

Traditional Translations: The Universal Optimizing the Handcrafted

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If you know your foundation, then of course you can do whatever you want. Some people say modernization is very bad, Coca Cola is very bad... Nothing is bad, if you know your foundation... Everything has beauty of its own nature.

– His Holiness the 12th Gyalwang Drukpa on the modernization of Tibetan Buddhist society

INTRODUCTION

Despite being energy efficient and “environmentally friendly,” many buildings designed today continue to ignore their immediate context, and instead rely solely on hardware, technical equipment, and LEED checklists to mediate their connection with the local environment. Against this backdrop, a small but growing movement of architects around the world are beginning to critically reexamine context in terms of locally accessible building materials, available human resources, and construction methods

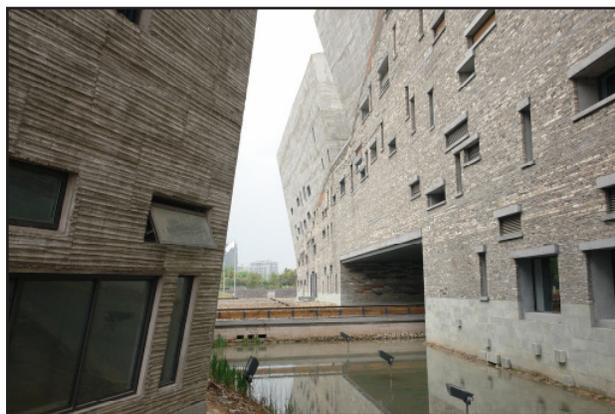


Fig. 1 : Ningbo Historic Museum: Amateur Architects Reexamining context through traditional building methods and local materials.

native to the areas where they are working. Projects such as those by Amateur Architects in China, Ziegert Roswag Seiler in Abu Dhabi, and FARE Studio in Burkina Faso, all make the case for an advanced form of critical regionalist work; one that extends Kenneth Frampton’s definition from a strategy that “mediate(s) the impact of universal civilization with elements derived indirectly from the peculiarities of a particular place” to one that proposes an “authentic dialogue” between local tradition and universal technology.^{1,2} (Fig.1)

Contemporary methods of analysis and computer simulation, material testing, and collaborative on-site training – made possible by air travel – are strategically utilized to provide these architects with the profound understanding of context required for engaging in a direct and mutual exchange. Two projects presented in this essay – one in Northern India, and the other in Bangladesh – will exemplify this position, and demonstrate that the knowledge emerging from this dialogue results in the development of a new type of optimized technology, which is neither imposed from the outside nor is solely the product of local culture.³ Both projects reveal a site sensitive architecture that “determine(s) more consciously the necessary links obtaining between place and production, between the “what” and the “how.””⁴

CASE STUDY ONE: The Druk White Lotus School in Ladakh, India

Ladakh, the “land of high passes,” is part of the state of Jammu and Kashmir, located in northern India on the border with China. The region is situated between the Karakoram Mountains and the Great Himalayan

Range. Because of its location in the rain shadow of the Himalayas and its yearly average of 300 days of sunshine, Ladakh is classified as a high-altitude desert with an average rainfall of only three inches per year, and temperatures ranging from -80° F in winter, to $+104^{\circ}$ F in summer. The extreme winter weather in Ladakh causes much of the country to be completely isolated for six months out of the year. The upper elevations are characterized by a rocky, sparse landscape with little vegetation, while the lower elevations near rivers are greener, with valleys punctuated by groves of willow and poplar trees. Many of these areas are cultivated, with irrigation provided by a complex system of canals.

