

Invited peer reviewed keynote speech / paper presentation (proceedings publication) : “ New Heat Modified Architecture ” 5 th European TMT -Workshop in Dresden / Germany May 2008




5th European TMT-Workshop 2008



2nd INS-Workshop
"Standardisation of TMT"
24th - 25th April 2008 in Dresden





Program 24 – 25 April 2008

Thursday, 24 April – Moderation Dr. W. Scheiding (IHD)

- 13:00 Address of welcome by the director of IHD, Dr.-Ing. S. Tobisch
- 13:15 **State-of-the-art 2008: production, markets, standardisation**
Dr. W. Scheiding (IHD)
- 13:45 **Standards as strategic instrument**
A. Schleifer (DIN)
- 14:15 **Plywood and moulded plywood parts made of thermally modified veneers**
L. Bluethgen, T. Schulz (IHD)
- 14:45 **Moulded plywood products for exterior use made of thermally modified veneers**
I. Avar (OWI)
- 15:15 Coffee break
- 16:00 **ThermoWood: Situation report, ThermoWood concept**
J. Ala-Viikari (Finnish ThermoWood Association)
- 16:30 **Developments in hardwoods, future prospects, realised projects**
H. Mitteramskogler (MIRAKO)
- 17:00 **Experiences from Estonia**
T. Tamm (TreTimber)
- 17:30 End of the first session
- 18:30 Guided walk through Old town
- 19:30 TMT-get-together in the restaurant "Wenzel"

Friday, 25 April – Moderation Dr. W. Scheiding (IHD)

- 09:00 **Introduction of TMT/TexWood Network**
K. Mueller (BTI Dresden)
- 09:15 **Solid wood panels made of thermally modified wood**
A. Weber, D. Krug (IHD)
- 09:45 **Advancements at Stellac process since 2004**
N. N. (Stellac Oy)
- 10:15 **Market introduction of wooden windows made from TMT**
K. Schweitzer (IHD)
- 10:45 Coffee break
- 11:30 **Durability of TMT after 4,5 years field tests**
K. Plaschkies, K. Jacobs (IHD)
- 12:00 **Building and creating with TMT: Progress report of a passive house standard kindergarten**
Prof. M. Despang (Despang Architekten / University of Nebraska USA)
- 12:30 Final discussion
- 13:00 End of the event

Please note that all information is without engagement.

New Thermally Modified Architecture

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Introduction

In contrast to the charming, unconventional "tree hugging" decades ago, the evidence of climate change and the peak of fossil resources presents bioclimatic building design no longer as an option, but an international, intergenerational obligation. The co-authors, Despang and Ellett, with their research and teaching platform at the College of Architecture in Lincoln, Nebraska, USA [2] and additional practice base [1] in Hannover, Germany, will present by means of their own recently completed academic and professional design projects, how two generations of younger "late fossil-age" architects try to avoid the failures of a solely technologically approach of the past, and begin to balance the thin line of archi-/eco-friendliness in their approach to designing an environment for the coming first truly post-fossil generation, distinguishing them as Generation P[ost-fossil]. The academic case study considers post-fossil urban dwelling in the American Mid-West, and the built practice example explores a passive house/no emissions philosophy towards a kindergarten in Germany. The paper presentation will explore the trial and error evolution of challenges, and great potential in viewing a post-fossil future as a generative design inspiration. The audience will be encouraged by the case studies to consider the progressive balance of eco- and archi-friendliness, and TMT as its integral and central tool for a sustainable future.

Analysis

"Sustainability" undoubtedly is the word of the beginning 21st Century, and is therefore also dominating both the global academic and the professional architectural practice as no other "one-word term" before. It is no wonder that it also polarizes the profession as no other subject before. A majority of younger architectural teachers especially see the root of the failure of early eco-architecture sprouting again, where "off the grid" building design is achieved by simply applying engineering knowledge and denying architectural competence.

In commonly revered environmentally "progressive" European countries, this indeed already happens—of course not within the cutting edge avant-garde, but in the dominating mainstream architecture, for "the people." As opposed to real improvements and innovations in many areas, real estate developers in German feed the growing architectural hunger of home-buyers by offering off-the-shelf "passive houses." These examples are, in actuality, service-/volume-optimized Styrofoam boxes, carved out to the south—undoubtedly economical, but arguable in terms of

their overall eco-friendliness, and certainly very questionable in their archi-friendliness.

Architectural education undoubtedly has the responsibility to be the counterpart to the purely profit-driven reality by means of speculative and highly critical investigative research.

