

# The Affordable Housing Workshop: Where Were the Architects?

RON DULANEY, JR.  
West Virginia University

## INTRODUCTION

There are many recent examples of architects working to improve the quality of affordable, single-family housing in the United States. Numerous architecture schools are now designing and building single family homes. Several design initiatives in response to the housing crisis resulting from Hurricane Katrina highlighted architects' efforts to improve the quality of single family housing along the Gulf Coast. A number of design competitions have helped to focus architects' attentions on improving the quality and performance of affordable housing. So it was noteworthy that architects were absent from the list of "local and national community development and design professionals" invited to speak at an affordable housing workshop recently hosted at my university. The workshop focused on owner-occupied, single family housing. How could architects be omitted from an event organized to "discuss trends, innovative approaches, best practices, and challenges in affordable and attainable housing" in light of the recent, sometimes highly publicized contributions of our practices in this area of work? The possibility that this particular omission was an exception was quickly dispelled as the result of reviewing publicity materials for similar, recent events across the country. This suggests that architects have yet to convince many within the affordable housing community of the value of their disciplinary contribution. In the United States, architecture has generally conceded to other disciplines the issue of affordable, single-family housing thus situating it in a world, perhaps parallel, but apart from architecture. Now as architects strive to positively affect affordable, single-family housing, it

is our responsibility to make our relevance evident within this parallel world. This may be achieved through greater realization of the research potential of design. The benefit to architects is that they could more effectively and broadly contribute to improvements in the quality of affordable, single family housing. The omission of architects at events such as the affordable housing workshop at my university might then become as noteworthy to other disciplines engaged with providing affordable housing as it currently is to architects.

## A SOCIO-ECONOMIC PROBLEM

Architecture has traditionally operated on a cultural field while the matter of affordable housing has been an economic problem or opportunity. This fundamental difference made it easy for architecture to leave affordable housing to the labor of other disciplines. At United States universities, even those with architecture programs, it is common to find Housing Studies situated within academic units such as Public Administration, Urban Planning, Finance, or Family and Consumer Sciences. While there are instances during the 20<sup>th</sup> century when architects worked to address affordable single-family housing, their housing proposals were generally components of utopian visions. In the United States the broad, socio-economic impact of such proposals on providing low to moderate income housing has been limited even though rightfully celebrated for architectural achievements. One is reminded, for example, of Frank Lloyd Wright's Usonian houses designed to be affordable for moderate income home-owners. To Wright, like Thomas Jefferson before him, home (i.e. land) ownership exemplified the political cul-

ture of the Republic. It was not merely a matter of economics and finances.

The basis for the housing workshop hosted by my university was that “creating opportunities for home ownership is one way this country can stabilize our economy.” Perhaps architects were not participants because they can do little to affect the macro-economy to which they themselves are highly subjected. However architects can, through design, affect the affordability of housing. What appears to be challenging for architects, however, is the achievement of affordability. When affordable house projects are published, little data is provided beyond photographs, a design drawing or two, and the occasional list or general description of major systems, materials, and products. While informative, such publications neither individually nor collectively reveal disciplinary knowledge on the subject. Knowledge remains personal or proprietary. Greater specificity about a body of projects would support the building of a disciplinary knowledge from which general design strategies and further innovations could be developed. This would permit the profession of architecture to more effectively improve the quality of owner-occupied affordable housing and would provide empirical data in support of design strategies and decisions likely to contribute to innovation. To change the *status quo*, architects must act with the gravity of a profession. We must make it evident that proposed changes resulting from design would result in qualitative improvements without adversely affecting financial affordability.

**TARGETING AFFORDABILITY**

Affordability is the most restrictive parameter in the design of affordable, owner-occupied housing. It may also be the most perplexing to address on

a broad scale by architects. The primary variables that must be considered in achieving affordability through design include household income and the Area Median Income (AMI) associated with a statistical area within which the house will be situated. Secondary variables include mortgage lending terms, tax and insurance payments, and subsidization by governmental and nonprofit housing organizations. Utilities, upkeep, and appreciation contribute to maintaining homeownership.

