

3. BAILEY SPRINGS, DAVIDSON, NORTH CAROLINA

3.1 Executive Summary

Bailey Springs, Davidson, North Carolina – Gate 3

Overview

This study demonstrates the ability of builders, such as David Weekley Homes (DWH), to build communities with greater than 10 homes that achieve all of the “must meet” and “should meet” criteria of Building America’s 40+% whole-house source energy savings goals for the mixed-humid climate zone. DWH will be incorporating advanced framing construction, instantaneous water heaters, high efficiency mechanical equipment, effective air sealing techniques and other strategies to meet the 40% energy goals cost effectively.

Key Results

The homes built by the Charlotte division of DWH have been able to maintain a competitive market advantage in all developments even within a soft housing market. The DWH Green Program is not only being implemented successfully in Charlotte, but nationwide in almost all divisions. With DWH divisions in Charlotte and nearby Charleston, BSC is currently supporting the transition to 2x6 advanced framing to allow the incorporation of higher levels of insulation at no incremental cost.

DWH has completed the pricing for the recommended further upgrades that will allow the homes to attain a 40% savings over the Building America benchmark and plans to implement these recommendations in houses currently under construction. The first of these houses should be complete by April of FY10.

Benchmark analyses shows that on average the DWH houses at Bailey Spring will require 40% less source energy to operate than a comparable home built to benchmark standards. The total incremental cost of the energy improvements is currently estimated at was \$4,913 including builder markups, and the predicted energy savings to the homeowner, at energy rates of \$0.09/kWhr and \$1.26 per therm, are \$997 per year. This results in a net positive cash flow of \$604 per year for the homeowner.

Gate Status

This project meets all of the Gate 3 requirements for Communities.

Table 3.1: Stage Gate Status Summary

"Must Meet" Gate Criteria	Status	Summary
Source Energy Savings	Pass	According to our analysis, the houses are modeled to achieve an energy savings of 40.0% when compared to the BA benchmark.
Market Coverage	Pass	10 homes within the Bailey Springs development will receive the BSC recommended package to achieve the savings requirements. Currently there are not any homes completed to the full specification.
Neutral Cost Target	Pass	The neutral cost target will be obtained with \$997 of annual savings from an initial upgrade cost of \$4913. The calculated annual net cashflow to the homeowner is \$604.

"Should Meet" Gate Criteria	Status	Summary
Marketability	Pass	DWH is marketing the houses at the Bailey Springs development under their David Weekley Green program. Media is available from DWH in the form of signage, print, online websites and four online videos featuring Dr. Joseph Lstiburek
Market Coverage	Pass	All homes built by the DWH Charlotte division will eventually include the specifications developed at the Bailey Springs community. This currently includes 11 communities in the Charlotte area. The Charlotte and Charleston divisions are working closely to learn from each other and implement the improvements detailed in this report.
Builder Commitment	Pass	DWH is committed to providing safe, healthy, comfortable, durable and efficient homes. This is evident through the development of their in-house standard the David Weekley Homes Green Home program. BSC will be working with not only DWH Charlotte in 2010, but also other divisions such as DWH Houston, to incrementally improve their home energy efficiency and further develop their Green Home program nationwide.
Gaps Analysis	Pass	DWH has completed the pricing for the BSC recommended upgrades. The first of these houses should be complete by April of FY10. Due to costs implications in a slow moving market there weren't any homes built to the full BSC specification in 2009.
Quality Assurance	Pass	BSC is working with DWH to ensure proper Quality Assurance and Quality Control through implementation of quality construction practices into their building environment. A comprehensive QA/QC list has been generated that DWH will follow closely when constructing under the Building America Program.

Conclusions

DWH in Carolina has constructed a demonstration home with advanced framing techniques for the Charlotte and Charleston divisions, and these divisions will be adopting these techniques in 2010. Under the BA program, BSC will provide support and training to these divisions of DWH. Key activities include training in advanced framing techniques, implementation of water management details, air sealing techniques, as well as HVAC and water heating system consultation to ensure proper selection of industry leading equipment while maintaining a focus on cost effective implementation.

Construction of the Bailey Springs development will continue into 2010. The BSC assisted DWH Green program has proven successful for the Charlotte division and the advanced framing construction methods developed in 2009 coupled with other mechanical upgrades will be implemented in 2010. The Charlotte division of DWH will be reducing their energy demand primarily through advanced airsealing techniques, the installation of SEER 14 air conditioners, 95% AFUE furnaces, 0.82 EF instantaneous domestic hot water heaters and Low-e windows in conjunction with advanced 2"x6" framing and insulation. It is anticipated that the next stage of upgrades may be implemented during the phases of the Bailey Springs development that begin during early 2010.