Culturally, Ladakh is a Tibetan Buddhist enclave situated in a predominantly Muslim Kashmir. It is one of the last places in the world where the people continue to follow the traditional Tibetan Buddhist way of life. Buddhism plays an important role in Ladakhi society, with the local monasteries acting as the spiritual and political centers for most villages. Agriculture has been the primary source of income for the Ladakhi people for hundreds of years, but a recent shift toward tourism and modernization has changed the economy of the region. Indian government opened the region in 1974 to immigration and tourism in order to promote population growth in the sparsely populated area, and thereby strengthening its power along the border with China. This decision has had a profound effect on traditional Ladakhi society – from a rise in unemployment due to mass migration to the capital Leh, to environmental problems caused by tourism – a tremendous strain has been put on the environment, and the people of the region. Ladakhi youth have been especially impacted, and are caught between their cultural values and the drive for modernization.⁵

The School

The Druk White Lotus School, located in the village of Shey near Ladakh's capital, emerged from the local community's desire to create a modern school that "enable(s) the students to have the confidence and competence needed to succeed in the modern world, together with a sound grounding in the Ladakhi language, culture and traditions."⁶ The school was conceived by one of Ladakh's highly revered spiritual leaders, the 12th Gyalwang Drukpa, who was instrumental in the fundraising and promotion

of the project. In 1997, a team of architects and engineers from Arup Associates and Arup began to design the school campus master plan, which included classroom buildings, residence halls, and a library, along with other school facilities that accommodate around 800 students. The project has been constructed in phases, and will be completed in 2013. (Fig.2)



Fig. 2 : Druk White Lotus School, Arup and Associates.

In order to facilitate a closer connection with the construction site, Arup has sent engineers and architects to live in Shey for four months out of each year. Being on site allows the Arup team to monitor the performance of recently completed buildings, and to use the data from this process to inform future design decisions. In addition to the advantages offered by on-site monitoring, the Arup team has been able to develop a close working relationship with the local builders, whose knowledge has proven vital to the construction process. Due to Ladakh's remoteness, it was decided early on in the project that local materials would be utilized wherever possible. Transporting large amounts of imported materials to the site would have caused unnecessary consumption of fuel, while the use of indigenous materials would promote the local economy and encourage community involvement in the building process.⁷

Traditional Translations: Modern Technology Optimizing the Handcrafted

Traditional Ladakhi structures, such as monasteries, make use of locally available stone, mud, and

wood. The buildings typically rest on a dressed stone foundation, which acts as a damp course, while the building's walls are constructed out of mud bricks made from a combination of river sand and straw. These walls are very strong due to their thickness and low height, and are often seismically reinforced by the addition of wooden ring beams that help the bricks to withstand lateral forces. A wooden post and beam framework spans between the load bearing exterior walls, and is supported periodically by wooden columns inside the building. Because wood is scarce in Ladakh, it is primarily used for structural members and over window and door openings. Ladakhi roofs are traditionally flat and consist of large wooden beams spanned by poplar joists, which are covered with rows of willow branches and an insulative layer of compacted earth and grass. The roof is typically finished with a final layer of waterproof clay.

The project leader, Jonathan Rose, emphasizes the influence that the region's monasteries had on Arup's design of the school: "We have learned to abandon many of the construction details we devised in London and have gone for local tradition instead. When you see how well the surrounding monasteries have survived – up to a thousand years – in such hostile conditions, you learn to respect what has gone before."⁸ The Arup design team capitalized on the advantages offered by the local materials and methods, and modified them in ways that increased their energy efficiency and structural performance. The main walls of the school are cavity walls consisting of an interior layer of mud brick and an protective exterior layer of dressed stone. Arup combined two traditional wall types, the stone foundation wall, and the exterior mud brick wall, to form a double layered wall that is more resistant to the elements, stronger, and provides more thermal mass than the traditional single layer mud brick wall. The roofs of the school buildings were also constructed using traditional methods, but were modified when Arup's computer analysis supported the addition of a layer of rock wool insulation, which was necessary to obtain optimal thermal performance. The use of dense materials in the construction of traditional Ladakhi walls and roofs takes advantage of the area's high exposure to sunlight. This use of thermal mass has also benefited the school's energy consumption. Computer monitoring of winter indoor temperatures

has proven that the thermal mass provided by the school's walls and roof absorbs and radiates so efficiently in the winter that an additional heat source is only necessary in extremely cold weather.⁹

