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"BROADENING THE PALLET" :

TEACHING SUSTAINABILITY THROUGH DESIGN

"MÁS USOS PARA EL PALLET" : ENSEÑAR SUSTENTABILIDAD A TRAVÉS DEL DISEÑO

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Abstract _

As the world population grows and urbanizes, faculty at schools of architecture are increasingly being asked to tackle issues of sustainability. To that end, this paper describes a pedagogical approach we have undertaken at the School of Architecture + Design at Virginia Tech in our third-year undergraduate design lab that attempts to integrate these concepts with the workings of the design process. This paper presents the process and results of a competition initiated by the Town of Blacksburg that asks the question, "What can be done with used pallets, one of the most prevalent waste products of our globalized and industrialized culture?"

Resumen _

A medida que la población mundial aumenta y se urbaniza, los académicos de las facultades de arquitectura deben hacerse cada vez más cargo del tema de la sustentabilidad. Con ese fin, este documento describe el enfoque pedagógico adoptado en el laboratorio de diseño del tercer año del programa de pregrado de la Escuela de Arquitectura y Diseño de Virginia Tech, mediante el cual intentamos integrar este concepto al desarrollo del proceso de diseño. El documento presenta el proceso y los resultados de un concurso realizado en la ciudad de Blacksburg en torno a la siguiente pregunta: "¿Qué hacer con los pallets usados, uno de los productos de desecho más comunes en nuestra cultura industrial globalizada?"

Palabras clave: arquitectura, sustentabilidad, pallets, reutilización.

Introduction_

As teachers of undergraduate architecture students, we have an obligation to introduce concepts of sustainability in our lectures and design labs. While traditionally these concepts have been introduced in lecture courses, we have endeavored to find additional ways to incorporate sustainability more broadly into the curriculum. To this end, we sought out a competition that would require the students to grapple with ideas of waste and reuse in design in a tangible way. The "Broadening the Pallet" competition organized by Sustainable Blacksburg in September 2010 afforded us this opportunity.

The Pallet Problem_

In a review of recent studies of pallet re-use and recycling in the U.S., Buehlmann, Araman, and Bush (2010) reported that recycling of pallets is on the rise, from 51 million units in 1992 to 357 million units in 2006. While this is a positive advancement in the packaging industry, Araman and Bush in a 2009 presentation at Virginia Tech's Department of Wood Science and Forest Products indicated that nearly 100 million pallets wind up in landfills every year (Buehlmann, 2010). To put the issue in context, Buehlmann et al. stated that in North America, the pallet industry represents the largest share of hardwood use by volume, making the pallet reuse agenda critical (2010).

The "Broadening the Pallet" Competition_

The unaltered pallet is a modular element which can be improved and placed into the overall system. Through sanding, the surface gains new clarity while still maintaining the scars and memory of its former uses. The staining then gives the pallet a new aesthetic character in addition to practical protection from the elements. Finally, each renewed pallet is placed into a system which relates one to the other. This system then becomes an environment in which new growth arises.

The footer became an exploration rather than just a problem to be solved. We wanted to integrate another element into the project, in addition to the pallets, that originated from a reclaimed material. The plastic flower pot became a mold which leaves its imprint on the concrete. The plastic, after the concrete has been removed, will ultimately become the liner for the low planters. This demonstrates the versatility of a material to be used in multiple forms.

The system reshapes the function and identity of the pallet, becoming more than landfill waste. The re-shaped pallet informs the user of the possibilities by demonstrating a particular method of pallet reuse. This then reshapes the user's notion of the pallet's potential, bringing innovative reuse to the forefront. Ultimately, this inspires the user to then improve upon the pallet and design new forms for a material previously disregarded. The pallet has become a catalyst for discovery.