3.2 Introduction

3.2.1. Project Overview

Bailey Springs is a residential community located in Davidson approximately 20 miles North of Charlotte, North Carolina. The development is being constructed by the Charlotte division of David Weekley Homes (DWH) and MacNeil Homes.

The community is located within DOE Climate Zone 3 and is considered to be a mixed-humid climate. A mixed-humid climate is defined as a region that receives more than 20 inches of annual precipitation, has approximately 5,400 heating degree days or less, and where the monthly average outdoor temperature drops below 45F during the winter months¹.

DWH is actively reducing the energy consumption of their homes through the implementation of their David Weekley Green Homes program and plans to attain savings of 40% over the BA benchmark in 2010. The David Weekley Green program is intended to promote certain features designed to make homes more economically sustainable over the long term and reduce energy usage and the resulting environmental impact. The Charlotte division of DWH will be reducing their energy demand primarily through advanced airsealing techniques, the installation of SEER 14 air conditioners, 95% AFUE furnaces, 0.82 EF instantaneous domestic hot water heaters and Low-e windows in conjunction with advanced 2"x6" framing and insulation.

DWH is working with Southern Energy Management for ENERGY STAR® verification and MASCO implementing their Environments for Living® (EFL) program. MASCO EFL is providing the majority of the testing and rating the homes. All homes are attaining the Diamond certification under the EFL program. The Diamond level of EFL ensures the homes have enhanced water efficiency, advanced indoor air quality and attain an air tightness of 0.25 cfm/ft² of envelope area at 50 pascals.

The homes built by the Charlotte division of DWH have been able to maintain a competitive market advantage in all developments even within a soft housing market. The DWH Green Program is not only being implemented successfully in Charlotte, but nationwide in almost all divisions.

¹ Joseph Lstiburek. Builder's Guide to Mixed-Humid Climates. Westford MA: Building Science Press, 2005



Figure 3.2.1: Model Home at Bailey Springs

3.2.2. Project Information Summary Sheet

PROJECT SUMMARY

Company	David Weekley Homes
Company Profile	<p>David Weekley Homes started in 1976, at a time when budget-friendly housing was dull and unimaginative. We quickly made a name for ourselves with an emphasis on innovative design and Customer Satisfaction that would change the face of homebuilding forever.</p> <p>As word spread about our unconventional approach, so too did the demand for our homes. Soon we were Texas' largest homebuilder, with operations in Houston, Dallas/Ft. Worth, San Antonio and Austin.</p> <p>After only ten years, our company had garnered hundreds of awards for homebuilding excellence, including "National Builder of the Year." We would go on to win this coveted award again, as well as the "National Housing Quality Award" and "America's Best Builder."</p> <p>Today, David Weekley Homes builds in 16 cities from Colorado to the Carolinas and is the third largest privately-held builder in America. We have also been named to FORTUNE® Magazine's list of "100 Best Companies to Work For" six times.</p> <p>http://www.davidweekleyhomes.com</p>
Contact Information	<p>11430 N. Community House Rd. Suite 275 Charlotte, NC 28277 (704) 972-4200</p>
Division Name	Charlotte
Company Type	David Weekley Homes
Community Name	Bailey Springs
City, State	Davidson, North Carolina
Climate Region	3

SPECIFICATIONS

Number of Houses	5 by May, 2010 – 10 by September, 2010
Municipal Address(es)	Currently Unknown
House Style(s)	Single Family, Production
Number of Stories	1-2
Number of Bedrooms	3-4
Plan Number(s)	2719 (McQueen) 2736 (Derron) 3576 (Adara)
Floor Area	1457 (McQueen) 2726 (Derron) 3583 (Adara)
Basement Area	Typically crawlspace or slab on grade
Estimated Energy Reduction	40% over BA Benchmark (eg. Derron)
Estimated Energy Savings	\$997 (eg. Derron)
Estimated Cost	Not Reported
Construction Start	Planned early 2010
Expected Buildout	End of 2010

3.2.3. Targets and Goals

The target for the DWH Davidson development is to achieve a 40% whole house energy savings over the BA benchmark in a mixed-humid climate. All homes built will also be part of the DWH Green Program, EFL Diamond, ENERGY STAR® and in 2010 they will be part of the DOE Builders Challenge.

