

Faster Better Cheaper: Aspiring Architects Take a Stab at the Modular Building Industry

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INTRODUCTION

In a world where the largest growing sector of the population is the poor, and the shrinking population is our traditional client base, how do we as a profession tap into a larger market? That is the practical question. More importantly, what can we as architects do to benefit that largest growing sector in a world of continually shrinking resources?

Many architects, and aspiring architects, are using the current crisis as a means to rethink their roles, redefining themselves as the very agents of change that can help alleviate the economic distress that this current financial condition has wrought on the 90% of the world's population that never interacts with architects. How can we as educators inspire and support these aspirations? How can we build into the academic culture a sense of urgency and an appreciation for what design talent can do in the area of the mundane, everyday environment in which the majority of the world's population must grow and thrive? How do we connect with marketplaces that have the greatest potential to affect larger numbers of people, like the modular building industry? For many universities the answer comes one studio at a time.

Students and faculty at Portland State University are taking on the ubiquitous portable classroom as a design project of worth in a sincere attempt to make a place for architects and for design thinking in the for-profit marketplace of the modular building industry and as a means for addressing larger issues that affect the greater good.

Architecture for the Greater Good

While social movements in architecture wax and wane, there is a clear and compelling movement in practice and education today toward a more socially responsive architecture spurred by recent conditions. Books, such as *Expanding Architecture*¹, promote the works of architects and educators who use design as a tool to empower underserved communities physically, socially, and politically. The work of many of the individuals and organizations touted clearly predates the current economic crisis and their relevance is made increasingly obvious as a result of it. *Basic Initiative*, *Design Corps*, *The Rural Studio*, and many university-based CDC's leverage student talent and labor in working with low-income sector communities to build housing and community service centers.

Others, like *Architecture for Humanity*, work directly in the public realm to galvanize widespread awareness and public support for international causes like disaster relief. Using media such as the internet, they sponsor international events and design competitions that reach large numbers of the public.

Much of the work of these groups is supported through government funding programs, some through public and private partnerships, and many focus, rightly so, on the betterment of specific communities. The products of some of these endeavors make their way to the private marketplace in the form of the modular building industry as items to be mass-produced. But few have been able to make significant inroads in an industry so driven by market forces to produce ever-cheaper products, in ev-

er-shorter time frames. And yet, mass-production seems the only way to truly reach the masses of humanity that we as a profession need to address.

Housing and the Modular Building Industry

It is the housing industry that we most associate with modular mass-produced construction. The history of this building type has waxed and waned in the United States with the Sears Roebuck kit house model of the early 20th C serving as the clearest historical model that attained significant success selling 70,000 homes. But while many other companies followed and continue to exist, it is the custom wood light-frame construction industry that has dominated the housing market in this country. For many reasons, the versatility of this model has proven persistent and confounds our intuitive belief in the obvious efficiencies that mass-production could provide. We fall drastically behind our European counterparts when it comes to the embrace of modular and mass produced artifacts which strive to address quality while reaching a wider audience and response to societal need. Case-in-point: the extremely popular Ikea *BoKlok* house is available as a kit or modular unit. It is targeted at and priced to appeal to single parent households and fixed-income families in Sweden and neighboring countries.

In this country, mass-production is, for the most part, reserved for the lowest common denominator in home provision. Manufactured mobile and modular homes are the bottom of the barrel when it comes to quality, design and comfort, so much so that to live in one is to be stigmatized. And yet mobile homes are a major provider of low-income housing in this country. In order to supply the lowest income sectors, while maintaining profit margins, they are subject to less stringent building code requirements and are made with substandard materials and poor quality construction. Conversely, it is in the higher end market that modular construction has more recently found some solid ground. Boutique houses by Marmol Radziner and the Anderson brothers stand out as exceptional examples of architects working to truly embrace modular construction. While they may find efficiencies in their methods, their clients are clearly not those of modest means. Even the Michelle Kaufman houses, so well-promoted by *Dwell* magazine are targeted at middle to upper middle income brackets and remain unaffordable for most Americans.

