

# Community-Scale Evaluation Results

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# COMMUNITY-SCALE EVALUATION RESULTS

## **ABSTRACT**

Using four Building Science Consortium Building America community-scale projects, this paper investigates the nature, strength, and durability of connections between high performance dwellings and developments. There are few inherent or natural links between the two (particularly in the production home setting); the connections must be either imposed (by government entities) or created in the marketplace. Because communities often involve two very distinct players—the developer and the builders—and the project often spans up to 10 years, it is challenging to develop and sustain either an imposed or marketed system with strong and meaningful links between high performance homes and neighborhoods.

An important element in keeping high performance homes and neighborhoods linked is bringing Building America performance criteria into ongoing efforts to develop national green building criteria, at both the building and the development level. Overall, perhaps the most promising approach is to combine certain imposed elements (from the Prairie Crossing and Civano projects) with new quality/value strategies that capture the developer's, the builder's, and the homebuyer's interest. If the developer and the builder have the tools they need to link quality and high performance, the buyer will have no trouble recognizing the value of living in both a home and a community that is lighter on their budget and their environment.

## **KEY WORDS**

Boise, Idaho  
Building Science Consortium  
Chuck Miller Construction  
Civano  
Grayslake, Illinois  
Green building  
Green development  
Hidden Springs  
High performance  
Ladera Ranch, California  
Prairie Crossing  
Pulte Homes  
Quality  
Solar energy  
Terramor  
Tucson, Arizona

## INTRODUCTION

It's not hard to find great examples of green developments — the ones with low impact on the local environment and landscape. It's also not that hard to find really great examples of resource- and energy-efficient homes — the ones designed and built for high performance. But what about projects that have accomplished **both**? And just how inherent are the links between resource-efficient development and structures?

As part of the Department of Energy's Building America program,<sup>1</sup> the Building Science Consortium (BSC) works with production builders nationwide on the design, construction, and commissioning of high performance homes (see side bar). This paper is about BSC evaluation of four of its community-scale projects, searching for the nature, strength, and durability of the connections between high performance development and high performance homes. The four projects are:

- Hidden Springs – Boise, Idaho
- Prairie Crossing – Grayslake, Illinois
- Civano – Tucson, Arizona
- Terramor – Ladera Ranch, California.

The following fundamental questions about these projects yield many interesting answers and more questions:

- What criteria shape the homes and community; how binding are these criteria?
- What were/are the drivers of the project criteria; are they market-based, municipally-required, or both?
- Which communities have sustained their level of energy and resource performance over time, and why?

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<sup>1</sup> For more information on the Building America program, see: [http://www.eere.energy.gov/buildings/building\\_america](http://www.eere.energy.gov/buildings/building_america).













with a top-of-the-line photo-voltaic rooftop system along with a minimum performance 10 SEER air conditioning unit.

**Civano** Civano development and construction are managed by the IMPACT system and the Sustainable Energy Standard. The stated goals of Civano are:

- Reduction of potable water consumption by 65%
- Reduction of home energy consumption by 50% over the 1995 Tucson Model Energy Code
- Reduction of internal vehicle miles by 40%
- Creation of one job onsite for every two residences
- Reduction of landfill-destined solid waste.

As Pulte Homes took on the role of Master Developer at Civano, a new Revised Civano Memorandum of Understanding and revised IMPACT system has been instituted.<sup>20</sup>

Section 5, “Specific Procedures for Implementation,” lays out both the Master Developer requirements prior to issuance of building permits, and building plan requirements and review. The latter requires the builder to:

- certify energy efficiency — 50% reduction over the 1995 Model Energy Code).
- design for passive solar — orientation for passive heating and cooling.
- incorporate solar energy device — this includes any dedicated solar energy system for heating, cooling or hot water; active or passive (such as a trombe wall).
- landscape and hardscape for low average albedo — .5 or greater average reflectivity.
- submit construction waste management plan that includes recycling.
- make all homes “solar-ready” in terms of structural and plumbing.
- install solar systems on all model homes.

Section 7, “Certification of Compliance,” establishes the following compliance mechanisms:

- Annual Monitoring report by Developer
- Developer-selected professional certification
- City audit option requiring developer documentation of compliance
- Non-compliance process hinging on building permit approvals
- Process for moving compliance from Developer to City determination

Finally, Section 10, “Non-Waiver of Compliance,” ends the MOU with a twist:

“Except as may be expressly agreed upon in writing, any decision by the City approving further development without complete compliance with all requirements and targets shall not constitute a waiver of any future application of requirements or Performance Targets...”