Arup has also used computer technology to optimize the seismic performance of local materials. Traditional Ladakhi structures offer some resistance to earthquakes that occasionally occur in the region. The inner wooden structural framework typically performs well under seismic loads, due to its flexibility. The internal roof structure is constructed with lightweight wooden joists, which also minimizes injury upon collapse. The wood frame structural system employed in the school is not unlike that of the surrounding monasteries. Although the traditional system offers some resistance to lateral forces, it does not provide enough stability to withstand large-scale earthquakes. This system was analyzed with Arup's GSA software and modified in order to create a structural timber sway frame that stands independently from the outer masonry walls, and is laterally reinforced with steel cross bracing and steel connection plates. These structural details have been intentionally left exposed to serve as a model for future projects in the area.¹⁰

A Continuing Education

Similar to the educational philosophy of the Druk White Lotus School, the architecture performs to modern standards, but is grounded in local culture and traditions. The school serves as a model for the community, and promotes the use of indigenous materials during a time of modernization in Ladakh. New, large-scale buildings in the capital, such as schools, are typically constructed with precast concrete, a material requiring importation, an immigrant workforce, and the added disadvantage of performing poorly during earthquakes. The school has sparked a renewed interest in traditional building methods, and proves that local materials can be optimized to meet or exceed today's needs. Despite being hit by a large mudslide in August 2010, all of the buildings on campus have remained standing, and the school's administration has announced that Arup's design has survived a major test.¹¹

Arup continues to monitor the existing buildings and to learn from the data gathered on location, they are also aware that the lessons learned while building the school have much broader implications for their

own work: "...as the findings of field research were fed back to the UK and the initial design progressed, it became clear that the school could potentially have a wide influence, not just in the local region, but also in contributing to the development of appropriate building technologies elsewhere in the world."¹²

CASE STUDY TWO: The Handmade School in Rudrapur, Bangladesh

The sandy alluvial plain crisscrossed by rivers provides fertile soil for the cultivation of rice and wheat in the Dinajpur District of northern Bangladesh. As in other areas of the country, the rivers provide a valuable resource that is the basis for the region's agricultural economy. The rivers, however, also pose a serious threat by flooding during monsoon season, thereby destroying crops and houses every year. In addition to the immediate devastation caused by flooding, the resulting damp frequently rises into dwelling foundations and walls, causing a slow deterioration of the structure that usually results in their collapse. Although materials traditionally used for housing are readily available and easily assembled, the cost of rebuilding after a flood places a huge burden on the already impoverished people living in the region.¹³ Rudrapur is a rural village located near the city of Dinajpur, close to the border with India. Much of the countryside surrounding the village is inaccessible due to the lack of paved roads, with animal drawn carts being the primary means of transportation in the area, making the importation of industrially produced building materials prohibitively expensive.

As is typical of other areas in the country, houses in the village are classified by their materials, which are commonly associated with the social status of the dwelling's occupants. The Kutcha house is typically the weakest type of traditional dwelling, constructed on an earthen foundation with walls made of a bamboo framework covered by organic materials that are attached to the structure with jute string. The walls are also made of mud in some areas. Because of their reliance on weaker, cheaper materials, Kutcha houses are the common choice of poorer members of the community. The Semi-Pucca house is constructed from sturdier materials than the Kutcha house, with the walls made from timber frames covered by woven bamboo mats, or CI sheets, and commonly rests on a brick perimeter wall foundation. Pucca construction, which uses either brick or concrete for walls and foundations, is

traditionally reserved for dwellings occupied by only the wealthiest families and is regarded in Bangladesh as the best of the three construction types.¹⁴

The School

The Handmade School was a project funded by the rural development NGO Dipshikha and was conceived to house the Modern Education and Training Institute (METI), a progressive school that provides village children an education based on positive reinforcement and self-awareness. The German architect, Anna Heringer, was instrumental in raising funds for the project and also led the design and construction of the school. Eike Roswag, a leading authority in earth construction, was invited to assist Heringer with material testing and fabrication during the construction phase of the project.