Parallel to these innovations making their way into the architectural reality, there also need to be immediate actions, which gives the innovations the necessary time to feed into them. This immediate action architecture also needs to take place on all architectural levels. Whereas to the "higher" architecture bioclimatic innovations already seem to have a more immediate access, in the ordinary realm, limited budgetarian background is used as an excuse to refuse bioclimatic architectural innovation. It is in this prosaic, everyday architectural world, however, that bioclimatic actions would have the most multiplicatorial and societal effect. In the following presentation, the authors will, with one executed and one speculative project, point out how within the ordinary domestic realm, immediate action can be taken which aims to balance on the archi-/eco-friendly edge.

German case study

Despang Architekten over the years has continuously taken public projects as a challenge to critically re-think societal typological stereotypes. A restrictive program and budget is continually seen as a provocation to fight the type-related mediocrity. The first opportunity came with the school for mentally disabled children in Garbsen, Germany, [3] where the client had to be convinced into the unconventional solid



Fig. 1: solid wood school Fig. 2: solid interior Fig. 3: north façade Fig. 4: graceful aging

wood tectonics as being essential for a multi-sensual engagement, which at the same time created a healthy, TMT sheathed structural enclosure. The SWM [4] wood clad building was the largest application of TMT wood at its time and an ever since a monitored icon for positive material assessment. The next type in need that Despang Architekten focused on, was the reanimation neighborhood grocery center [5], which gave back the everyday goods shopping to a grown urban community.

As much as the former grocery center was outdated and was found necessary to be rejuvenated, so was the neighboring kindergarten, an essential social element in the community. In this vein, Despang Architekten went through a transitional process of raising awareness towards the need of a bioclimatic approach in architecture. The solid wood school already implemented passive solar devices and, in combination with the thermal mass and TMT enclosure tectonics, decreased the carbon footprint of the building. However, consistent with an accelerated understanding of the need for architecture to contribute to a cleaner world in the early 21st Century, Despang Architekten was hired by the City of Hannover to push the bar even higher and make

this kindergarten the first to apply "Passive House Technology" and ultimately achieve the "Passive House Standard" [6] in the city of Hannover.

This once again by the IHD [7] scientifically supported architectural enterprise is an intercultural investigation of the immediate implementation of bioclimatic design, which lets the human activity shape both archi- and eco-friendly space and form.

Since the leaders of the Western Hemisphere have the sad reputation of being the dominant environmental polluters in the world, with building stock being the largest contributor, the design was launched as a case study project, which serves as an explorative vehicle for this strategy that for the first conceivable post-fossil generation of growing-up terrestrials, the City of Hannover meets the challenge as the pilot case of an adequate didactical abode.

The intentional motivation is to let the youngest generation immediately grow up in an adequate built environment, which equips them with an intuitive advantage.



Fig. 5: passive house? 08 Fig. 6: archi-friendliness Fig. 7: Wright precedent, 1947 Fig. 8: ideal-ization

In collaboration with the sun, the event of the children's activity is the basic thermal conditioner. The energetically-optimized enclosure investigates the balance of both eco- and archi-friendliness and the sensual union of space, form and nature. The site encompasses an iconic 1950's suburban setting, with a great balance of density and green outdoor spaces. The project was to replace a previous fossil-age kindergarten structure from the early 1970's, which was situated in a way that it "clogged" a recreational park corridor, which initiated the original mid-century master plan. Almost half a century later, the goal was to bring it back to the original natural scheme and let the building, both from a site-strategic and architectural view point, become embedded in nature again. Respecting and taking advantage of the natural shading potential of the mature trees on the site, the building occupies almost the same foot print of the previous structure. The human event and activity of the children structures the building in a clear way. All of the serving spaces align along the north end and are connected by the linear circulation space, which is wide enough to serve as well as a play-street, and leads to the living-rooms to the south. This internal hierarchy responds to the thermal logic in the transition of the enclosure from completely closed off to the north, to the complete openness to the sunny south. Regarding the landscape revitalization goal, the northern front is not treated like a facade, but with the sequence of vertical wooden slats, which are thinned out over the openings, to blend into the natural tectonic pattern of the green space. The light shining through the louvered TMT parts during the darker seasons gives it a mystical notion and enhances the children's curiosity.

Further, the calculated perception of the facade as more of a landscape than as an architectural element, in addition to the fact that landscape elements get less attacked, serves as built-in vandalism prevention, and as a result, keeps maintenance costs low. In the inner play-concourse, the spatial transition character is



Fig. 9: wood prefab Fig. 10: assembly Fig. 11: fence inspiration Fig. 12: erased architecture

enhanced by rhythmical sky lights, which serve as a natural way-finding device to the living rooms. Juxtaposing this, the all-glass southern enclosure embraces the sun and the light as the major thermal performance tools. The curvilinearity of the façade maximizes the solar exposure and solar heat gain during the move of the sun in the cycle of a day. Spatially, the concavity areas of the pounding of the glass-waves provide an intimate feel and a smooth transition from the inside to the outside. From the park, the all-glass front dematerializes the building mass, and in this way blurs the boundaries between architecture and landscape.