Income category:	Household income must not exceed:
Moderate Income	120% AMI
Low Income	80% AMI
Very Low Income	50% AMI
Extremely Low Income	30% AMI

Figure 1: Household Income Limits per Income Category as a Percentage of Area Median Income (AMI); Data Source: HUD

The U.S. Department of Housing and Urban Development’s (HUD) definition of affordability is for a household to pay no more than 30% of its annual income on housing.<sup>1</sup> When targeting affordability then, the immediate question is for whom will a house be affordable? HUD categorizes a household income based on its relationship to the Average Median Income<sup>2</sup> of the geographic area in which the household exists (Figure 1). A factor for the number of persons living in a household is applied to the AMI to adjust income limits for each category. The default limit is based on a four person household.<sup>3</sup>

The AMI is based upon Census Bureau data and updated annually. In metropolitan areas, an AMI is established for the entire Metropolitan Statistical Area (MSA) whereas in non-metropolitan areas the AMI

Area	2009-2010 HUD Area Median Income	Annual Affordable Housing Cost Limits for each Income Category			
		Moderate	Low	Very Low	Extremely Low
<<County>> - low	\$43,100	\$15,516	\$10,344	\$6,465	\$3,879
<<Metro Statistics Area>> - high	\$102,700	\$36,972	\$24,648	\$15,405	\$9,243
<<State>> (for comparison)	\$48,400	\$17,424	\$11,616	\$7,260	\$4,356
U.S. (for comparison)	\$64,000	\$23,040	\$15,360	\$9,600	\$5,760

Figure 2: Example of Variation in Annual Affordable Housing Cost Limit per Income Category, 2009-2010 HUD AMI, West Virginia; Data Source: HUD

is established for each county. HUD's limits are subject to review and adjustment by the United States Department of Agriculture (USDA) in rural areas.

To exemplify what this means in my home state, the affordable housing cost limit in each income category for a four person household has been calculated based on 2009 statistics for counties or MSAs with the highest and lowest median incomes in my state (Figure 2). While state and national median incomes are not used by HUD, they are provided for the purpose of demonstrating the range of housing cost limits – i.e. affordability.

According to the latest published five year *West Virginia Proposed HUD Consolidated Development Plan*, "there is a significant need for decent, affordable, owner-occupied housing" in the state. According to the proposed plan, "no owner-occupied housing units in West Virginia would be affordable to households with incomes below 30% MFI." It should be noted that the area in West Virginia with the highest AMI is associated with Washington, DC., and this AMI nearly doubles the next highest one. The second major conclusion of the report is that severe rental affordability also exists for these extremely low income families. According to the 2000 HUD State of the Cities Database (SOCDB) Comprehensive Housing Affordability Strategy (CHAS) Data there were nearly 52,000 extremely low income West Virginia families in rental housing.

West Virginia's strategic response to these two major conclusions is to prioritize assistance to eligible and qualified public housing (and HUD Section 8 voucher) tenants to become first-time homeowners of single family detached houses. This in turn makes subsidized public housing units available to lower income families. The plan also references a 1998 state report of 83,000 'frustrated' renters – renters who are demographically inclined toward homeownership "but who may be discouraged from doing so due to existing homeownership data." The state views the transition of these 'frustrated' renters to homeowners as opportunities to make more affordable rental housing available to lower income renters.

In West Virginia to design owner-occupied affordable, owner-occupied housing is to potentially design for the broad spectrum of very low to moderate income households. Based on the West Virginia

AMI, monthly housing cost limits for very low to moderate income range from \$375 to \$1,450. Assuming a down payment of 3.5%, a monthly escrow payment in the range of \$100-300/month<sup>2</sup>, a mortgage loan interest rate of 7% paid over 30 years, and \$50-150 per month in utilities, this translates to monthly mortgage payment of approximately \$225 to \$1200 - a house sale price range of approximately \$34,000 to approximately \$180,000 for a four person household. This suggests that owner-occupied 'affordable housing' may be too broad as the subject of architectural design research and too general in describing individual projects and research agendas.