The school was designed to serve approximately 150 students from the village, and was intended to become a representative public building in the village; it was designed "to gain and disseminate knowledge and information for optimizing the use of locally available resources" which, along with the improvement of building techniques, would help support the local economy and promote the "creation of a regional identity."¹⁵ Using local resources would set a new trend for the construction of mid-size buildings in the region, which are typically made of imported materials such as concrete and masonry. Although these materials are more expensive and energy intensive, they are deemed by the local community as being more durable and modern, while traditional materials, such as bamboo and mud, are seen as being substandard and symbolic of the poor, rural life. Initially, the headmaster of METI, Prodip Tigga, was reluctant to accept a design for a school that used mud as the main building material, fearing the local's reaction, he explains, "What they expect from a good school is what is represented from the outside. A mud school would symbolize to most of them that they cannot afford anything better."¹⁶

Layered mud walls in Bangladesh are typically made by hand. In order to facilitate construction, a mud with a very wet consistency is employed, causing shrinkage upon drying. The traditional method of hand building can also result in a poorly compacted wall, which can easily become infested with burrowing rodents, causing a further weakening

of the structure, making it more prone to water damage during flooding. Bamboo also has inherent weaknesses as a building material. Because of their lightweight nature and lashed connections, bamboo roofs are commonly destroyed by uplift due to high winds.¹⁷ The jute string employed to connect structural members and side wall materials is also subject to deterioration overtime. Despite these disadvantages, the use of local materials also offers several benefits. In addition to supporting the local economy, their ease of transport, and low environmental impact, their use has been shown to provide a greater level of comfort than structures that employ industrially produced products. The thermal mass of mud walls provide a constant comfortable temperature and level of humidity that adjusts during the seasons, while bamboo mat walls allow for ventilation during the region's mild winters and hot summers. The primary challenge during the construction of the school was to capitalize on the strengths of the local materials while modifying them to improve their durability and strength: this was achieved by laboratory and on-site testing of the materials, and experimentation during the construction phase of the project. By bringing attention to the inherent advantages of indigenous materials, and by enhancing their performance, Heringer hoped that the Handmade School would help "to change (their) image...and show that they can be beautiful."¹⁸

Traditional Translations: Cross-Cultural Collaboration Modifies the Handmade

The school was constructed from September to December 2005, by volunteers from the village of Rudrapur, METI students, local craftsmen, as well as architects and engineers from Germany and Austria. The school was designed as a two story building, with the first floor consisting of massive earthen walls, while the second floor facade and structure were constructed out of bamboo. To prevent damage from rising damp, a brick perimeter wall foundation with a vapor barrier was constructed. The brick used for the foundation was produced in the nearby capital of the region, Dinajpur, and was one of the few materials imported to the site for the project.

The ground floor walls were constructed out of locally available mud mixed with straw from adjacent rice fields. Straw was introduced as a modification to the traditional Bangladeshi method

in order to reinforce the clay mixture, making it more resistant to the elements. This technique, called *Wellerbau* or cob construction, originated in Europe and was introduced by the German team. In order to test appropriate drying times and construction procedures for this new approach to an old technique, a small wall section was built on site prior to the construction of the school. The walls were made by hand, by building up consecutive layers of the mud and straw mixture, which were allowed to dry for a few days and then trimmed to the desired shape with the sharp edge of a spade, creating a durable surface that requires no finishing.