The architects use their German practice base and US research platform to revitalize the stereotypical prejudice of poor American building technology and presumably architecturally-advanced German "Ecotecture." As German developers start to sell archi-ugly Styrofoam boxes as Passive Houses, following the post-fossil goal, the traditional American light wood frame structure was identified as the most efficient and effective. According to the "thermos bottle" enclosure principle, prefabricated cellulose insulated 40 cm thick wall segments (including already installed and glazed windows) sit on a slab above foam-glass gravel. Whereas the southern multi-curvilinear glass wall with triple glazed floor-to-ceiling glass maximizes the solar gain, the three other highly-insulated sides are clad with a skin of Thermally Modified Timber, in the form of slats which have been introduced already through the solid wood school. The refinement this time was a lattice dimension of 6/6 cm, twice as large as with the school, to create a fence-like notion instead of the fine ribbed texture of the school's sheathing enclosure, which was produced by Storaenso [8]. As the innovative novelty, as opposed to the school, where solid wood boards have been used as the underlying layer, with the kindergarten, thermally modified recycled plywood boards / Thermoform Binderholz [9] have been used. Emerged from the solid wood school the bar has been pushed even higher and TMT technology directly related to a postfossil architectural approach, as enabling everyone, everywhere in the world to produce its equivalent to tropical hardwood out of locally grown softwoods through a low-energy heat exposure process and with that, having the incredible compensational potential to save the rainforests.



Fig.13: thinned-out welcoming Fig.14: smooth fade out Fig.15: north not the bad back Fig.16: glowing wood

The interior is dominated by birch plywood wall claddings and wood wool acoustical ceilings on naturally brown-colored linoleum floors. The structural system is a light frame prefabricated wood platform system, with thermally disconnected TJI trusses as the peripheral members. The roof is constructed of wooden beams.

The goal of this concept, that the post-fossil building is naturally adapting the first post-fossil generation for a future in challenging both eco- and archi-friendliness, has so far been recognized by the PHAIDON 21st Century World Atlas of Architecture [10] and as the German winner at the international Bienal Miami 2007 [11], just like Stefan Behnisch in 2005 with his Genzyme Building in Cambridge MA, as his bioclimatic American icon. Considering the small size and prosaic typological category of the project, these are promising signs for a rising awareness for the local of the glo-cal aspect of TMT architecture.



Fig. 17: sun booths Fig. 18: cocoon-ing Fig. 19: way-finding Fig. 20: beacon-ing

American case study

As mentioned previously, the academic freedom of architectural education is itself a necessary and critical proponent for the further study and exploration of the balance of archi- and eco-friendly design. Because pragmatic issues, such as low budgets and client disagreements, which are ever-present in the work of Despang Architekten and others, are necessarily absent in the academic realm, free and unrestrained paths are afforded students in their exploration of this subject.

One such exploratory project, as produced by Amber Ellett [12] in a graduate architecture design studio taught by Martin at the University of Nebraska, will be discussed in this section.

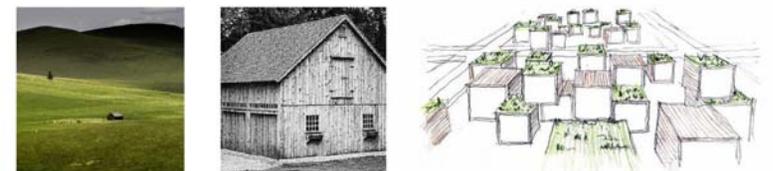


Fig.21: warm atmosphere Fig.22: vernacular inspiration Fig.23: urban adaptation

The topic of exploration, given to the design studio, was responsible, urban dwelling in Lincoln, Nebraska. The ultimate goal was to present an alternative to the conventional thinking of housing development, and show an option which was innovative and sustainable in one.

Whereas stereotypically the urban European city fabric is considered to be most sustainable, Amber re-discovered the rigid Jeffersonian grid in the US as of postfossil potential because of its sun exposure through southern orientation.