Clearer focus by architects on those affordable housing needs identified through multi-disciplinary collaborative efforts such as State Consolidated HUD Development Plans would provide opportunities to bring our efforts into alignment with broader housing initiatives. For example in West Virginia architects might focus on improving the quality and attainability of moderate income owner-occupied housing in order to move the state's 'frustrated' renters into homeownership or improving the quality and attainability of low income owner-occupied housing to move eligible and qualified public housing tenants into homeownership. Both of these efforts improve opportunities not only for the new home-owner, but for providing better rental opportunities for very low and extremely low income families for whom homeownership is not yet feasible. Such focused, supportive efforts might begin to earn architects a position of relevance among housing professionals on the matter of providing owner-occupied affordable housing. Ultimately, however, we must demonstrate that our efforts are effective. This requires not only a summary of our achievements, but also the data and methodologies that contributed to them, and 'failures' encountered during the work.

## RESEARCH AND DESIGN

Architectural design is the synthesis of multiple design parameters which widely vary from project to project. Thus, design as an activity typically results in a particular, individual product or building. The success of the design of a building may only be fully assessed after construction. In a recent article on architectural research, Stephen Kieran critically observes that "architecture exists in a world where

all we ever do is design and build prototypes, with little real reflection and informed improvement from one act of design to the next (Kieran, 2007). Critically questioning this condition has recently led to a probing within the discipline about how design may constitute research. How do the design activities of the architect generate new knowledge or understanding and thus constitute a valid mode of research? Generally, a primary way architects gain knowledge and understanding of their subject "is through the act of designing itself, and through the experience and interpretation of other designs" (Lawson, 2002). To understand design research, it may be helpful to compare scientific and design methodologies for generating new knowledge or integrating existing knowledge in a new synthesis. An architectural design proposal may be equated to a scientific hypothesis, and the subsequent construction (and post-occupancy evaluations) of the design may be equated to experimental studies in the sciences. However, it "might be thought that the significant difference between the processes of scientific research and design research lies in the repeatability of experiments, and in the full disclosure of data and methodology. Architects, and indeed other designers, do not habitually share such details . . ." (Weinstock, May/June 2008). Architects have traditionally neglected to disclose data and methodologies related to their designs and the subsequent constructions. The result is that design research has remained in the realm of developing personal or proprietary knowledge rather than generating disciplinary knowledge.

### DESIGN AS RESEARCH

In addition to appearing good and fitting well, buildings are increasingly expected to perform and be performed well. Performance as a goal and measure of building suggests the need to inform architectural design with data or evidence. Such data-informed or evidence-based design is expanding beyond the healthcare industry where it was introduced around 2003. In an early description of an 'evidence-based designer', healthcare architect Kirk Hamilton states that "evidence-based healthcare designers make critical decisions, together with informed clients, on the basis of the best available information from credible research and the evaluation of completed projects" (Hamilton, 2004). The need for credible research suggests the need to bring personal and proprietary knowledge

generated through design and evaluation of built projects into the realm of disciplinary knowledge. Knowledge becomes disciplinary through the disclosure of methodologies and the collection, organization and dissemination of data. Repeatability in design research is more difficult to achieve because "each design is an answer to a set of questions and circumstances that are unique" (Weinstock, May/June 2008). It is unlikely that any set of variables related to one project would be repeated exactly in another project. Therefore, neither the need nor the opportunity exists to repeat a synthetic design 'hypothesis' related to a particular set of variables. Architectural design typically results in a 'one off' product. This has traditionally discouraged the development of disciplinary data bases (beyond cost data). Consequently there has been little need or desire for the disclosure of design methodologies.

Within a synthetic design process, individual parameters and variables are interdependent. While they may be isolated for the purpose of observation and interpretation, they may not be manipulated in isolation. Michael Weinstock states that "architectural research is possible, but tends to proceed by incremental advances, and longer term research goals have to be conducted through a series of realized experiments" (Weinstock, May/June 2008). Architectural design research requires data collected from realized projects which equate to the experimental studies of the sciences. In the 1960s Post-Occupancy Evaluation (POE) emerged within architectural practice to diagnose building performance. POE methodologies have more recently been championed and further developed by Wolfgang Preisler (1995, 2001). However, when conducted, POEs are 'additional services' of the architect, and the cost of these services has limited them to commercial projects and for repetitious building programs. Even within this relatively narrow group of applications, the impact of POEs in expanding disciplinary knowledge has been inconsequential due to the lack of dissemination of such studies. The dissemination of data and its analysis will, as Hamilton has suggested, permit the act of drawing "rationale inferences" from data during subsequent design processes.