3.3 Whole-House Performance and Systems Engineering

3.3.1. Energy Analysis Summary

Table 3.2: Estimated Whole House Energy Use for Bailey Springs, North Carolina

ESTIMATED WHOLE HOUSE ENERGY USE BY PLAN NUMBER					
Plan No.	Source (MMBtu/year)	Site (MMBtu/year)	Area + Bsmt (sq ft)	No. of Bedrooms	% Electric
2719	128	64	1457+ 1400	3	41
2736	162	83	2762 + 0	3	38
3576	219	112	3983 + 0	4	38

With the enclosure and mechanical characteristics presented in Table 3.3, the average plan achieves a performance level of 40% reduction relative to the Building America Benchmark.

3.3.1.1. Parametric Energy Simulations

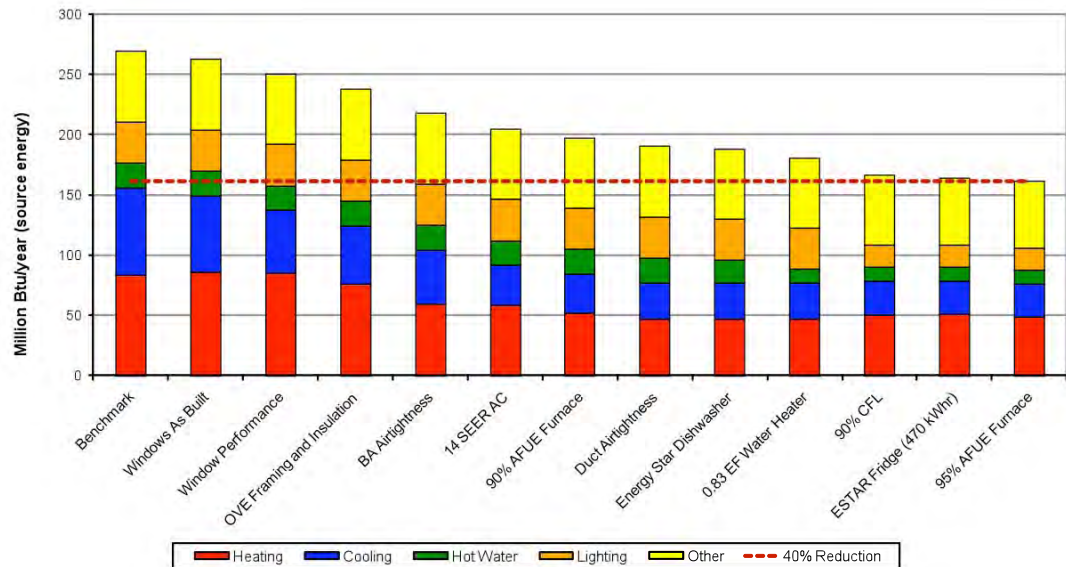


Figure 3.3.1: Parametric energy simulations for Plan #2736

3.3.1.2. End-Use Site and Source Energy Summaries

Table 3.3: Summary of End-Use Site-Energy for Plan #2736

End-Use	Annual Site Energy			
	BA Benchmark		Prototype 1	
	kWh	therms	kWh	therms
Space Heating	446	706	228	409
Space Cooling	6195	0	2270	0
DHW	0	189	0	108
Lighting*	2986		1588	
Appliances + Plug	5111	0	4854	0
OA Ventilation**	218		235	
Total Usage	14956	895	9175	517
Site Generation	0	0	0	0
Net Energy Use	14956	895	9175	517

*Lighting end-use includes both interior and exterior lighting

**This OA Ventilation energy consumption is for fan energy only, space conditioning is included in Space Heating and Cooling

Table 3.4: Summary of End-Use Source-Energy and Savings for Plan #2736

End-Use	Estimated Annual Source Energy		Source Energy Savings	
	BA Benchmark	Prototype 1	Percent of End-Use	Percent of Total
	106 BTU/yr	106 BTU/yr	Prototype 1 savings	Prototype 1 savings
Space Heating	82	47	42%	13%
Space Cooling	71	26	63%	17%
DHW	21	12	43%	3%
Lighting*	34	18	47%	6%
Appliances + Plug	59	56	5%	1%
OA Ventilation**	3	3	-8%	0%
Total Usage	269	162	40%	40%
Site Generation	0	0		0%
Net Energy Use	269	162	40%	40%

The "Percent of End-Use" columns show how effective the prototype building is at reducing energy use in each end-use category.