In addition to the modifications to the local mud construction methods, adjustments to the typical bamboo structural configuration were also made. Because bamboo in Bangladesh is not traditionally used to span a distance longer than the width

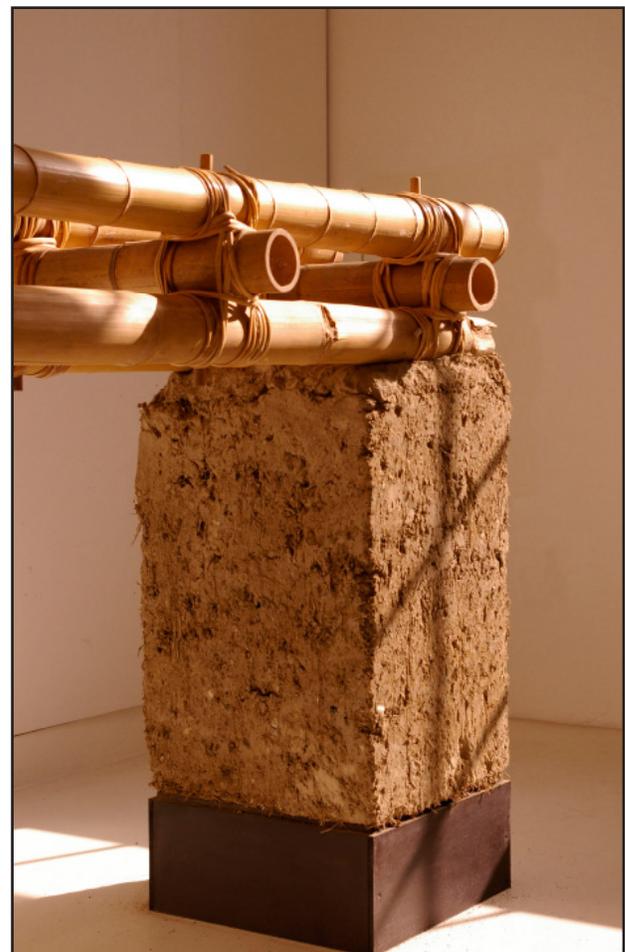


Fig. 3 : Bamboo structural test prototype.

of a small house, a new approach was needed for constructing a bamboo structure capable of supporting the second floor and roof of the school. A modified system – similar to European style timber-frame construction – was devised, which relies on the strength of multiple layers of bamboo rather than the single layer present in most indigenous dwellings. The bamboo layers were fastened with steel pins and secured with a nylon cord, creating a durable replacement for the traditional jute string connections, which are susceptible to rapid deterioration due to moisture.¹⁹ In order to determine the assembly's structural capacity and the optimal arrangement of the members, a ten foot model was constructed and stress tested in a German laboratory prior to construction. (Fig.3) The resulting structural arrangement was subsequently modified in the field when the bamboo delivered to the site had a smaller profile than the members that had been previously tested. Another 1:1 prototype was built on-site, and tested under the weight of the construction crew.²⁰

Because the construction process was perfected either shortly before or during construction, it benefited directly from on-site observation and input from the entire construction team. As a local construction worker observes, on-site testing was also an important vehicle for communication between the locals and the visiting team: "It was good to do tests and experiments together before starting the real construction, so we could understand it although we did not know the language." He continues by stating that "...everybody learned a lot from each other. I learned how to build strong walls, how to use measurement tools, and the foreigners learned that the best mixing machines are water buffalos."²¹

Giving Tradition a Future

The Handmade School has become a much loved building in the village, and now also serves double duty as an unofficial town hall when school is not in session. The project has achieved the goal of convincing the local community that their indigenous materials can provide a high level of durability and comfort comparable to or better than industrial products. The school's success has led to the development of a model housing project for Rudrapur, headed by Heringer, and built by students from BRAC University in Dhaka and the Linz University of Art, in conjunction with local craftsmen.

