



**BUILDING AMERICA CONSORTIA
AND
NATIONAL LABORATORY
STATUS REPORT**

July 2009

IBACOS®
| Home Quality + Performance |

MONTHLY STATUS REPORT, July 2009

Cooperative Agreement DE-FC26-08NT 02231

Prepared by IBACOS

I. CURRENT PROGRESS AT EACH GATE LEVEL

Task 2

Gate 1A – *Expected Whole-House Energy Savings and Cost Targets*

- IBACOS conducted TRNSYS modeling on a 2x8 wall system with 2” insulating sheathing. The modeling showed that a version of the wall system with a single top plate saves 10 kWh/year in heating and cooling energy usage over a version with double top plates.
- IBACOS completed TRNSYS modeling to define the thermal performance and comfort implications of leading, high performance window systems. It was assumed that each window was mounted in an exterior position in a 2x8 wall system with 2” insulating sheathing. The windows that exhibited the best performance were (in order of decreasing energy efficiency):
 1. Owens Corning Solace KR90 unit with a National Fenestration Rating Council (NFRC) rating of total U-value = 0.17 Btu/hr-ft²-F; (SHGC) = 0.16
 2. Serious Materials 501 unit with NFRC rating of total U-value = 0.22 Btu/hr-ft²-F; SHGC = 0.33;
 3. Gorell unit with NFRC rating of total U-value = 0.25 Btu/hr-ft²-F; SHGC = 0.27

From the TRNSYS modeling, IBACOS derived a whole-house Thermal Comfort Performance Index (TCPI) for each window. The windows that were the leaders in energy efficiency were also the leaders in the TCPI value.

- The Serious Materials 501 Series has emerged as the favorite window based on the latest incremental construction cost and energy savings information. This window has a cost vs. energy savings ratio of \$0.41/kWh, or 23% better than the next best window evaluated, the Solace KR90. IBACOS based the energy savings information on EnergyGauge USA modeling and compared it to the base window that was used (U-value = 0.33, SHGC = 0.30).

Gate 1B – *Systems Evaluations and Specifications*

- The field test at The New American Home 2009 in Las Vegas, NV continued taking measurements related to the gas engine-fired mini-split heat pump system, and the gas-fired tankless water heater.
- The wall mock-up research continued in the IBACOS facility. Four different fasteners were used to attach the exterior insulating sheathing to the wall systems. A favorite fastener

emerged that exhibited good attachment characteristics while remaining cost effective. The insulating sheathing manufacturer suggested that in situations where multiple layers of insulating sheathing are installed on a wall, the inner layer does not need to be installed as rigorously as the outer layer (which would have to meet the attachment requirements posted by the manufacturer), since strapping will help attach it to the assembly. In addition, the insulating sheathing manufacturer suggested using one fastener at common panel joints to secure both panels, instead of using a dedicated fastener for each panel at all perimeter locations. A favorite fastener emerged while installing furring strips over the insulating sheathing. While IBACOS installed sheathing tape and flashing membrane over the fasteners and sheathing panel joints respectively, it was concluded that the amount of effort for this detail was substantial enough to strongly consider using housewrap instead. IBACOS also observed that installing a recessed window within a 2x8 wall system requires more detailing work than if the window is in an exterior location. It requires more work because the insulating sheathing has to be carefully installed at the recessed portion of the wall (outboard side) on additional rough framing, the window sill has to be properly sloped for drainage, and extensive flashing is necessary to make sure the recess is water-tight, especially at outside corners.

- IBACOS continued to work on the lighting technology and design demonstration area in its facility. IBACOS completed the rough drafts of storyboards that tackle color temperature and color rendering. Other storyboard concepts are in the works. IBACOS is in the process of installing cove lighting systems using T5, T8, and LED technologies. Key takeaways from the lighting area are the cove construction and the lighting distribution on the wall and ceiling at different mounting heights. The cove area evaluates ambient lighting and energy benefits in context with the construction details and process. Also, discussions continued in July with Progress Lighting, Bartco Lighting, and Birchwood Lighting for these manufacturers to participate in the demonstration area and offer builder-positive designs using their products.

