monolithic mineral walls, the absorption of noise in the texture of the wood – wool ceilings and the robust yet elastic property of the wood for the openings and wardrobes, all to provide a most neutral background to allow for the most effective celebration of the children’s creativity, represented by their crafted artifacts in variety and diversity of form and color.







The intention and hope was to have all affected creatures experience the new building in the most true sense as a natural and stimulating part of their living environment, foremost the children and their teachers, as well as the prairie dog and the professors on their walks through their universe, the green lung of the campus of the Georg-August- University of Göttingen.

**Passive House Specific Values**

Specific Annual Heating Demand (annual method): 15.0 kWh / (m²a)

Specific Annual DHW Demand (incl. heat losses): 8 kWh / (m²a)

Specific Primary Energy Demand (DHW, heating, auxiliary electricity): 37 kWh/($m^2$a)

Total Specific Primary Energy Demand (DHW, heating, auxiliary electricity, lighting and electrical appliances): 89 kWh/($m^2$a)

Electricity Demand (auxiliary electricity, ventilation, lighting and electrical appliances) : 25 kWh/($m^2$a)

Energetically Effective Air Exchange: 0.44 $h^{-1}$

$n_{50}$ (Pressurization test result) : 0.43 $h^{-1}$

Ventilation Unit with Heat Recovery: Al-ko Therm Kombi 2400-1

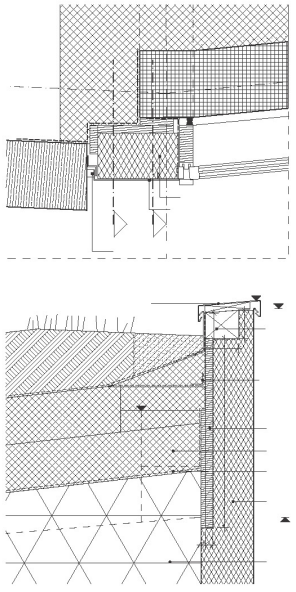
Air Flow Rate: 2230 m³/h

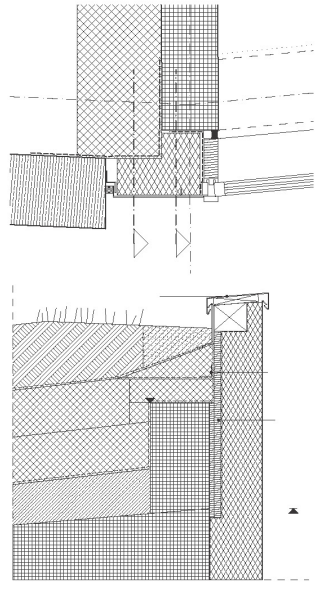
Specific Fan Power: 0.44 W/(m³/h)

Efficiency of Heat Recovery: 80%

Heat Generation: district heating (min. 50/70°C)

Heating Load (eCCPHPP): 13 W/m²





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