The knowledge gained by observing the effects of weathering on the school has continued to guide the evolution of the traditional building processes, and imported materials, such as the nylon cord used for the bamboo connections, and the masonry used for the school's foundation, have been exchanged for materials available closer to the village.²²

The opportunity to discover and improve on the potential offered by traditional Bangladeshi building materials and local craft knowledge emerged from the collaboration between the visiting team from Germany and Austria, and Rudrapur's craftsmen. Eike Roswag underlines the importance of this unique exchange between cultures:

The construction of the building was an enormous challenge...it put the local builders and the foreign architects in the same difficult situation.... When design details were conceived in collaboration, and the construction was accomplished as a team, a profound sense of rootedness and integration emerged, which allowed for the possibility of understanding and change.²³

After the school's completion, Roswag returned to Germany and founded an office with two other members from the visiting construction team, Christoph Ziegert and Uwe Seiler. Their current work continues to be influenced by their experiences in Rudrapur, with earth construction being one of their primary specializations and areas of research, and their Berliner office includes a laboratory where they test and develop earthen building materials for a wide range of projects. Frequently awarded contracts in developing nations, the office of Ziegert Roswag Seiler, actively seeks out working relationships with local artisans on every project, initiating "local solutions through positive communication."²⁴

CONCLUSION

The optimized building processes, developed during the construction of the Druk White Lotus School and the Handmade School, are the result of a direct dialogue between local tradition and universal technology, and were realized through the use of computer analysis, material testing, and cross-cultural collaboration. The local builders involved in both projects now have extended their skills and expertise, giving them the opportunity to train others and to use the modified methods they helped to develop on future projects. The schools serve as prototypes for future buildings, and their

success has encouraged a renewed interest in the use of indigenous materials and practices within the communities they serve. The goal of these projects was not to copy historical precedent, but to “reflect our time” by stimulating the evolution of traditional building techniques rather than replacing them with imported industrial products and methods.²⁵ The newly developed craft knowledge continues to evolve and to affect not only the architecture of the Ladakhi and Bangladeshi communities where it originated, but it has also impacted the work of both Arup and the office of Ziegert Roswag Seiler, on projects around the world. In this way, the process of creating architecture that is sensitive and indeed finds meaning in context has become a reciprocal practice that advances both local and universal knowledge through careful observation, research, and collaboration, using elements derived directly from local tradition.