Disaster Relief and the Modular Building Industry

It is in the provision of housing for disaster relief where the need for efficiency, mass production and expediency truly converge. Each new tragedy mobilizes designers and many innovative solutions are put forth. A number of them are built but generally in disappointingly small numbers in comparison with the magnitude of the need. By and large the answer to housing those left homeless continues to be the infamous FEMA trailer, known for its toxicity and for its failure to address any options for permanency. Some notable examples of alternative solutions have found some success in the marketplace. Home improvement giant, *Lowes*, now offers a kit of parts for building the competition winning *Katrina Cottage*.

Portable Classrooms and the Modular Building Industry

With heightened awareness of weak student performance in this country, decaying school facilities and nationwide calls for the "greening" of our schools, comes renewed attention to the persistent phenomenon of the portable classroom. Recently, designers have made significant strides in bringing to market beautifully designed, sustainably produced and sustainably performing alternatives to the current portable. *Project FROG* and *Gen 7* have products on the market far superior to the status quo. While they are good long-term solutions, they cannot, and arguably should not, compete with current price points on portable classrooms. As such, they may make exciting additions to some fortunate schools, but they will not be able to serve in the sheer numbers necessary to address the magnitude of the problem in this country.

Is there is a middle ground? A better product, by degrees, greener, more attuned to human comfort, more aesthetically appealing, that could find more immediate acceptance in the industry and in the marketplace? There is no question that competing in economic terms with the current model is clearly difficult. But how close can we come?

PSU AND THE PORTABLE CLASSROOM

At Portland State University, architecture students and faculty see that, while the plight of the portable classroom may not merit the immediate call-

to-arms that life-saving, disaster relief deserves, it portends an equally emergent crisis with respect to education in our nation.



Figure 1: Typical Portable

These mass-produced containers for teaching the youth of this country are the much-maligned FEMA trailers of the Katrina fiasco, unhealthy, uninspired, and unsustainable. Never the less, they are the spaces in which a great percentage of students in the US are schooled, six million in fact.² In Portland, Oregon alone, portable classrooms in use number in the thousands. Many of them are approaching their 70's and 80's in terms of age. So much for the "temporary" in "temporary classroom." They are intrinsically permanent solutions to the overcrowding created by uneven fluctuations in enrollment and our collective failure to provide reliable and reasonable funding for our public schools, and they are here to stay. Our mission at Portland State University is to work with both the manufacturers and the school districts to find real solutions that, while they may fall short of winning big points in architectural competitions, will address and respect the challenges to which all parties involved are susceptible and will provide healthful and engaging spaces that contribute to the educational experience they are meant to house. At the same time, this challenge provides us an opportunity to examine our ignorance of the possibilities in architecture for quality mass-production that enhances the physical environment while addressing social and societal inequities.

Our field suffers from a tendency to elevate one application of our knowledge – building design – over all others, evident in the awards programs we run, the feature stories we publish, and the studios we emphasize in school.³

Process

The following studios and Symposium were supported by a grant from the Center for Sustainable Processes and Practices at PSU.

Three simultaneous studios looking at different issues related to portables, became potent vehicles for promoting social responsiveness in architectural education at PSU. Unlike any previous studios, they required students to operate as partners in a research based, multi-disciplinary, collaborative enterprise to develop a socially responsive yet sound business model - not a typical skill set for most students of architecture. The entire process is obviously beyond the scope of a typical quarter and is expected to unfold over a longer time frame to cover research, design development, funding acquisition, and the creation of a full-scale prototype in partnership with a local manufacturer.

The students enrolled in these particular studios helped organize and participated in a two-part symposium sponsored by PSU and AIA Portland entitled *Learning Activism*. The symposium was intended to promote the idea of architecture for the public good as a form of activism and drew participants from all related fields. The first day of the Symposium consisted of panel presentations by national and local figures in the field of public architecture such as John Peterson (Public Architecture), Danny Wick (Rural Studio) and Sergio Palleroni (Basic Initiative), among others.