### OPPORTUNITIES FOR DESIGN RESEARCH IN AFFORDABLE, OWNER-OCCUPANT HOUSING

Affordable single-family housing, traditionally neglected by architects in the U.S., has recently

gained the discipline's attention through widespread publicity of a number of architect-driven affordable housing programs. These include the Auburn Rural Studio (Dean & Hursley, 2002; Moos & Trechsel, 2003), Design Corps (Bell, 2004), and Architecture for Humanity (Sinclair & Stohr, 2006); post-hurricane reconstruction such as the 'Katrina Cottages'; and through awareness increased by numerous architectural design competitions including the 2003 SECCA HOME House Project: The Future of Affordable Housing (D. J. Brown, 2004); the 2004 Cradle to Cradle Home Competition (Diana Brown, 2005); and the 2008 Houston 99k House Competition (Cite, 2008); These efforts have focused on improving the livability and sustainability of affordable single-family homes. Individual design proposals and built projects alike have been celebrated – their appearances well documented. However, the individual design proposals are by architects; therefore, the un-built projects generally remain as untested hypotheses, and the data and methodologies related to constructed projects are rarely disseminated. The three design competitions referenced above serve as cases in point.

All of these competitions included plans to build selected design proposals following a juried award process. The SECCA and C2C competitions received tremendous attention from designers with 440 and 625 design entries respectively. The SECCA competition called for proposals informed by a Habitat for Humanity prototype, utilizing sustainable materials, technologies, and methods, and to be delivered within a building budget of approximately \$65,000 in the Winston-Salem, NC area. The C2C competition called for an innovative and affordable housing solution that respects the character of the surrounding Roanoke, VA neighborhood, is economically viable, and is representative of the thinking represented in McDonough and Braungart's book titled *Cradle to Cradle* (2002). Through juried processes, the SECCA competition merited twenty-five submissions with awards, and the C2C competition merited seven submissions with awards. Strangely, within the available documentation of the design proposals and the jury's process for making the awards, the design proposals were only the most general information and knowledge related to methodologies, materials, technologies, and costs were provided. Ultimately, it seems, the construction would serve as the true test of the merit of these entries. However, a preliminary literature search suggests that,

while design proposals have been built, there is little to no evaluative dissemination of the built projects. Why have methodologies and post-occupancy data related to such high profile proposals not been disseminated on a disciplinary scale, or worse perhaps, not been evaluated?

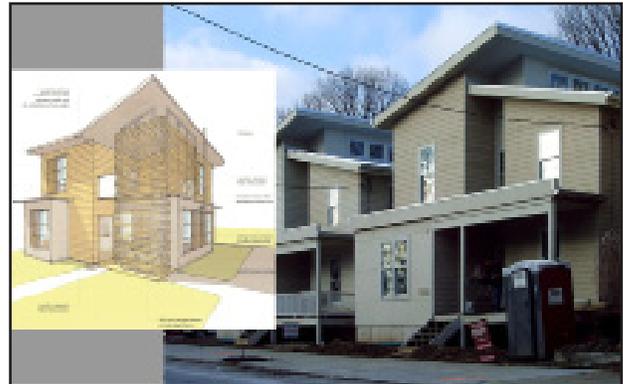


Figure 3: S. Flavio Espinoza's SECCA HOME/House Competition proposal (L) and the as-built project (R)

Through e-mail correspondence, SECCA HOME/ House Project Director David J. Brown was unable to provide information related to post-construction evaluation, but he did state that proposals from the SECCA competition are planned to or have been constructed in Cincinnati, OH and in Wisconsin and provided a contact in Cincinnati. Two 1400 s.f. houses, substantially modified versions of designer Flavio Esponiza's competition entry, were built in Cincinnati on donated land at a cost of \$226,000 each (in 2007). With subsidization by the city, each was sold at a price of \$180,000 (Baverman, 2007). A request by the author for information regarding post-



Figure 4: Coates Design winning Cradle to Cradle Home Competition proposal (L) and the built project (R) signed by Interactive Design Group (IDG)



Figure 5: Hybrid/ORA winning 99k House Competition proposal (L) and the as-built project (R)

construction assessments did not receive a reply, however the project has received LEED certification.