Task 3

Gate 2 – *Prototype House Evaluations*

- **Ecological Construction Laboratory – Champaign, IL, 50%, Cold.** Monitoring and data collection continued in July.
- **Harvard Communities – Denver, CO, 50%, Cold.** Data acquisition is underway and will continue for the rest of 2009. IBACOS completed and discussed the first three months of data with the builder, who requested more analysis in a few areas, a task that should be complete in late Q4 2009 or early Q1 2010. For Harvard Communities, the standard practice is to build to approximately a 38% level of energy savings. Due to the state of the housing market, moving to 40% is not practical at this time.
- **Imagine Homes – San Antonio, TX, 50%, Hot-Humid.** During July, discussions continued on several proposed 50% whole-house, energy savings design packages. These discussions

centered around transitioning the builder from traditional 2x4 framing to 2x6 advanced framing. The selection of a prototype design is expected in early Q3 2009. IBACOS also began to analyze the design strategies relative to the G2 “Must Meet” criteria.

- **Insight Homes – Greenwood, DE, 50%, Mixed-Humid.** There is an ongoing effort in place to ensure Insight Homes passes all G2 “Must Meet” criteria. This effort focuses on durability, moisture management, and HVAC system designs at their current level of energy savings. During August, additional modeling will be conducted using Energy Gauge USA (v2.8.02) to evaluate specification packages that will meet the 50% level of energy savings.
- **Pine Mountain Builders – Pine Mountain, GA, 50%, Mixed-Humid.** Monitoring of the two completed 50% prototypes continued. In addition, preliminary discussions on developing a strategic plan for community-scale implementation of the outlined 50% specifications continued.
- **Robson Communities – Phoenix, AZ, 50%, Hot-Dry/Mixed-Dry.** Due to the prolonged downturn in the housing market, this division is unable to pursue the construction of a 50% prototype at this time.
- **studio26 – Orefield, PA, 40%, Cold.** The prototype houses are complete. IBACOS delivered a final process mapping report to the builder. No future work is anticipated.
- **Wathen-Castanos – Fresno, CA, 50%, Hot-Dry.** IBACOS formed a partnership with Wathen-Castanos, a builder participating in Builders Challenge. This builder’s current product is in the 40 to 50% energy savings range. It plans to start construction on a 50% prototype in mid to late 2009. Wathen-Castanos is interested in moving toward 50% on a community scale. IBACOS had an initial meeting and technical assessment with the builder, completed preliminary modeling, and held an operational process mapping session on July 16-17.

Task 4

Gate 3 – *Initial Community-Scale Evaluations*

- **ELDI/S&A Homes – Pittsburgh, PA, 40%, Cold.** One of the first six houses was sold, and closing is scheduled for mid-August. However, since only one house has sold so far, the developer has not decided if it will continue building houses at the 40% level of energy savings. IBACOS has an ongoing process in place to help the builder reassess the cost of the current energy savings specification package and provide alternate specifications to achieve the 40% savings level; but, cost restrictions from the developer make these efforts hard.
- **Imagine Homes – San Antonio, TX, 40%, Hot-Humid.** Modeling work at the 50% whole-house energy savings level is ongoing. IBACOS continued to help the builder evaluate and document G3 criteria of 40% whole-house energy savings at the community scale.
- **Insight Homes – Greenwood, DE, 40%, Mixed-Humid.** Home sales and closings for Insight Homes were on a slight rise in July. Construction on the first model house began at one of the builder’s new communities. IBACOS continued to help create details that will be incorporated in Insight Homes’ construction documentation and will address water

management and durability issues in order to pass all “Must Meet” and “Should Meet” G3 criteria. IBACOS also continued to work with the builder on quality control and quality assurance items, such as scopes of work, and to develop a high performance, fully-integrated HVAC system design process.

- **K Hovnanian/Landover Group – Clinton, MD and Woodbridge, VA, 40%, Mixed-Humid.** IBACOS completed final performance testing on the two remaining houses in Maryland and Virginia. No additional work is planned at the 40% level at this time.
- **Pine Mountain Builders – Pine Mountain, GA, 40%, Mixed-Humid.** The builder met all “Must Meet” and “Should Meet” G3 criteria and more than 10 houses are complete.
- **Tindall Homes – Mansfield, NJ, 40%, Mixed-Humid.** The builder met all “Must Meet” and “Should Meet” G3 criteria and more than 10 houses are complete.