The "Percent of Total" columns show how the energy reduction in each end-use category contributes to the overall savings.

The modeling shows that the homes built as designed achieve the 40% target. The four most significant upgrades were as follows:

- Implementation of airsealing at an incremental energy savings of 7.4%.
- 100% CFL lighting showed 5.4% incremental savings
- Installation of a 14 SEER air conditioning system which showed a 4.9% incremental energy savings.
- Advanced framing and R-19 wall insulation showed an incremental savings of 4.7%

3.3.2. Discussion

3.3.2.1. Enclosure Design

Table 3.5 (below) summarizes the building enclosure assemblies used for this project.

Table 3.5: Enclosure Specifications

ENCLOSURE	SPECIFICATIONS
Ceiling	
Description -	Trussed, vented attic
Insulation -	R-38 fiberglass batt
Walls	
Description -	2x6 Advanced Framing
Insulation -	R-19 fiberglass batt
Foundation	
Description -	Slab on Grade or Vented Unconditioned Crawlspace
Insulation -	None
Windows	
Description -	Double Pane Vinyl Spectrally Selective LoE
Manufacturer -	Silverline - 2900
U-value -	0.35
SHGC -	0.34
Infiltration	
Specification -	Estimated 2.5 in ² leakage area per 100 ft ² envelope
Performance test -	Currently untested

All homes within the Bailey Springs development built by David Weekley homes have a either a slab on grade or concrete block stem wall crawlspace with conventional 2x4 wall framing and faced fiberglass batt insulation. The attics are conventionally trussed and insulated with fiberglass batt. The advanced airsealing techniques used by DWH are creating envelopes that are consistently achieving Environments for Living Diamond level airtightness requirements on production level homes. The diamond threshold for airtightness is 0.25 cfm or less per square foot of envelope area at 50 pascals (EFL, 2008) which is equivalent to the BSC BA minimum specification of 0.25 cfm/ft² at 50 pascals.

Beginning in 2010, a select group of homes within the Bailey Springs development will be advanced framed with 2x6 studs at 24" on centre, stack framed with single top plates and two stud corners. Other unnecessary framing removal will also be completed such as removing headers in non-load bearing walls and above interior doorways. The following photos are from the advanced framing demonstration home that was built in September, 2009. Figure 3.3.2 shows the new method for door way framing and Figure 3.3.3 shows an unnecessary header in a non-load bearing wall that will be removed in future homes.



Figure 3.3.2: Interior Door Framing



Figure 3.3.3: Header in Non-Load Bearing Wall

Air sealing details are very important to create an air tight enclosure. The following figures show the extensive use of expansion foam around all enclosure penetrations to ensure an air seal is created.



Figure 3.3.4: R-6 Insulated Ducting Entering from Attic Space



Figure 3.3.5: Framing and Plumbing Penetrations Sealed at Garage Wall



Figure 3.3.6: Framing and Plumbing Penetrations Sealed at Garage Wall



Figure 3.3.7: Electrical Penetrations Sealed at Top Plate

3.3.2.2. Mechanical System Design

Table 3.6 (below) summarizes the mechanical systems used by this project.

Table 3.6: Mechanical system specifications

MECHANICAL SYSTEMS	SPECIFICATIONS
Heating	
Description -	[e.g., 8.25 HSPF Air Source Heat Pump]
Manufacturer & Model -	[insert Name of Company & Equipment Series]
Cooling (outdoor unit)	
Description -	[e.g., 14 SEER Air Source Heat Pump]
Manufacturer & Model -	[insert Name of Company & Equipment Series]
Cooling (indoor unit)	
Description -	[insert description]
Manufacturer & Model -	[insert Name of Company & Equipment Series]
Domestic Hot Water	

MECHANICAL SYSTEMS		SPECIFICATIONS
Description -		0.82 EF Instantaneous
Manufacturer & Model -		Not Currently Chosen
Distribution		
Description -	R-6 flex duct in attic and conditioned space	
Leakage -		Estimated at 3% or less
Ventilation		
Description -		N/A
Manufacturer & Model -		N/A
Return Pathways		
Description -	Transfer grilles/jump ducts at bedrooms, central return	
Dehumidification		
Description -		N/A
Manufacturer & Model -		N/A
PV System		
Description -		N/A
Manufacturer & Model -		N/A
Solar Hot Water		
Description -		N/A
Manufacturer & Model -		N/A

The attic mounted air handler and furnace distribute air throughout the home through R-6 insulated flexible ductwork. All ductwork runs are sealed with mastic and are tested by the EFL program to achieve typical leakage rates of less than 3%. Figure 3.3.8 shows an example of the R-6 insulated venting sealed with mastic. BSC recommends that the entire HVAC system be placed within the thermal and air pressure boundary.