Reshape
Inform
Inspire

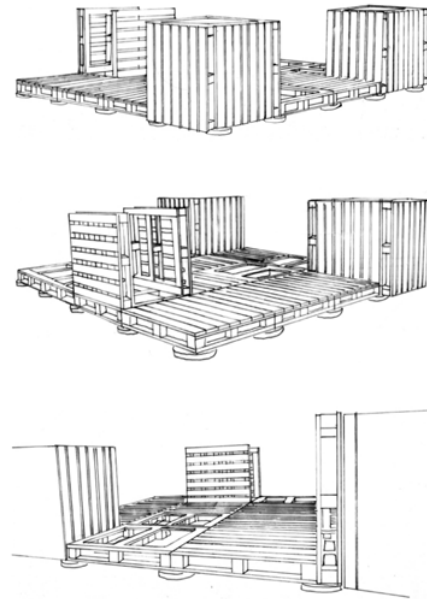
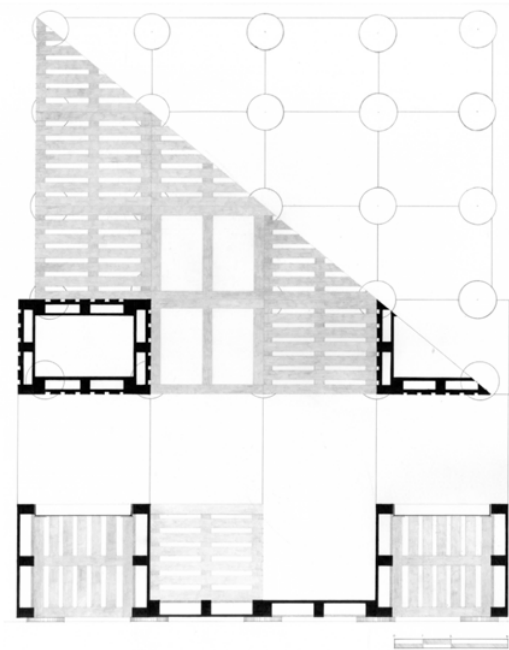


Image 1_Reuse of Pallets in Full Form by Black and McFarland (source: Kenneth Black and Ross McFarland).

Through educational seminars such as those occurring during the annual Sustainability Week, the organization aims to inform the general public about initiatives pursued throughout the region that encourage thoughtful environmental stewardship. In September 2010, a competition entitled "Broadening the Pallet" was introduced to the community.

The underlying premise was that wooden pallets are frequently used to ship items from one location to another, then discarded as waste in landfills. The contest invited entrants to re-imagine the pallet in another use. Three categories were envisioned: in the first, pallets could be reused in their full form; in the second, they could be reused in a modified form; and in the third, they could be reused to create a work of art.

The jury was comprised of town citizens, local architects, and faculty from the College of Architecture and Urban Studies at Virginia Tech. We required our third-year undergraduate architecture students to enter the competition in a category of their choice, and allowed them to work in teams of up to three individuals. The culmination of the competition was a public exhibition of the work and announcement of the winners on September 26, 2010 as part of the Sustainability Week activities located at the Blacksburg Community Center.

At the outset of the competition, we showed our students a short film from the PBS documentary series E2 Design entitled "Superuse" (Fettig, 2008). The film features the work of the Dutch firm Architecten 2012, which has achieved success through its use of unconventional reclaimed materials, including car windshields, defunct washing machines, and cable spools.

The students were challenged to consider their working method; would they begin with the pallet and look for a use, consider a use and modify the pallet to

Reuse of Pallets in Full Form

The winning entry in this category was designed by two of our students, Kenneth Black and Ross McFarland, whose competition entry board is shown in Image 1. They embraced the idea of sustainability not merely in the reuse of pallets, but throughout the work. Their entry was an articulated system of pallets arranged in three dimensions to form an integrated garden system for small urban lots. They described their entry entitled "Reshape, Inform, Inspire," as follows:

The system uses reclaimed pallets and plastic flower pots to form the majority of the structure with a minimal introduction of additional new materials. The system creates an environment for both plant cultivation and spatial interaction. Its parts are easily repeated and/or replaced and are protected from the elements through staining and concrete footings. By maintaining the original pallet form, the system expresses the versatile and modular nature of the pallet itself.

Black and McFarland's entry resulted in several innovations once the ethic of reuse was adopted. In investigating the use of discarded flower pots as a membrane to support, and drain, the planting medium, they made a side discovery that the bottom of the pots made ideal forms for concrete footings. They made the suggestion that these footings might be poured in different thicknesses to accommodate uneven terrain, allowing their garden system to be installed in a range of existing underutilized urban spaces.

Additional entries in this category from members of our design lab included a bunk bed designed by Michael Wood from six pallets and dimension lumber, a floating fishing pier designed by Sebastian Casciaro, a bike rack designed by Margaret Untiedt formed of an A-frame made of pallets, and a chai tea table with a sliding drawer created by Divya Khattar, all shown in Image 2. These

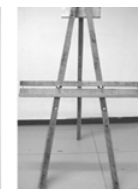


Image 2_Black and McFarland's Entry in the "Broadening the Pallet" Competition (source: Kenneth Black and Ross McFarland).