II. SUMMARY OF TECHNICAL HIGHLIGHTS

Task 1 – *Building America System Research Management and Technical Support*

IBACOS participated in an expert meeting held by the National Association of Home Builders (NAHB) Research Center on July 15. The meeting focused on quality management systems for builders of high performance homes. It validated many of the short and long-term research needs identified and documented in the 5-year plan for quality management of high performance homes.

Task 2

Stage 1 – *Integrated Solutions for Specific Climate Regions and System Performance Evaluations*

IBACOS continued to work with the National Renewable Energy Laboratory (NREL) on the Building America Benchmark process for 2009. IBACOS also worked on the review of proposed detailed analysis methods for the lighting and miscellaneous electric loads categories.

Task 3

Stage 2 – *Prototype Houses*

- **Wathen-Castanos.** IBACOS completed an initial assessment of the builder’s current construction practices. IBACOS is preparing to model several potential solutions for a prototype house that will achieve a 50% energy savings level. Possible technical solutions include modeling 2x6 framing with 1” expanded polystyrene foam (EPS), moving the ducts and forced air unit (FAU) into conditioned space, and upgrading the tankless water heater to a higher efficiency unit. A construction start date for the prototype house has not been determined.

- **Imagine Homes.** Construction on the prototype house is expected to begin in Q4 2009 or Q1 2010. The primary technical solutions under investigation for this Hot-Humid house include 2x6 advanced framing, solar thermal water heating, and energy recovery ventilation. IBACOS is currently facilitating discussions among all of the involved parties to understand the technical and practical details of building to advanced framing specifications. Preliminary investigations into solar thermal systems have looked at the Bosch FKB or FKC 1-3 systems and the Phoenix Solar system.
- **Harvard Near Zero Energy House.** Monitoring of the house is ongoing.
- **K Hovnanian Homes.** Both construction and performance testing of the builder's houses are complete.
- **The New American Home 2010.** The construction of The New American Home 2010 in Las Vegas, NV continued. Performance testing of the ductwork indicated that the HVAC subcontractor needs to increase the airtightness of two of the five air distribution systems. Open-cell spray foam insulation was successfully used to create a cathedralized attic assembly. Damp spray cellulose was sprayed into the wood-framed exterior wall cavities.
- IBACOS continued to actively collect monitoring data from ten houses.

Task 4

Stage 3 – *Initial Community-Scale Evaluations*

- IBACOS continued its work with Insight Homes to develop standardized HVAC design and construction documentation processes that better enable them to consistently deliver homes that meet the 40% level of source energy savings. An additional site visit was conducted in July to review construction details and preliminary HVAC designs for two house models, as well as to assist in the creation and review material for their sales and marketing departments.
- IBACOS continued to discuss a potential 50% specification package with Harvard Communities. Further discussions are important to evaluate whether or not the builder can proceed with the 50% package at the scale needed to meet stage gate criteria. Harvard has stated that given current market conditions, it is uncomfortable making the upgrades needed to reach 50% on a consistent basis.

Task 5

Stage 4 – *Project Closeout, Final Evaluations of BA Communities*

No 2009 activity planned.

Task 6 - *Other Research Activities*

IBACOS does not currently have work in this Task.

I. PROJECT MANAGEMENT ISSUES

The prolonged timing of feedback for the American Recovery and Reinvestment Act (ARRA) proposal submitted by IBACOS continues to create a difficult dynamic with respect to budgets and staffing. While IBACOS anticipates using additional internal staff and potentially adding new staff to complete this work, it is impossible to prepare for this without feedback on project scope or funding. Additional staff will also be needed to complete work for increased funding for the core Building America work in 2010. Without feedback on IBACOS' ARRA proposal, maintaining current staff levels has become increasingly difficult. Adding staff in preparation for additional work cannot begin in earnest and could impact the rate and scope of IBACOS' ARRA work in 2009.

II. INPUT ON UPCOMING EVENTS FOR EERE'S 30-60-90 DAY REPORT

IBACOS does not currently have an event for the EERE'S 30-60-90 Day Report.

CONFERENCE PRESENTATIONS

IBACOS did not present at any conferences in July.