Figure 3.3.8: R-6 Insulated Ducting in Attic Space

3.3.2.3. Lighting and Miscellaneous Electrical Loads

DWH will install 100% CFL lighting for all fixtures. According to BSC's parametric analysis, the simple replacement of the traditional incandescent bulb with CFL lighting saves 70% on lighting energy. An ENERGY STAR® dishwasher is included in the base package and ENERGY STAR refrigerator and clothes washer are available at the design studio.

3.3.2.4. Site-generated Renewable Energy

There currently are no plans to include site generated renewable energy for homes in this development.

3.4 Construction Support

3.4.1. Construction Overview

Dr. Lstiburek has helped develop the DWH Green Program and consulted on their quality assurance and quality control measures. Early in the development Dr. Lstiburek completed walk-throughs with DWH staff to review and discuss air sealing and water management techniques. During construction BSC employees will be on-site at several intervals to inspect and review construction.

Southern Energy Management completed two site visits to each home during construction to perform EFL testing.

The Frame Inspection ensured:

- Soffits, chases & drops properly were capped and sealed.
- Floor truss system sealed from outside/attic air.
- Can air barrier and insulation be installed properly?

The Insulation Inspection ensured:

- No gaps, voids, compression.
- Is insulation continuous with air barrier?
- Wind obstruction baffles installed where necessary.

The second visit to each house included a window inspection, room pressure test and blower door test. The window inspection ensured the windows attained specified U-values and SHGC requirements. The room pressure test verified that there was sufficient fresh air flow to each room and the blower door test compared the homes airtightness to the ENERGY STAR® requirements as well as the EFL Diamond specifications which align with the BA airtightness requirements.

3.4.2. Educational Events and Training

Dr. Joseph Lstiburek and Aaron Grin of BSC conducted an advanced framing training session for both the Charlotte and Charleston divisions of DWH on September 15. A prototype for the advanced framing system was started in Charleston at the end of that week and Aaron Grin returned on September 24th to inspect the progress and provide additional on-site instruction. The success of this first effort will be evaluated by DWH in the next few months. BSC intends to provide additional support to help introduce this technology on a division-wide scale.

3.4.3. Systems Testing

Once constructed, the homes will be subject to testing by Southern Energy Management (SEM). SEM will complete the tests required to attain ENERGY STAR® and EFL Diamond certification. The following tests were performed:

- Air leakage
- Duct leakage

- Local air flows
- System external static pressure
- Outside air duct air flow

BSC will review the results of this testing to ensure compliance with the Building America targets and complete additional testing if it is deemed necessary.

3.4.4. Monitoring

BSC is currently not monitoring any homes within the DWH Davidson community. It is anticipated during 2010 with the occupancy of the homes that BSC will collect utility use data for comparison to modeled energy consumption.

3.5 Project Evaluation

The following sections evaluate the performance of the final production building designs using energy simulations and targeted field tests, if needed. References are made to the results from field tests and energy simulations, which are included as an appendix to this report.

3.5.1. Source Energy Savings

Requirement:	<i>Final production home designs must provide targeted whole house source energy efficiency savings based on BA performance analysis procedures and prior stage energy performance measurements.</i>
Conclusion:	Pass

The homes constructed by DWH at the Bailey Springs development will include most elements of the technology package prepared by BSC. According to our analysis, the houses are modeled to achieve an energy savings of 40.0% when compared to the BA benchmark. It is anticipated that the upgrades will be implemented during the phases of the Bailey Springs development that begin during early 2010. The combination of implementing QA and process changes has allowed the integration of these changes to happen seamlessly and BSC has a high degree of confidence in DWH Charlotte’s ability to implement these additional changes.

