



# Green Building Rating System Evaluation

## Rating Systems Evaluated

- **USGBC LEED for Homes:** launched at Greenbuild, Chicago November 2007
- **NAHB Green Home Building Guidelines;** due to launch Winter 2008
- **NAHB Green Home Building Guidelines as amended by the Joint County/City Green Building Subcommittee**
- **City of Scottsdale, AZ Green Building Home Program (since 1998)**

# Methodology

- **Each evaluation residence was rated four times, once with each of the four evaluated rating systems;**
- **Each residence was rated for location-specific points by locating it in five simulated locations;**
- **Evaluated residences were based on five plan sets submitted to DSD over the last several years; some assumptions regarding materials and methods were made in order to facilitate ratings;**

# Residences Used in Evaluation

- **Residence A-** Passive Solar, Masonry/Rammed Earth construction; designed & engineered by owner
- **Residence B-** Zero Net Energy custom solar home; insulated (exterior) masonry construction
- **Residence C-** Large-scale developer model; meets code
- **Residence D-** Owner designed/built rammed earth custom home; based on permaculture principles
- **Residence E-** Large-scale developer “energy efficient” model

# Simulated Building Sites

- **A - Star Valley-**  
Intersection of W  
Valencia Rd and  
S Mountain  
Eagle Drive
- **B -Menlo Park –**  
W Congress at  
Grande
- **C -Civano –**  
South  
Nightbloom Way  
and E Seven  
Generations Way
- **D -Marana –**  
North El Uno  
Gordo and W  
Dos Rotundo  
Drive
- **E -Midtown –**  
South Avenida  
de las Palmas  
and East  
Broadway Blvd.



# LEED for Homes Resource

## Categories

- **Location & Linkages (LL)** 10 Points Available; none required
- **Sustainable Sites (SS)** 21 Points Available; Min 5 pts. Required
- **Water Efficiency (WE)** 15 Points Available; Min 3 pts. Required
- **Energy & Atmosphere (EA)** 38 Points Available;
- **Materials & Resources (MR)** 14 Points Available; Min.2 pts. Required
- **Indoor Air Quality (IAQ)** 20 Points Available; Min. 6 pts. Required
- **Awareness & Education (AE)** 3 Points Available; none required
- **Innovation & Design Process (ID)** 9 Points Available

### Certification Levels:

***Certified:*** 45 points

***Silver:*** 60 points

***Gold:*** 75 points

***Platinum:*** 90 points

# NAHB Green Home Building Guidelines Guiding Principles

- **Lot Design, Preparation, & Development** – *102 possible points*
- **Resource Efficiency** – *206 possible points*
- **Energy Efficiency** – *up to 100 points for Performance Path; 100 or more additional points for additional measures*
- **Water Efficiency** – *100 + possible points*
- **Indoor Environmental Quality** – *154 + possible points*
- **Operation, Maintenance, & Homeowner Education** – *19+ possible points*
- **Global Impact** -*18 possible points*

# NAHB Green Home Building Guidelines Certification Levels

<b>NAHB Model Green Home Categories</b>	<b>BRONZE</b>	<b>SILVER</b>	<b>GOLD</b>
<b>Lot Design, Preparation, and Development</b>	<b>8</b>	<b>10</b>	<b>12</b>
<b>Resource Efficiency</b>	<b>44</b>	<b>60</b>	<b>77</b>
<b>Energy Efficiency</b>	<b>37</b>	<b>62</b>	<b>100</b>
<b>Water Efficiency</b>	<b>6</b>	<b>13</b>	<b>19</b>
<b>Indoor Environmental Quality</b>	<b>32</b>	<b>54</b>	<b>72</b>
<b>Operation, Maintenance, and Homeowner Education</b>	<b>7</b>	<b>7</b>	<b>9</b>
<b>Global Impact</b>	<b>3</b>	<b>5</b>	<b>6</b>
<b>Additional points from sections of your choice</b>	<b>100</b>	<b>100</b>	<b>100</b>

# Scottsdale Green Home Rating Categories

- Site
- Structural Elements
- Energy Rating/Performance
- Thermal Envelope
- Heating, Ventilation & Air Conditioning
- Electrical Power, Lighting, Appliances
- Plumbing System
- Roofing
- Interior Finishes
- Exterior Finishes
- Int. Doors, Cabinets, & Woodwork
- Flooring
- Solid Waste
- Innovative Design