ENDNOTES

- 1 Kenneth Frampton, “Towards a Critical Regionalism: Six Points for an Architecture of Resistance,” in *The Anti-aesthetic: essays on postmodern culture*, ed. Hal Foster (Ann Arbor: Bay Press, 1983), 21.
- 2 Paul Ricoeur, “Universal Civilization and National Cultures,” in *Architectural Regionalism: collected writings on place, identity, modernity, and tradition*, ed. Vincent B. Canizaro (New York: Princeton Architectural Press, 2007), 53.
- 3 Frampton, “Towards a Critical Regionalism: Six Points for an Architecture of Resistance,” 16. The term optimized technology in this essay references Frampton’s use of it in his writing.
- 4 Kenneth Frampton, “On Reading Heidegger,” in *Oppositions Reader: Selected Readings from a Journal for Ideas and Criticism in Architecture*, ed. K. Michael Hays (Princeton: Princeton Architectural Press, 1998), 4.
- 5 Information on recent changes in Ladakhi culture is referenced from Jean Michaud’s article, “A Historical Account of Modern Social Change in Ladakh (Indian Kashmir) with Special Attention Paid to Tourism,” *International Journal of Comparative Sociology* 37, no. 3-4 (1996): 286-300.
- 6 Principle of the Druk White Lotus School, Maureen Songhurst, “Inside the School,” Druk White Lotus School, <http://www.dwls.org/Curriculum.html> (accessed August 31, 2010).
- 7 Information is referenced from the article by Jim Fleming, Rory McGowan, Dorothee Richter, and Jonathan Rose, “Druk White Lotus School Ladakh, Northern India,” *The ARUP Journal* 2 (2002): 12-17.
- 8 Jonathan Glancey, “Sweet Valley High,” *guardian.co.uk*, January 28, 2002, under “Arts,” <http://arts.guardian.co.uk/critic/feature/0,1169,641811,00.html> (accessed September 2, 2010).
- 9 Information about Arup’s temperature monitoring and thermal design is referenced from Francesca Galeazzi’s article, “Druk White Lotus School, Ladakh, India,” *Intelligent Buildings International* 1(2009): 87-91.
- 10 *Ibid.*, 91-92.
- 11 Druk Padma Karpo Education Society, “Emergency News,” Druk White Lotus School, <http://www.dwls.org/news-and-blogs/21-emergency-news/98-flash-floods-latest-news-8-august-2010-1500.html> (accessed August 11, 2010).
- 12 Jim Fleming, Rory McGowan, Dorothee Richter, Jonathan Rose, “Druk White Lotus School Ladakh, Northern India,” *The ARUP Journal* 2 (2002): 12.
- 13 Information regarding building materials in rural Bangladesh is referenced from Robert L.P. Hodgson and M.L. Carter’s article, “Some Factors Governing Choices Of Building Materials In Rural Bangladesh,” *Affordable Building Technologies* (February 1999): 87-97.
- 14 Information regarding housing types in rural Bangladesh is referenced from Dr. K. Iftekhar Ahmed’s book, *Handbook on Design and Construction of Housing for Flood-prone Rural Areas of Bangladesh* (Dhaka, Bangladesh: Nymphaea, 2005), under “Asian Disaster Preparedness Center Library,” http://www.adpc.net/AUDMP/library/housinghandbook/handbook_complete-b.pdf
- 15 Eike Roswag, “School Handmade in Bangladesh,” METI School, http://www.meti-school.de/daten/index_e.htm (accessed August 31, 2010).
- 16 Anna Heringer, “Projects Handmade School,” Anna Heringer, <http://www.anna-heringer.com/index.php?id=31> (accessed August 31, 2010).
- 17 Robert L.P. Hodgson, M.L. Carter, “Some Factors Governing Choices Of Building Materials In Rural Bangladesh,” *Affordable Building Technologies* (February 1999): 87-97.
- 18 Clifford Pearson, “Handmade Architecture,” *Architectural Record*, October, 2008, under “Features,” <http://archrecord.construction.com/features/humanitarianDesign/0810heringer.asp> (accessed August 31, 2009). Heringer became aware of the inherent weaknesses of local materials when she first arrived to Bangladesh as student to work for Dipshikha as a volunteer. Her subsequent studies as an architect led her to further explore the possibilities for the materials in her thesis. Because of her interest and knowledge of the village and the locally available building materials, she was asked by the METI school director to lead the construction of the new village school.
- 19 Roland Pawlitschko, “METI School in Rudrapur, Bangladesh – Analogue Construction Using Local Resources,” *Detail* 4 (2007): 308-309.
- 20 Eike Roswag, “Photos of Realization: Test Weller- Loam,” METI School, http://www.meti-school.de/daten/index_e.htm (accessed August 31, 2010).
- 21 Anna Heringer, “Projects Handmade School,” Anna Heringer, <http://www.anna-heringer.com/index.php?id=31> (accessed August 31, 2010).
- 22 Anna Heringer, “Projects Homemade,” Anna Heringer, <http://www.anna-heringer.com/index.php?id=39> (accessed August 31, 2009).
- 23 Eike Roswag, “Zusammen Arbeit,” *Der Architekt* 6 (2008): 58-59.
- 24 Friederike Meyer, “Ziegert, Roswag, Seiler Architekten Ingenieure,” *Bau Netz*, <http://www.baunetz.de/talk/crystal/index.php?nr=21> (accessed September 19, 2010).

25 Eike Roswag, "Zusammen Arbeit," *Der Architekt*
6 (2008), 58.

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