Image 3_Reuse of Pallets in Full Form by Wood, Casciaro, Untiedt, and Khattar (source: Elizabeth Grant).

Image 4_Pallets Reused in a Modified Form by Hamner (source: Catherine Hamner).

Image 5_Hamner's Entry in the "Broadening the Pallet" Competition (source: Elizabeth Grant).

Pallets Reused in a Modified Form

In the modified pallet category, three of our students received awards. First place went to Catherine Hamner with her disassembly and reuse of a pallet as an easel. Hamner located a sturdy pallet longer than the standard 1.2 meter-by-1.0-meter (48-inch-by-40-inch) variety commonly found in North America. She used the stringers of this pallet as the legs of an easel, building the adjustable ledges and hinge support from the remaining lumber. Hamner emphasized the functional nature of her entry and wrote of her design,

The easel design incorporates the wood of the pallet and its unique cut characteristics. Using a 2.3-meter-long (7.5-foot-long) easel, only one easel comes from one pallet, reusing the wood for the creation and display of art, instead of just as a piece of art itself.

Third place in the modified category went to the team of Logan Hoffman, David Quick, and James Trent, for their full-scale creation of a bus stop for the Blacksburg Transit system. This team, along with the team of Black and McFarland, and Michael Wood, constructed their entries at the college's Research and Demonstration Facility, which was purpose-built for students to test out their designs in full scale. The covered bay between the two phases of the building has facilitated a range of investigations over the years, such as the University's three Solar Decathlon entries including the recent award-winning Lumenhaus.

Through the time-consuming process of disassembly, Hoffman, Quick and Trent learned the frustration and difficulty inherent in repurposing a material that has been optimized for a single use. For example, removing the ring shank nails from the pallet lumber proved tedious, and often resulted in split boards. The solution they arrived at was to cut the boards off of the pallet frame, sacrificing some length, but streamlining the construction process. The team wrote of their entry:

Sustainability poses the question of how can we use recycled or reclaimed materials in place of new ones? Using the Town of Blacksburg as a model for application, we took a discarded item, the pallet, and looked toward designing something that was lacking in the town. The idea for a bus stop shelter arose from the Blacksburg Transit stops that lack shelter. While the larger stops have shelters, the intermediate stops have none, leaving the riders exposed to the weather. The driving force behind the bus stop shelter is to let the language of the pallet dictate the design, how the components interact, and what function each serves. Stringers are the structure; slats hold the structure together. With a bus stop shelter composed



Image 6_Pallets Reused in a Modified Form by Hoffman, Quick and Trent (source: Logan Hoffman).

Image 7_Pallets Reused in a Modified Form by Ervi (source: Michael Ervi).

Image 8_Hoffman, Quick and Trent's Entry in the "Broadening the Pallet" Competition (source: Logan Hoffman).

Honorable mention in the modified category was awarded to Michael Ervi, who also constructed a bus stop. His entry elevated the pieces of the pallet to a new level of craftsmanship, and, like Catherine Hamner, he placed a limit on himself by using only the wood available from the deconstruction of two pallets. He investigated the potential and limitations of joints created from reclaimed pallet lumber, especially in the articulation of the central support column of the structure. This column was created from several pieces of pallet wood arranged in a cruciform joint to enhance its strength.

Ervi's competition board, which details his construction method and depicts the final result, is reproduced in Image 7. On it, he writes:

The function of a pallet is intended to transport goods in a safe way while maximizing the amount of goods that can be shipped. Staying in context with the function of the pallet, its next use could be to transport people and protect them from the environment. A suspended awning acting as an umbrella offers protection from the rain and sun while maintaining an open air space around its base... The idea of reclaiming the pallet after its intended use makes good sense, however the process of reclaiming the wood tends to be a chore... The process of deconstructing a pallet becomes the departure point of design and helps inform the style of heavy timber construction. The peg or key hole is the primary means of fastening and from that the process I derived consists of drilling a hole around each nail head and simply removing the boards without splitting, cracking or causing disfigurement to the material. The once impossible-to-remove nails are now stuck out far enough to allow room for a large crow bar to remove them with little effort. In the end reusable piles of wood remain and the craftsman style heavy timber shelter utilizes wooden dowels and liquid fasteners to complete its fabrication maintaining a sensitive approach to its original form.