In the case of the C2C competition, a non-awarded 1,600 s.f. proposal was built in 2007 for a construction cost (excluding land) of approximately \$150,000. With subsidization, this house sold for approximately \$95,000 (Law, 2006). In response to a request for information related to evaluation following construction, C2C organizer Gregg Lewis responded that “we feel as though we made great strides toward broadcasting the ideas outlined in McDonough and Braungart’s “Cradle to Cradle” text locally - and internationally. I’m afraid that I cannot offer much more in the way of detail.” It appears that the potential for these hypotheses (the design proposals) and experiments (the construction processes) to generate disciplinary knowledge has so far been unfulfilled.

The recent 99k House competition exemplifies a movement toward assessing the validity of a design proposal. It called for a creative, innovative, and affordable sustainable house prototype for the Gulf Coast region that could be initially built in Houston, TX for \$75,000 and sold for less than \$99,000 including land and real estate transaction fees. Unlike the previous two competitions, the 99k House competition contained two stages. During the first stage, five finalists were selected from 182 entries through a juried process similar to the previous competitions. However, in the second stage each finalist developed construction drawings that served as the basis of a quantity take-off and a construction cost estimate by a professional building contractor. This second phase represented a ‘virtual’ construction whereby the design was translated into construction

methods, material specifications and quantities, and construction costs. This ‘virtual’ construction served as a preliminary test of the constructability and probable cost of each design proposal. The data resulting from this preliminary testing then informed the final selection of a design proposal to be further tested through physical construction. In the winning 1,200 s.f. proposal, the ‘virtual’ construction suggested that certain technologies could not be afforded by the budget, and this information could be factored into the jury process. The final selection of a proposed design in the 99k House competition included the consideration of evidence supporting the validity of each finalist’s entry. The dissemination through publication of the results of this evidence-based selection and design revision process, even though general, provides data applicable beyond the specific proposals of this design competition. While this example limits the evidence to constructability and cost data, it does suggest a movement toward evidence-based design, or design research, of affordable housing. Construction began in October 2008 and was completed during spring 2009. It is too early to assess whether and how methodologies and data resulting from the tests of construction and occupation will be disseminated.

Single family housing is achieved without architects through conventional, low-technology building methods and with the modest yet noble goal of providing basic shelter. Habitat for Humanity homes are good examples. Architectural design competitions are attempts by architects to advance affordable single family housing through design innovation directed at maintaining the affordability of basic shelter, improving quality of life, reducing the carbon footprint, and/or in many cases creating careful relationships between building and context. However, with these competitions, the limited, published information about the built projects suggests a substantial deviation between the stated design goals and the constructed works. Even with such a deviation, the absence of dissemination of methodologies and conclusions related to the experiment (the construction of the work) reinforces architectural design as an individual, isolated act. Greater dissemination would serve as evidence to inform future work and to make “informed improvement from one act of design to the next.” Use of such evidence should enable greater success in aligning the stated goals of a project, a design proposal, and the methodologies and results of constructing

a design. The evaluation of completed projects provides data or evidence upon which future design decisions may be made.

## CONCLUSION

The capacity of architectural design to address broad societal conditions is limited if we approach work addressing such conditions solely within a cultural field and as 'one-off' acts. In an article commenting on the role of architects in addressing housing problems, University of Minnesota College of Design Dean Thomas Fisher states that just as medicine has evolved a public health model focused on addressing the needs of groups of people (in addition to the traditional doctor/patient relationship), so should architecture evolve, in addition to the architect/client model, "a public-health version of our profession" (Fisher, 2006). He calls for architects to address public health issues with architectural implications through developing "accredited programs to prepare students for such work, funded research to develop new forms of housing and infrastructure, and committed practitioners ready to work in the nonprofit, corporate, and governmental sectors focused on shelter and habitat." He goes on to say that architects have much to offer in addressing such crises, "but we cannot address them one family at a time."

While housing is a condition addressed by many disciplines, the architect's approach is synthetic and focused on improving, through design, such characteristics as livability, affordability, and sustainability, while engaging the critical questions of our culture and discipline. The development of better informed proposals in housing design research requires the availability of data (or 'evidence') associated with project-related variables. This data, collected from previously realized projects and made accessible, supports the "drawing of inferences" during the design process. As a discipline, we must develop the disciplinary body of evidence that makes our potential contribution to meeting affordable housing needs irrefutable by the other disciplines engaged in such work. Perhaps then it would seem impossible to hold an affordable housing workshop to "discuss trends, innovative approaches, best practices, and challenges in affordable and attainable housing" without the presence of architects among the "local and national community development and design professionals."