3.5.2. Market Coverage

Requirement:	<i>Must have a minimum of 10 homes per project (including projects from all teams). At least five homes must be completed by March/April to be used as a case study in the annual Joule* report.</i>
Conclusion:	Pass

All homes built by DWH within the Bailey Springs development are being built to the EFL Diamond standard, Energy Star® Certified and are part of the DWH Green Home program. DWH has begun a wholesale transformation of their building practices in the Charlotte, NC region to apply this construction specification to all of the division’s developments. This

transformation, which is being assisted by the Building America Program and Environments for Living, is part of a national strategy for David Weekley Homes

3.5.3. Neutral Cost Target

Requirement:	<i>The incremental annual cost† of energy improvements, when financed as part of a 30 year mortgage, must be less than or equal to the annual reduction in utility bill costs relative to the BA benchmark house.</i>
Conclusion:	Pass

The neutral cost analysis for the average sized home (Plan #2736) within the Bailey Springs development of Davidson North Carolina is show below.

Table 3.7: Neutral Cost Worksheet Part 1

End Use	Annual Electric Energy (Site)			Annual Gas Energy (Site)			Annual Utility Bill Reduction vs Benchmark (\$/yr)	Local Marginal Electricity Price (\$/kWh)	Local Marginal Gas Price (\$/therm)
	Benchmark (kWh/yr)	Builder Standard Practice (Optional) (kWh/yr)	Prototype House (kWh/yr)	Benchmark (therms/yr)	Builder Standard Practice (Optional) (therms/yr)	Prototype House (therms/yr)			
Space Heating	446		228	706		409	\$394	\$0.09	\$1.26
Space Cooling	6195		2270	0		0	\$353		
DHW	0		0	189		108	\$102		
Lighting	2986		1588	0		0	\$126		
Appliances and MELs	5111		4854	0		0	\$23		
Ventilation	218		235	0		0	(\$2)		
Total Usage	14956		9175	895		517	\$997		
Site Generation	0		0	0		0	\$0		
Net Energy Use	14956		9175	895		517	\$997		
Added Annual Mortgage Cost w/o Site Gen.							\$392		
Net Cash Flow to Consumer w/o Site Gen.							\$604		
Added Annual Mortgage Cost with Site Gen.							\$392		
Net Cash Flow to Consumer with Site Gen.							\$604		
								Neutral Cost Criteria Met?	Yes