The second day provided participants an opportunity to become activists on an important local issue if only for a day. The topic chosen was *Re-Imagining the Portable Classroom* and it took the form of an all-day charrette. Participants were presented with the issues at the heart of the debate on portable classrooms in Portland, Oregon, and then worked in groups to develop ideas, sketches and suggestions for their improvement. Participants included representatives from two leading modular manufacturers from the area, school district administrators, teachers, behavioral psychologists, architects and engineers. PSU and UO (University of Oregon) students acted as moderators for the speaker sessions and as resources and recorders for the charrette groups.

In addition, students visited and interviewed the students and teachers learning in portables in area

public schools, conducted surveys and observed the use of these classrooms. They met with behavioral psychologists to understand how children, in particular, are affected by natural light, sound, views and access to nature, concerns that are currently getting more press through the “biophilic” movement. They spoke with educators about current thought on new curricular models, such as *The School of One*. Students toured manufacturing facilities for portables and were required to look at them from the standpoint of design, economics, construction and transportation efficiency. This experience served to make students more aware of the conditions and pressures under which manufacturers operate and which play an important role in defining the product that gets to the market.

Findings

Some important findings made evident through this kind of multi-disciplinary approach had to do with infrastructure-related issues and funding roadblocks. These issues are at the root of why schools are driven to resort to the current model. It is shocking to learn, for instance, that in Portland, the purchase and installation of a portable classroom costs the school district approximately \$300,000-350,000 for a two room unit. Could a decent permanent addition be much more? The unit itself represents less than half of that cost. The rest is lost in “soft” costs and expensive “permanent” infrastructure for what is presumably a temporary installment. These include the cost of poured concrete spread footings that are required by code in Oregon’s seismic zone, bioswales for water management, stairs and ramps. These alone represent a significant investment that is lost if the portable is actually *made portable* and moved to another site where the need might arise. For these reasons, not surprisingly, these structures rarely move even though their portability could better address the fluctuating enrollment issues they are meant to address in the first place. In addition, funding sources are a major driver. Tax-averse Oregonians have failed to pass bonds that would approve needed capital investments in their ageing school building stock. Portables, on the other hand, are funded from maintenance and operations budgets and are, therefore, the only means by which facilities can be expanded. As a result, the future for portables looks long and healthy. Awareness of these issues presents potential opportunities for cost saving solutions.

EXPLORATIONS

The studios were divided into groups addressing different but related questions with respect to portables. In general, most of the solutions proposed could be readily implemented given the proper economic and industry incentives. Other solutions represented innovative directions that would require greater up-front research and development for longer term efficiency and potentially greater return. They were conducted with continued participation from many of the representatives from industry and the school districts as well as other professionals who took part in the symposium.

Infrastructure as Hub

These students focused on the “permanent” infrastructure investments that are currently required for the installation of a single portable. They proposed that these permanent structures could act as hubs whereby multiple units could be “plugged in.” Services could be brought to these central locations and shared across a number of units generating a significant cost savings. These hubs could also act as common spaces and adapt to the addition or withdrawal of the portables forming a community of classrooms.

Upgrading the Model

Students in this group chose to accept the general constraints that define current portables including building structure and dimensions while offering modest but significant improvements. They implemented many of the suggestions that surfaced during the charrette process including modifying the roof outline for enhanced daylighting and ventilation, alternative heating and cooling strategies and unit arrangements that enhanced shared outdoor spaces.

True Portability

Those solutions focusing on true portability tended to look towards more innovative if less readily adaptable solutions. Most of those attempted to rectify difficulties associated with infrastructure costs by introducing the potential use of a steel chasis and helical pier foundations as ways to minimize cost associated with extensive concrete pours. In addition, they explored possibilities of expandability, designing smaller, easily shipped units that,