In a sort of backhanded way, this section appears to give the City of Tucson the option of **not** fully applying the Civano IMPACT system.

<sup>20</sup> “Civano IMPACT System Revised Memorandum of Understanding on Implementation and Monitoring Process” is dated December 8, 2003 ([http://www.civanoneighbors.com/docs/guiding/revised/Civano\\_MOU\\_Dec\\_8\\_2003.pdf](http://www.civanoneighbors.com/docs/guiding/revised/Civano_MOU_Dec_8_2003.pdf)).

## Summary of the Nature, Strength and Durability

So where do these four exemplary community-scale high performance projects leave us?

- In all four projects, links between high performance land development and high performance homes were imposed, not inherent. While there are some natural links that are possible — such as district heating, community greywater systems, street and lot layout for solar orientation — these links are almost always at the infrastructure-level and are better suited for multi-family and cohousing developments than the American mainstay: the single-family detached home.
- Many if not most land development-level features of high performance communities are high visibility — conservation areas, bike paths, community centers, mass transit connections. Many if not most building-level features of the same communities are, at least initially<sup>21</sup>, low visibility or even invisible — energy performance, indoor environmental quality, durability.
- Municipally-based requirements and compliance mechanisms are necessary but not always sufficient elements of imposed connections between high performance buildings and community development. Only the two projects with municipally-imposed linkages — Prairie Crossing and Civano — demonstrated any strength and durability in terms of their criteria, and even these projects' linkage systems have been stressed over the course of the projects.
- Both developer and institutional memory are needed to sustain original project objectives and performance goals. Since most community projects last up to a decade or more, the staying power of even legally binding systems can be eroded by the inevitable “changing of the guard.”
- If the buying public (as market-guided by the Developer) and the general public (as public conscience-guided by local government) do not “get” the connection between high performance land development and high performance homes, then the economic pressures on both the developer and the jurisdiction can erode the rigor of imposed connections.
- The businesses of land or community development and home building seldom have inherent connections — the business entities that have the technical and the marketing skills for both land development and home building are remarkably small in number.

## WHERE DO WE GO FROM HERE?

There are really three issues at stake for high performance community-scale projects:

- bringing real high performance building criteria into mainstream green building;

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<sup>21</sup> By initially, the author means prior to home purchase.

- making the links between green development and green building bombproof;
- creating truly effective marketing that makes a value connection between high performance land development and high performance homes.

**Moving High Performance into Green Building** While there is movement within the residential green building industry towards a building science base, only one program in the country has embraced the Building America high performance approach in entirety — the Central New Mexico Building America Partner Program.<sup>22</sup> And even the most successful high performance builders struggle with the lengths to which they must go to informationally market the consumer benefits of high performance — lower energy costs, greater comfort, superior indoor air quality, reduced maintenance, increased service life. A national program, with the technical approach of the Energy and Environmental Building Association (EEBA)<sup>23</sup> and the market vision of the United States Green Building Council (USGBC),<sup>24</sup> is needed for significant penetration among homebuilders and homebuyers.

It makes little sense to pack photo-voltaics on the roof when a minimum performance 10 SEER AC unit chugs along just beneath them. It makes little sense to give green building credit for “40-year” asphalt shingles when lack of systems-thinking is leading to moisture accumulation and rot in the roof sheathing just beneath them. It makes little sense to give credit for low-formaldehyde cavity insulation and provide no outside air dilution (through mechanical ventilation) for the same pollutants. These are neither fictions nor anomalies — the green building marketplace abounds with just such examples. For its own sustainability, green building must embrace the principles of systems thinking and high performance.

**Bomb-proof Links** Civano and Prairie Crossing have elements, that when put together, may constitute the best approach for imposing links between high performance land development and buildings. The Civano IMPACT system is thorough and rigorous, establishing a good balance between developer and government responsibility for sustained performance. The all-or-nothing building science-based performance building code from Lake County, if coupled with training for both the builders and the building officials, delivers high performance homes. It would not hurt if communities seeking to link high performance land development and buildings had a national model program to which they could refer. The United States Green Building Council is currently developing a LEED for Neighborhood Development (LEED-ND) that could be coupled to a high performance residential green building program.<sup>25</sup>

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<sup>22</sup> For more information on this program, see: <http://www.bapartner.org>. Another program, Built Green Colorado, is moving their program toward a building-science basis; see .