## ENDNOTES

1. For home ownership, mortgage, taxes, insurance, and utilities combined should not exceed 30% of household income.
2. Also referred to as Median Family Income (MFI)
3. The HUD adjustments to AMI for household size are as follows:

Number of Persons in Family and Percentage Adjustments to AMI							
1	2	3	4	5	6	7	8
70%	80%	90%	Base	108%	116%	124%	132%

4. Includes the West Virginia median \$40 monthly /\$457 annual policy, (The Tax Foundation, 2008) for residential property taxes, the average \$55 monthly / \$650 annually (Insurance Information Institute, 2006) for hazard insurance, and \$40 (based on .75% annual rate) private mortgage insurance.

## REFERENCES

- "99K House Competition: Rice Design Alliance and AIA Houston Announce Finalists," *Cite: A Publication of the Rice Design Alliance*: Spring 2008, Issue 74, pp 6-8
- Ahrentzen, Sherry. "Fleshing out green." *Newsletter of the Committee on the Environment (COTE), American Institute of Architects*: Spring 2007. 31 Dec 2008 [http://info.aia.org/nwsltr\\_cote.cfm?pagename=cote\\_a\\_0703\\_fleshing](http://info.aia.org/nwsltr_cote.cfm?pagename=cote_a_0703_fleshing)
- Barcus, H. R., "Assessing Variation in Rural America's Housing Stock: Case Studies from Growing and Declining Areas," in Essex, Stephen J., A W Gilg, & R Yarwood (eds.), *Rural Change and Sustainability: Agriculture, the Environment and Communities* (CABI Press) 2006
- Baverman, Laura, "Green Building Movement Finds a Home in Northside," *Business Courier of Cincinnati*, Oct 19, 2007
- Bell, Bryan (ed.), *Good Deeds, Good Design: Community Service through Architecture* (NY: Princeton Architectural Press) 2004
- Brown, David J. (ed.), *The HOMEhouse Project: The Future of Affordable Housing* (Cambridge, MA: The MIT Press) 2004
- Brown, Diana. "C2C Winners Announced," *Environmental Design + Construction*, Mar 2005, pp 42-45
- Cho, Seong-Hoon, David H. Newman, David N. Wear, "Impacts of Second Home Development on Housing Prices in the Southern Appalachian Highlands," *Review of Urban & Regional Development Studies*, Nov 2003, Vol. 15 Issue 3, pp 208-225
- Christian, Jeffrey E., Page Pate, Phil Childs, Jerry Atchley, "Small House with Construction Cost of \$100K, Total Energy Cost of \$0.88 a Day," *ASHRAE Transactions*, 2006, Vol. 112 Issue 1, pp 269-280
- Dean, Andrea Oppenheimer & Timothy Hursley. *Rural Studio: Samuel Mockbee and the Architecture of Decency* (NY: Princeton Architectural Press) 2002

Dennenberg, A.L.; Jackson, R.J.; Frumkin, H.; Schieber, R.A.; Pratt, M.; Kochtitzky, C.; Tilson, H.H., . "The Impact of Community Design and Land-Use Choices on Public Health: A Scientific Research Agenda," *American Journal of Public Health*, Sep 2003, Vol 93 Issue 9, pp 1500-1508

Evans, Gary W., Hoi-Yan Erica Chan, Nancy M. Wells, Heidi Saltzman, "Housing Quality and Mental Health," *Journal of Consulting and Clinical Psychology*: 2000, Vol. 68 No. 3, pp 526-530

Fisher, Thomas. "The Profession Must Harness its Talents to Address Housing Problems of an Unprecedented Scale," *Architecture*: Feb 2006, Vol. 95 Issue 2, p 72

Flade, Antje. "No Place Like Home," *Scientific American Mind*: 2007, Vol. 18 Issue 1, pp 70-75