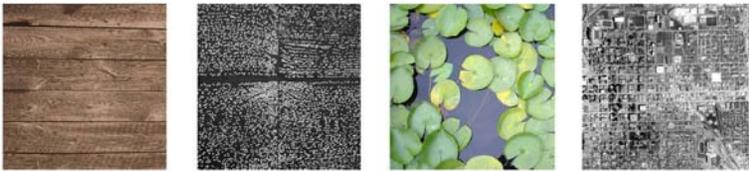


Fig.24: warm TMT wood Fig.25: glowing concrete Fig.26: green oasis Fig.27: calming the metropolis

Amber's approach to the design project was one of simplistic density, and pure forms. Great inspiration came from iconic historical examples of timber-constructed barns, which often stood in the middle of agricultural fields. An attempt was made to reinterpret this condition for modern residential terms, and adapt the calming sensation of such a condition.

While the quintessential Midwestern home consists of a barn located on a vast plot of natural vegetation, such peaceful and serene notions are oft never found in urban settings. The immense suburban sprawl consuming precious land and natural resources may be replaced with a more appropriate dense eco-community in this instance, creating lush, natural dwelling places in this highly-hectic world. In this speculative scheme, eco-clusters are created through a series of modular building units. Positioned in clusters around individual private courtyards, a dense scheme may be implemented while still affording residents intriguing private and public spaces. Each unit, only 1100 square feet, may be manipulated on the interior to accommodate a variety of residents, ranging from one-bedroom to three-bedroom units. Because of the units being planned in a modular way, the scheme proves affordable and flexible, able to adapt to a variety of social conditions.

The selection of highly specific and high performing materials in the design of the housing units was crucial, not only to ensure the intentioned psychological reaction of the users, but as well to ensure the energy performance of the structures themselves.



Fig.28: solar Jeffersonian Fig.29: dense intimacy Fig.30: open, embracing south Fig.31: detail study

An airtight construction consisting of wooden structural insulated panels (SIPS) affords a highly efficient building envelope (R-42) with little to no infiltration. Green roofs further insulate the building envelope, while creating individual roof terraces for residents. Precisely calculated according to Lincoln's solar position, each unit will

benefit from maximum solar penetration in the winter, due to a fully-glazed southern façade, while natural self-shading in the summer.

Translucent concrete on the north façade creates a high-performance thermal mass and provides structural stability for the units, while transmitted light at night, creating privacy and an ephemeral neighborhood glow. Clad in local TMT softwood, a material reference to local tradition for barn structures, the residences possess a natural and humane presence, calming and collective. This material may be harvested and reused from existing barns, and reused again at the end of the building's life, reducing the consumption of raw building materials. Also the potential of termite resistance quality of TMT makes this material a perfect in this nation and climate. TMT shutter windows and doors specifically designed for the east and west facades allow natural ventilation to take its course, while possessing the ability to close completely at night, created a solidly insulated thermal building envelope.



Fig. 32: social layering and interaction

Fig.33: warm courtyard

Fig.34: NIXON things we like

Amber's philosophy of diversity through simplicity and efficiency through minimization provides a distinctly different perspective than the normal position of consumption and excess which is so prevalent in the US. As is evident through her explorations, Generation P is being challenged and tested in academic settings, in preparation for their emersion into a post-fossil future. A new position of the younger generation, of beautiful space performing well in a post-fossil era, is growing ever-present.

Conclusion

The architectural world is becoming increasingly united and along with it goes an awareness of the improvement in the local ordinary realm and in socially (as ecologically responsible) architectural interventions. As an example, Amber Ellett, and Despang Architekten, with the practice base in Germany and the teaching/practice platform in the US, use their intercultural hybridism to inspire each other to work on "immediate action" plans for exploring the edge of archi- and eco-friendliness.

In this notion, Amber consequently uses her afforded academic freedom to go far beyond the pragmatic boundaries which are given to Martin's practice explorations.

Wood as TMT is their shared passion in regards of their belief in the new excitement about local customization and through that rediscovery of a native materiality.

Amber, representing her county as opposite to its stereotypic perception, as ecologically and socially engaged through reinventing itself and its own mid-20th-Century legacy of inspired, joyful architectural investigations, is a very promising sign at the beginning of the post-fossil 21st Century of "Eco Architecture."

TMT has by now been significantly adopted in Europe, Russia, Asia and South America, but not yet to its deserving potential in the USA. Martin and Amber and the

coming student generations are ready and look forward to collaborate on the research development of the architectural potential of TMT at the University of Nebraska, Lincoln, USA.

Just like the progressive material inspired notion of the Californian NIXON company [13], TMT has the additional potential to become another global symbol for the "massive change" [14] of a young environmentally-concerned generation, who as opposed to formerly bad conscience guided discovered the excitement of moving forward in optimistic style as their powerful driving force.

References

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