## Certification Levels:

*Entry:* 50-99 points

*Advanced:* ≥100 points

# Residence A- 2056 SF-Passive Solar, Masonry/Rammed Earth Construction :

<i>Location</i>	<i>LEED Homes</i>	<i>NAHB</i>	<i>NAHB-PC</i>	<i>Scottsdale</i>
<b>A</b>	<b>68</b>	<b>366</b>	<b>379</b>	<b>120</b>
<b>B</b>	<b>75</b>	<b>375</b>	<b>379</b>	<b>122</b>
<b>C</b>	<b>71</b>	<b>375</b>	<b>378</b>	<b>120</b>
<b>D</b>	<b>68</b>	<b>366</b>	<b>379</b>	<b>120</b>
<b>E</b>	<b>74</b>	<b>366</b>	<b>374</b>	<b>122</b>
<b>Size Adj</b>	<b>4</b>	<b>N/A</b>	<b>N/A</b>	<b>8</b>

A - Star Valley   B -Menlo Park   C –Civano   D –Marana   E -Midtown

**Certification Levels:**

***LEED for Homes: Gold***

***NAHB National: Fails*** (Gold or Silver; fails Global Impact Category)

***NAHB Pima County Revised: Fails*** (Gold or Silver; fails Global Impact)

***Scottsdale Green Building: Advanced Level***

# Residence B- 2169 SF Zero-Net Energy Custom Solar; Insulated Masonry Construction

<i>Location</i>	<i>LEED Homes</i>	<i>NAHB</i>	<i>NAHB-PC</i>	<i>Scottsdale</i>
<b>A</b>	<b>49</b>	<b>414</b>	<b>402</b>	<b>104</b>
<b>B</b>	<b>54</b>	<b>423</b>	<b>411</b>	<b>106</b>
<b>C</b>	<b>50</b>	<b>413</b>	<b>411</b>	<b>104</b>
<b>D</b>	<b>47</b>	<b>414</b>	<b>402</b>	<b>104</b>
<b>E</b>	<b>53</b>	<b>409</b>	<b>402</b>	<b>106</b>
<b>Size Adj</b>	<b>2</b>	<b>N/A</b>	<b>N/A</b>	<b>8</b>

- A - Star Valley    B -Menlo Park    C –Civano    D –Marana    E -Midtown

**Certification Levels:**

***LEED for Homes: Certified***

***NAHB National: Fails*** (Gold or Silver in most categories; Fails Global Impact)

***NAHB Pima County Revised: Fails*** (Gold or Silver in most categories; Fails Global Impact)

***Scottsdale Green Building: Advanced Level***

# Residence C- 1600 Large Scale Developer Model; Meets Code

<i>Location</i>	<i>LEED Homes</i>	<i>NAHB</i>	<i>NAHB-PC</i>	<i>Scottsdale</i>
A	15	166	170	10
B	22	175	179	12
C	18	175	169	10
D	15	166	170	10
E	21	166	165	12
Size Adj	4	N/A	N/A	10

- A - Star Valley B -Menlo Park C –Civano D –Marana E -Midtown

**Certification Levels:**

***LEED for Homes:* Fails to achieve certification**

***NAHB National:* Fails** (all categories except Energy Efficiency & Indoor Environmental Quality – achieves Silver)

***NAHB Pima County Revised:* Fails** (all categories except Energy Efficiency & Indoor Environmental Quality – achieves Silver)

***Scottsdale Green Building:* Fails to achieve mandatory measures or certification level**

# Residence D- 988 SF Owner Designed/Built Rammed Earth Custom Home; Uses Permaculture Principles

<b>Location</b>	<b>LEED Homes</b>	<b>NAHB</b>	<b>NAHB-PC</b>	<b>Scottsdale</b>
<b>A</b>	<b>70</b>	<b>372</b>	<b>394</b>	<b>142</b>
<b>B</b>	<b>77</b>	<b>381</b>	<b>403</b>	<b>144</b>
<b>C</b>	<b>73</b>	<b>381</b>	<b>393</b>	<b>142</b>
<b>D</b>	<b>70</b>	<b>372</b>	<b>394</b>	<b>142</b>
<b>E</b>	<b>74</b>	<b>372</b>	<b>384</b>	<b>144</b>
<b>Size Adj</b>	<b>7</b>	<b>N/A</b>	<b>N/A</b>	<b>20</b>