Table 3.8: Neutral Cost Worksheet Part 2

Measure	Builder Standard Practice (Optional)	Code Minimum House*	Prototype House*	Total Incremental Cost + 10% markup)	Amortized Annual Cost (30 year mortgage, 7% interest)	Footnotes
Thermal Enclosure:	\$0	\$0	\$0	\$0	\$0	
Roof / Attic	\$0	\$0	\$0	\$0	\$0	
Cathedral Roof	\$0	\$0	\$0	\$0	\$0	
Flat Ceiling	\$0	\$0	\$0	\$0	\$0	
Radiant Barrier	\$0	\$0	\$0	\$0	\$0	
Other Roof Attic Measure	\$0	\$0	\$0	\$0	\$0	
Wall	\$0	\$0	\$0	\$0	\$0	
Cavity Insulation	\$0	\$0	\$0	\$0	\$0	
Insulating Sheathing	\$0	\$0	\$0	\$0	\$0	
Advanced Framing	\$0	\$0	\$0	\$0	\$0	
Other Wall Measure	\$0	\$0	\$0	\$0	\$0	
Foundation	\$0	\$0	\$0	\$0	\$0	
Slab	\$0	\$0	\$0	\$0	\$0	
Crawlspace	\$0	\$0	\$0	\$0	\$0	
Basement	\$0	\$0	\$0	\$0	\$0	
Air Infiltration Reduction	\$0	\$0	\$0	\$0	\$0	
Other Enclosure Measures	\$0	\$0	\$0	\$0	\$0	
Windows:	\$0	\$0	\$0	\$0	\$0	
Glazing: U-Factor / SHGC	\$0	\$0	\$0	\$0	\$0	
Slider (horz)	\$0	\$0	\$0	\$0	\$0	
Slider (vert)	\$0	\$0	\$0	\$0	\$0	
Fixed	\$0	\$0	\$0	\$0	\$0	
Patio	\$0	\$0	\$0	\$0	\$0	
French	\$0	\$0	\$0	\$0	\$0	
Other Window Measures	\$0	\$0	\$0	\$0	\$0	
HVAC System:	\$0	\$0	\$1,200	\$1,320	\$105	
Furnace: 95% AFUE	\$0	\$0	\$1,200	\$1,320	\$105	
A/C: SEER	\$0	\$0	\$0	\$0	\$0	
Ducts	\$0	\$0	\$0	\$0	\$0	
Ventilation	\$0	\$0	\$0	\$0	\$0	
Other HVAC Measures	\$0	\$0	\$0	\$0	\$0	
Water Heating:	\$0	\$0	\$1,720	\$1,892	\$151	
Water Heater Size	\$0	\$0	\$0	\$0	\$0	
Solar System	\$0	\$0	\$0	\$0	\$0	
Tankless	\$0	\$0	\$1,720	\$1,892	\$151	
Distribution Type	\$0	\$0	\$0	\$0	\$0	
Other Water Heating	\$0	\$0	\$0	\$0	\$0	
Lighting:	\$0	\$0	\$1,546	\$1,701	\$136	
Hard Wired Fluorescents	\$0	\$0	\$1,546	\$1,701	\$136	
Compact Fluorescents	\$0	\$0	\$0	\$0	\$0	
Other Lighting Measures	\$0	\$0	\$0	\$0	\$0	
Appliances:	\$0	\$0	\$0	\$0	\$0	
Energy Star	\$0	\$0	\$0	\$0	\$0	
Other Appliance Measures	\$0	\$0	\$0	\$0	\$0	
Misc Electric Loads:	\$0	\$0	\$0	\$0	\$0	
Home Automation	\$0	\$0	\$0	\$0	\$0	
Other MEL Measures	\$0	\$0	\$0	\$0	\$0	
Other Measures	\$0	\$0	\$0	\$0	\$0	
3rd Party Inspections and QA Testing	\$0	\$0	\$0	\$0	\$0	
Total Energy Efficiency Investment	\$0	\$0	\$4,466	\$4,913	\$392	
Site Generation	\$0	\$0	\$0	\$0	\$0	
Total with Site Generation	\$0	\$0	\$4,466	\$4,913	\$392	
REBATES / INCENTIVES	\$0	\$0	\$0	\$0	\$0	
SMUD Rule 15 Hook Up Fee Discount	\$0	\$0	\$0	\$0	\$0	
Incentive for Lighting and Energy Star	\$0	\$0	\$0	\$0	\$0	
SMUD PV Buydown	\$0	\$0	\$0	\$0	\$0	
Other	\$0	\$0	\$0	\$0	\$0	
Total Incremental Cost to Buyer Including Incentives	\$0	\$0	\$4,466	\$4,913	\$392	

Neutral cost within a 30 yr mortgage assuming a rate of 7% is possible with the Building America upgrades. There will be an estimated \$604 of positive cash flow with this mortgage leaving ample additional resources to address additional recommended upgrades that could be implemented in late 2010.

3.5.4. Marketability

Requirement:	<i>Based on initial response from model homes, should be marketable relative to the value-added benefit seen by consumers at increased or neutral cost.</i>
Conclusion:	Pass

DWH is marketing the houses at the Bailey Springs development under their David Weekley Green program. The DWH Green Program has been very efficiently marketed. One of the primary focus areas of the marketing is existing DWH homeowners. This allows current homeowners to upgrade their homes to more energy efficient models, while helping to maintain DWH sales in a slowing market. Media is available from DWH in the form of signage, print, online websites and four online videos featuring Dr. Joseph Lstiburek. Most of the media is easily accessible directly from the DWH main website. Both print and online frequently asked question publications address a wide spectrum of concerns for the home buyer. The information provided informative and shows how the DWH Green Program has integrated both ENERGY STAR® and EFL Diamond certifications as well as Building America research. To inform and educate the home buyer DWH has also has a list of commonly used green terminology acronyms which helps the homebuyer understand the ways the Green Program is making better homes.

3.5.5. Market Coverage

Requirement:	<i>Project case studies should cover a representative range of weather conditions and construction practices in major metropolitan areas in the targeted climate region.</i>
Conclusion:	Pass

All homes built by the DWH Charlotte division will eventually include the specifications developed at the Bailey Springs community. This currently includes 11 communities in the Charlotte area with homes ranging from 1500 ft² to over 4000 ft². This transformation, which is being assisted by the Building America Program and Environments for Living, is part of a national strategy for David Weekley Homes to implementing the David Weekley Green program in all divisions. The Charlotte and Charleston divisions are working closely to learn from each other and implement the improvements detailed in this report.