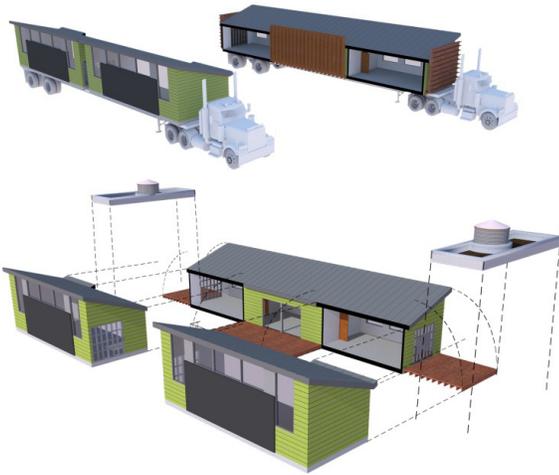


Figure 2: UPGRADE, Green, Bardawil and Churchill

once on site, could be expanded or added onto to increase size.



Figure 3: DROPBOX, Tomasini

Designing for Permanence

In looking at structures that could survive greater permanency, a number of promising directions were explored. All solutions were responses to the following observations regarding current portables: Current portables are rarely relocated, they are not built to last and most are stand-alone (double) units,

which must incur the high cost of infrastructure (foundation, services and rainwater management) each time a new unit is added. These solutions exploited the “permanent” infrastructure requirements to provide structures that, while modular in construction, offered a sense of permanency, materially and aesthetically, and promoted an educational model that could grow and adapt over time.

Step 1
Combine 2 Classroom Moduls



Step 2
Add & Orient Clerestory so Windows face North or East to Combined 2 Classroom Moduls.



Step 3
Add + Modular (Wet / Utility / Break Out / Project Space) with Outdoor Deck & Water Cistern



Step 4
Complete 2 + Modular School



Step 5
Add more Wet / Utility / Break Out / Project Spaces & Reverse Orientation for Gray Water Collection



Step 6
Add more Classroom Moduls and Small Connecting Moduls as needed.



Figure 4: +TWO, Hutchings, Oun

Adapting already existing portables

In exploring how already existing portables could be modified, students created a physical catalogue of ideas and tools that could be distributed to teachers and administrators. The catalogue outlines simple DIY construction projects as well as pinpoints existing tools and equipment already on the market that could help to rectify conditions such as poor natural ventilation and daylight, insufficient wall & and storage space as well as addressing aesthetic considerations.

CONCLUSION

The expected outcome of this process is the production of a full-scale prototype fabricated in part-

nership with local modular building manufacturer, Blazer, who has been participatory in this process from the preliminary stages. While it might be natural to expect some hesitancy on the part of industry to work with architects, particularly with student architects with little experience, we have, in truth, encountered a great deal of support. Manufacturers are aware of how their products are perceived by the general public and are sincerely interested in working toward improving them, but their constraints and priorities are not obvious to us. As in any collaborative process, the relationship must be one of mutual respect and exchange of knowledge. The involvement of students may in fact eliminate the potential perception of imposed agenda that inevitably accompanies outsider involvement in another's territory. In this case it is clear that the students are learning a great deal from industry participation and are not reticent to admit it. However, concerns about working with the private for-profit sector on our part do exist. The question must be raised; as an academic institution concerned with providing an educational opportunity rather than seeking remuneration, are we simply providing free labor and design talent to companies for their own financial benefit? What opportunities exist for practicing architects in this scenario?

Lastly, it is important to note that this exercise serves to express to the next generation of architects that the enticing, formalistic exercises that still make up the majority of design education in this country do not represent the range of possibilities for practice in the field nor do they give voice to the more pressing concerns we should be addressing as designers. The good news is that students of today are keenly aware of the dire situation we as a global society find ourselves in with respect to the environment and to issues of social justice, and are not the hard sell we envision them to be.

Endnotes

1 Bell, Bryan and Wakeford, Katie, *Expanding Architecture: Design as Activism* (Los Angeles, CA: Metropolis Books, 2008).

2 Architecture for Humanity (2009). *Open Architecture Challenge: Classroom*, Retrieved from <http://openarchitecturenetwork.org/competitions/challenge/2009>.

3 Fischer, Thomas, "The Once and Future Profession," *Archvoices*, *AIA Online*, 2002.