A - Star Valley   B -Menlo Park   C –Civano   D –Marana   E -Midtown

**Certification Levels:**

**LEED for Homes: Silver or Gold (Dependent on Location)**

**NAHB National: Fails;** (Gold or Silver in most categories; Fails Indoor Environmental Quality)

**NAHB Pima County Revised: Fails** (Gold or Silver in most categories; Fails Indoor Environmental Quality)

**Scottsdale Green Building: Advanced Level**

# Residence E- 4071 SF Large-Scale Developer “Energy Efficient” Model

<i>Location</i>	<i>LEED Homes</i>	<i>NAHB</i>	<i>NAHB-PC</i>	<i>Scottsdale</i>
A	39.5	146	144	61
B	46.5	155	149	63
C	42.5	155	148	61
D	39.5	146	158	61
E	45.5	151	144	63
Size Adj	-9	N/A	N/A	-2

- A - Star Valley    B -Menlo Park    C –Civano    D –Marana    E -Midtown

**Certification Levels:**

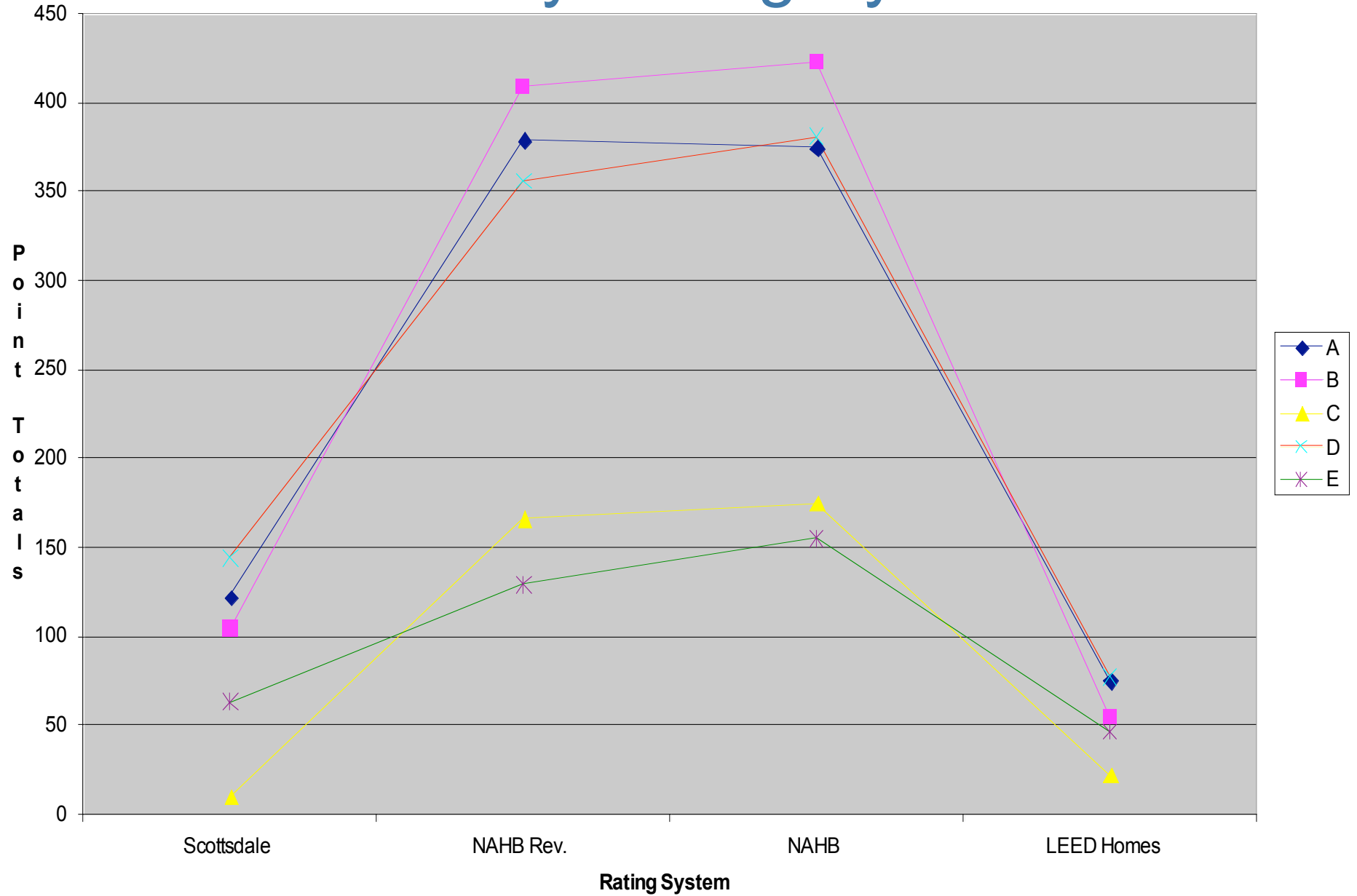
***LEED for Homes: Certified in two locations; fails to achieve certification in other locations***