3.5.6. Builder Commitment

Requirement:	<i>Should demonstrate strong builder commitment to continued construction at current or future BA performance targets.</i>
Conclusion:	Pass

DWH is committed to providing safe, healthy, comfortable, durable and efficient homes. This is evident through the development of their in-house standard the David Weekley Homes Green Home program. BSC will be working with not only DWH Charlotte in 2010, but also other divisions such as DWH Houston, to incrementally improve their home energy

efficiency and further develop their Green Home program nationwide. The national residential housing market slowdown has pushed builders to strongly focus on reducing construction costs. DWH recognized this slowing and shifted their building towards green and have maintained their leading position within their market. However, continued work is likely because they have realized a competitive advantage by implementing green building techniques and do not wish lose this advantage. BSC believes that DWH has a very high degree of commitment to the program.

3.5.7. Gaps Analysis

Requirement:	<i>Should include a summary of builder technical support requirements, gaps analysis, lessons learned, optimal builder business practices, what not to do, documentation of failures, recommendations for policy improvements, and remaining technical and market barriers to achieving current and future performance levels.</i>
Conclusion:	Pass

An advanced framing house was completed as a prototype and learning tool. The results of the advanced framing test house are being evaluated by the Charlotte division and plans are being made to include the advanced framing package in all homes in the area. DWH has completed the pricing for the other BSC recommended upgrades. The first of these houses should be complete by April of FY10. Due to costs implications in a slow moving market there weren't any homes built to the full BSC specification in 2009.

The Charlotte division of DWH will be reducing their energy demand primarily through advanced airsealing techniques, the installation of SEER 14 air conditioners, 95% AFUE furnaces, 0.82 EF instantaneous domestic hot water heats and Low-e windows in conjunction with advanced 2"x6" framing and insulation. It is anticipated that the next stage of upgrades may be implemented during the phases of the Bailey Springs development that begin during early 2010.

3.5.8. Quality Assurance

Requirement:	Should provide documentation of builder's energy related QA and QC processes.
Conclusion:	Pass

BSC is working with DWH to ensure proper Quality Assurance and Quality Control through implementation of quality construction practices into their building environment. A comprehensive QA/QC list has been generated that DWH will follow closely when constructing under the Building America Program. This QA/QC checklist addresses details that are integrated into construction documents, contracts and subcontractor scopes of work. Compliance with the QA/QC checklist ensures that the building will maintain a healthy, safe, durable, and comfortable living environment in addition to being energy efficient. This is attained through proper water management, choosing quality materials and proper installation of all materials that follows a whole house systems engineering approach. BSC has been working with DWH nationwide to develop the DWH Green Program, and because of this, many of the points on the QA/QC checklist have been adopted as standard practice.

3.6 Conclusions/Remarks

Construction of the Bailey Springs development will continue into 2010. The BSC assisted DWH Green program has proven successful for the Charlotte division and the advanced framing construction methods developed in 2009 coupled with other mechanical upgrades will be implemented in 2010. The Green program is intended to promote certain features designed to make homes more economically sustainable over the long term and reduce energy usage and the resulting environmental impact. The Charlotte division of DWH will be reducing their energy demand primarily through advanced airsealing techniques, the installation of SEER 14 air conditioners, 95% AFUE furnaces, 0.82 EF instantaneous domestic hot water heaters and Low-e windows in conjunction with advanced 2"x6" framing and insulation. It is anticipated that the next stage of upgrades may be implemented during the phases of the Bailey Springs development that begin during early 2010.

Under the BA program, BSC will provide support and training to these divisions of DWH. Key activities include training in advanced framing techniques, implementation of water management details, air sealing techniques, as well as HVAC and water heating system consultation to ensure proper selection of industry leading equipment while maintaining a focus on cost effective implementation.

DWH is working with Southern Energy Management for ENERGY STAR® verification and MASCO implementing their Environments for Living® program. MASCO EFL is providing the majority of the testing and rating the homes. All homes are attaining the Diamond certification under the EFL program and will qualify for the DOE Builders Challenge.

3.7 Appendices

3.7.1. Site Visit Photos

Appendix E.3.7.1
Bailey Springs, Davidson, North Carolina Site Visit Photos

Appendix E1. Bailey Springs, Davidson, North Carolina



Stack Framing at 24" OC, Single top and Bottom Plates and blocking for Cabinetry



Airsealing HVAC Penetrations to Unconditioned Attic



Airsealing of plumbing penetrations



Example of Air Leak Requiring Sealing – Note visible light above top plate and below header – Repaired on while on site.