Others in the third-year design lab approached the issue of disassembly at a smaller scale, and in some cases like the stool made by Haley Miller and the bench constructed by Christopher Jewell, the inconsistencies in length and width of the resulting lumber were embraced as a design constraint. The wagon built by Emily Clark took the position of pallet lumber as raw material for a new object. These three projects are depicted in Image 9.

The individuals and teams who entered the "Reuse of Pallets in Full Form" and "Pallets Reused in a Modified Form" categories found themselves up against a particular challenge. The college's wood shop does not allow the working of pallet lumber because of the possibility of encountering embedded metal such as staples or nails, which could potentially result in injury to students and damage to expensive machinery. Moreover, the pallets are often treated





9 Image 9_Pallets Reused in a Modified Form by Miller, Jewell and Clark (source: Elizabeth Grant).



10 Image 10_Reused Pallets in a Work of Art by McGrath (source: B. Casey McGrath).



11 Image 11_Reused Pallets in a Work of Art by Pedro (source: Jillian Pedro).

Reused Pallets in a Work of Art

Two students in our third-year design lab placed within this category with conceptual works that challenged the potential embedded within the pallet. Casey McGrath, who received second place in the art category, interpreted the dictum to reuse the pallet in the competition as metaphor for the dictum to reduce, reuse and recycle in the built environment. His literal “framing” of distressed pieces of pallet lumber, shown in Image10, calls into question the appropriateness of the premise of the competition itself.

The adjacent distressed copper plate showing the lifecycle of both humans and buildings is, in his words, “a commentary on sustainable design and the process/decay of a building”.

His entry reads:

The argument is a question of whether or not it's really worth the time, money, and effort to focus on sustainable design, or “green architecture”. Does the end justify the means? Will this approach to design really prolong the lifespan of the building? Is it our job or concern as artists and designers to address these questions? Or should we be more concerned with the aesthetics of design—creating something beautiful?

Jillian Pedro also interpreted the deconstruction of a pallet in a metaphorical sense. She took a typical pallet and cut it in two, then painted the larger portion with an “antique” phone with a cord and the smaller portion with a cell phone. The entry was intended to dematerialize the pallet and give it a new role as performance art which made reference to the ephemeral nature of our material culture. The relationship between the old and new phones can be construed to be a commentary on the rapid evolution and disposable nature of much of our material culture, which can be extended to the pallet itself as a participant in the commercial process.

She wrote the following hypotheses about the impact of her work:

Deconstructing a wooden pallet and giving it an identity to stand, sit, talk and listen with digs below its surface function of storage and transportation. The abstraction leaves an impression on the public and provides inspiration for innovation as well as a social interaction for community improvement.

Pedro's entry points to a peculiar difficulty with repurposing familiar materials in an unfamiliar way. Cognitive dissonance is created when our perceptions of commonplace items are shifted, and Pedro used this to her advantage in developing her art piece. Ironically, in an attempt to test her theses about the public's reaction to the work, she left it in a public place to be manipulated in the way hoped for in her narrative above, and it went missing. In a way similar to the work of Architecten 2012, Pedro showed how a piece of “trash” can be transformed into an engaging, perhaps even desirable, object when the designer intervenes to give it a new life.





Image 12_Pedro's Missing Entry in the "Broadening the Pallet" Competition (source: Jillian Pedro).



Conclusions_

A strong argument can be made that wood pallets finding their way into a community should be placed back into the commercial shipping stream for reuse when in good condition, or, where practical, be used as fuel or ground for mulch when they are too damaged to serve their original purpose. Unfortunately, however, many pallets do not end up serving these needs, and instead end up in a landfill. The "Broadening the Pallet" competition's aim was to elevate these pallets to their highest and best use. The students' struggles with reclaiming pallets helped them understand the effort needed to work with reused materials in lieu of new materials. Their experience was a microcosm of the larger world of adaptive reuse they will engage when they graduate and enter a design field full of such opportunities. The students learned the limitations of reused materials, and developed a rigorous working method to handle these limitations. Those who were most successful found resourceful answers to issues of connection, structure and envelope, key to their development as architects. Interestingly, many of the students took on projects relating to issues of sustainability not explicitly contained within the competition brief.

The urban garden, the bus stops, the bike rack, and the public art project all address fundamental needs of a rapidly urbanizing world. It is our hope as educators that as cities are reinvented, and materials enter the waste stream in ever-increasing rates, the next generation of architects armed with innovative ideas and the skills to implement them will find ways of converting this waste into purposeful, inventive designs that are sustainable in all senses of the word.

Acknowledgments_

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