***NAHB National: Fails*** (Bronze in some categories; Fails Indoor Environmental Quality, Homeowner Education and Global Impact)

***NAHB Pima County Revised: Fails*** (Bronze in some categories; Fails Indoor Environmental Quality, Homeowner Education & Global Impact )

***Scottsdale Green Building: Entry Level***

# Totals By Rating System



# REScheck Ratings

- **Residence A** - 21.4% better than code at time of submittal (2003 IECC) –(thermal mass)
- **Residence B**- 58.2% better than code at time of submittal (2003 IECC)
- **Residence C**- 0.6% better than code at time of submittal (2003 IECC)
- **Residence D**- 4.2% better than code at time of submittal (2000 IECC) – (thermal mass)
- **Residence E**- 27.1 % better than code at time of submittal (2003 IECC)

<b>Program</b>	<b>Size Adj. Factor</b>	<b>Requires Points in All Categories</b>	<b>Mandatory Measures</b>	<b>Climate Responsive Adaptations</b>	<b>Coverage of Alternative Construction</b>
<b>LEED Homes</b>	<b>Yes</b>	<b>Not all categories</b>	<b>Yes</b>	<b>Few</b>	<b>Fair</b>
<b>NAHB</b>	<b>No</b>	<b>Yes</b>	<b>EE only</b>	<b>Few</b>	<b>Fair</b>
<b>NAHB-PC</b>	<b>No</b>	<b>Yes</b>	<b>EE only</b>	<b>Good</b>	<b>Fair</b>
<b>Scottsdale</b>	<b>Yes (based on local average)</b>	<b>No</b>	<b>Yes</b>	<b>Excellent</b>	<b>Good</b>

# Findings & Issues

- Green Building Program applicants will need to **training** on how to address rating system requirements in plan sets/specifications. **Cover sheet checklists and mandatory initial orientation meetings** would help reduce time spent on verification by staff and minimize errors in documentation.
- **Location of structure** can earn several points (1-10 typically), but these are limited due to some Pima County characteristics. (Limited mass transit, few brownfields available for redevelopment, patterns of zoning and growth).
- **REScheck software** may not adequately address high thermal mass construction benefits. Energy modeling using Energy-10 or another readily available software program may yield more accurate scores for construction techniques that are not handled adequately by REScheck.

# Findings & Issues

- **The size of a residence** has been shown to have significant effects on material and energy use, but the NAHB and Pima County revised NAHB Green Home Guidelines omit a size adjustment factor, and the Scottsdale Program pegs the neutral score for size to the average size house in the city (3000-3500 SF), that is significantly larger than the national average (2366 SF).
- **A doubling of house size results in**
  - 15-50% increase in energy consumption
  - 40-90% increase in materials use
- **An extremely energy efficient large house might offset its' size adjustment penalty with innovation points, offering the large home market an option for achieving high scores in a rating system**

# Findings & Issues

- **Added emphasis in areas of local concern** may be reason to revise an existing rating system or create a new system especially for that region. In Pima County, water conservation, water recycling and reuse, energy efficiency, and heat island reduction strategies would be areas to recognize with mandatory measures, additional point values;
- **Point values and balancing required points across categories are tools** to promote a balanced approach to designing green homes;
- **Each rating system has strengths and weaknesses;** devising a program that takes the very best of each system may be the most effective way to develop a local green building program.
- **Levels of certification provide an opportunity** for a variety of products with a range of price points to achieve certification