<sup>23</sup> For more information on EEBA, see: <http://www.eeba.org>.

<sup>24</sup> For more information on the USGBC, see: <http://www.usgbc.org>.

<sup>25</sup> LEED stands for Leadership in Energy and Environmental Design.

But ultimately, if the general and home buying public does not understand and demand high performance development and buildings, imposing a supply is never as successful as developing a demand.

**Creating Market Demand for High Performance** The current economic pressures imposed by low energy costs — for both home operating and product manufacturing costs — are simply not great enough to market high performance on the back of energy alone. But what if the value of energy efficiency, indoor environmental quality, comfort, and durability could be made strikingly visible?

A relatively new economic approach currently being employed by the military may provide guidance — Public/Private Venture (PPV) housing. PPV is a partnership between a private company and a branch of the US military in which the private company agrees to own, construct, maintain, renovate, and manage housing for an extended period of time, often as long as 50 years. Imagine — the builder now looks at every element of his product (the home) for its overall performance — its contribution to initial **and** 50-year operating costs. All of a sudden, high performance becomes not only attractive to the builder, it becomes imperative. But PPV is for the military — a special type of housing situation. How can this same approach be used to capture both the builder and the homebuyer in the open market?

Sometime in the future, developers and builders may expand the view of their businesses to embrace communities and homes as a stream of services, rather than a one-time product. To do this, they will need to gain control, much as military housing contractors within the PPV need to gain control, over both the initial and operating costs of homes. The economic engine that can drive this is the guarantee—it is currently being used by home builders for energy operating costs and comfort,<sup>26</sup> and could be extended to cover all manner of operating and resource costs—water, maintenance, even some aspects of transportation costs for the homeowner (moving the realm from the structure out to the community development level). The beauty of the guarantee is two-fold:

- It instills total quality — quality of design, quality of materials/components, quality of workmanship/installation. The guarantee forces participation and coordination along the entire construction process and among all of the players.
- It delivers simple and clear value. It moves resource-efficiency and high performance from complex and altruistic to straightforward and marketable.

## IN SUMMARY

There are few if any inherent links between high performance dwellings and development — the links must be imposed or created. These four Building America projects have revealed both a history of, and a need for, approaches

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<sup>26</sup> An example of a guarantee program is the MASCO Environments for Living (EFL) program; see: <http://www.eflhome.com>.

that link high performance dwellings and developments. It is likely that a combination of imposed public sector (the Civano IMPACT system and Lake County alternative building code) and marketed private sector (guarantee programs) tools are needed to make the resource efficiency of buildings as tangible and as visible as the resource efficiency of land development, creating the link between the two for the homebuyer.

The structure of the residential building industry reflects the difficulty in linking high performance dwellings and development — the developer and the builder are almost always different business entities, with different skill sets, obstacles, and opportunities. The one thing that unites them is the buyer — ultimately, they both need to attract homebuyers.

Quality is the one issue that can unify the developer, the builder and the buyer. All three entities understand and value quality. Extending the general issue of quality to include environmental quality is perhaps the simplest and most direct way to link high performance dwellings and development. In other words, a green home must be a quality home, a green development must be a quality development. Any entity—government agency, non-governmental organization, builder, developer — interested in accomplishing comprehensive and real environmental gain should look to performance measures and metrics that capture resource efficiency in the context of quality. It is a fit that builders and developers can sell, and consumers will buy.

## About this Report

This report was prepared for the US Department of Energy's Building America Program. The report is freely available to the public at [www.buildingamerica.gov](http://www.buildingamerica.gov).

## About the Author

**Joseph Lstiburek, Ph.D., P.Eng.**, is a principal of Building Science Corporation in Westford, Massachusetts. He has twenty-five years of experience in design, construction, investigation, and building science research. Joe is an ASHRAE Fellow and an internationally recognized authority on indoor air quality, moisture, and condensation in buildings. More information about Joseph Lstiburek can be found at [www.buildingscience.com](http://www.buildingscience.com)

Direct all correspondence to: Joseph Lstiburek, Building Science Corporation, 70 Main Street, Westford, MA 01886

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