Goutsos, Stavros, "A Systems Approach to Sustainable Rural Development: Analyzing and Evaluating the Impact of Environmental Transport Policy in Six European Regions." *Environmental Research, Engineering and Management*, 2004, Vol. 1, pp 4-9

Hamilton, Kirk. "The New Evidence-Based Designers," *Interiors & Sources*, Jan 2004, pp 58-59

Heywood, Frances. "Understanding Needs: A Starting Point for Quality," *Housing Studies*, Sep 2004 Vol. 19 No. 5, pp 709-726,

Kieran, Stephen. "Research in Design: Planning Doing Monitoring Learning." *Journal of Architectural Education*: Sep 2007, Vol. 61 Issue 1, pp 27-31

Koebel, C. Theodore, "Growth Patterns and Rural Housing in Appalachia," *Virginia Issues & Answers: A Public Policy Forum*, Winter 2006, Vol 13, No. 1, pp 2-6

Law, Violet. "First Cradle to Cradle House Built in Roanoke," *Architectural Record News* (online) Jul 12, 2006 <http://archrecord.construction.com/news/daily/archives/060713cradle.asp> accessed 05.02.2009

Lawson, Bryan. "The Subject that Won't Go Away ... but Perhaps We Are Ahead of the Game: Design as Research." *arq: Architectural Research Quarterly* (London; England): 2002, Vol 6 No 2, pp 109-114

McDonough, William & Michael Braungart, *Cradle to Cradle: Remaking the Way We Make Things* (NY: North Point Press) 2002

Moos, David & Gail Trechsel (eds.). *Samuel Mockbee and the Rural Studio: Community Architecture* (NY: Distributed Art Publishers), 2003

Partridge, Mark D., Dan S. Rickman, Kamar Ali, M. Rose Olfert, "Agglomeration Spillovers and Wage and Housing Cost Gradients across the Urban Hierarchy," *Journal of International Economics* 78 (2009) pp 126-140

Prante, Gerald, "New Census Data on Property Taxes on Homeowners," *The Tax Foundation*, Sep 2009, Retrieved Sep 26, 2009 from <http://www.taxfoundation.org/publications/show/25197.html>

Preiser, Wolfgang F.E., "Post-Occupancy Evaluation: How to Make Buildings Work Better," *Facilities*: Oct 1995, Vol. 13 Issue 11, pp 19-28

Preiser, Wolfgang F.E., "Feedback, Feedforward and Control: Post-Occupancy Evaluation to the Rescue," *Building Research & Information*, Nov 2001, Vol. 29 Issue 6, pp 456-459

Sinclair, Cameron & Kate Stohr (eds.). *Design Like You Give a Damn: Architectural Responses to Humanitarian Crises* (NY: Metropolis Books) 2006

State of West Virginia, Executive Summary, Proposed HUD Consolidated Development Plan 2005-2009: Feb 28, 2005. Retrieved May 02, 2009 <http://www.wvdo.org/community/ExecutiveSummary.pdf>

United States Department of Housing and Urban Development, *Fiscal Year Income Limits Documentation System*. Retrieved Sep 26, 2009, from [http://www.huduser.org/datasets/il/il2009/select\\_Geography.odb](http://www.huduser.org/datasets/il/il2009/select_Geography.odb)

United States Department of Housing and Urban Development, *State of the Cities Data Systems: Comprehensive Housing Affordability Strategy (CHAS) Data*. Retrieved May 06, 2009, from <http://socds.huduser.org/chas/index.htm>

Weinstock, Michael. "Can Architectural Design Be Research?" *Architectural Design*: May/June 2008, Vol. 78 Issue 3, pp 112-115

## IMAGE SOURCES

Figure 3 (Left): Brown, David J. (ed.), *The HOMEHouse Project: The Future of Affordable Housing* (Cambridge, MA: The MIT Press) 2004, p 45

Figure 3 (Right): <http://www.building-cincinnati.com> accessed 11.20.2009

Figure 4 (Left): <http://www.cradletocradlehome.com> accessed 11.20.2009

Figure 4 (Right): <http://www.vrstuff.com> accessed 11.20.2009

Figure 5 (Left): <http://www.the99khouse.com> accessed 11.20.2009

Figure 6 (Right): <http://www.djc.com/news/ae/12008790.html> accessed 11.20.2009