

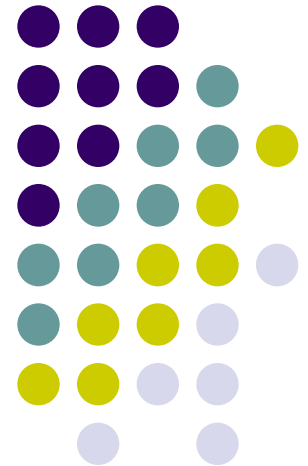
Green Building Trends: Scottsdale and Beyond



City of Scottsdale Green Building Program

June 2012

Anthony Floyd, AIA, LEED-AP
City of Scottsdale
Office of Environmental Initiatives





Overview

- 1. Background**
- 2. Scottsdale Green Buildings**
- 3. Solar Energy Activity**
- 4. Green Codes and Standards**

Scottsdale Environmental Initiatives

1. Indian Bend Multi-Use Wash
2. Environmentally Sensitive Lands Ord.
3. Natural Area Open Space
4. McDowell Mountain Preserve
5. Sensitive Design Principles
6. Green Building Program



SCOTTSDALE

AZ





Green Building Program

- **Established in 1998 as a voluntary program**
 - Green Building Advisory Committee (1998-2011)
 - Program development and outreach
- **Regionally derived rating criteria**
 - Sonoran Desert Character and Sustainability
 - Developed for single family, multifamily and commercial development
- **Verification Process**
 - Integration with city development process
 - Building plan review, permits and inspections



Green Building Incentives

- Expedited plan review and development process assistance
- Market differentiation for owners, developers, designers and builders
 - Directory of participants and construction site signs
- Promotional material, education and public outreach



Green Building Rating Checklist



City of Scottsdale

Green Building Rating Checklist

Residential – New Construction, Major Remodels & Additions

Sept. 1, 2006 - Update

Plan Check # _____ Building Permit # _____ GB Total Points _____

Project or Owner's Name - _____

Project Address - _____

Designer Name - _____

Builder Name - _____

Use this rating worksheet to qualify projects under the Green Building Program for one- and two-family dwellings and multiple single-family dwellings (townhouses and condominiums) not more than three stories in height with a separate means of egress (International Residential Code - IRC Section R101.2).

All building system components, materials, and equipment must be installed per code and manufacturer's instructions.

<u>Entry Level</u>	<u>Advanced Level</u>
<ul style="list-style-type: none"> • Meet all mandatory measures and adjust rating for house size (p. 2 – 7). • Accumulate <u>50 - 99 points</u> from the rating checklist (p. 8 – 26). 	<ul style="list-style-type: none"> • Meet all mandatory measures and adjust rating for house size (p. 2 – 7). • Accumulate <u>100 or more points</u> from the rating checklist (p. 8 – 26).

<u>Summary of Rating Categories</u>		
1. Site	6. Electrical Power, Lighting, Appliances	11. Interior Doors, Cabinetry, Trim
2. Structural Elements	7. Plumbing System	12. Flooring
3. Energy Rating/Performance	8. Roofing	13. Solid Waste
4. Thermal Envelope	9. Exterior Finishes	14. Innovative Design
5. Heating, Ventilation, & Air Conditioning	10. Interior Finishes	

How does Scottsdale Compare to other Green Building Programs?

Prepared by the
Residential Green
Building Committee,
USGBC Arizona
Chapter



Program Measures	LEED for Homes	ICC 700/NAHB	City of Scottsdale Green Building Program	Pima County Regional Residential GB Program	Coconino County Sustainable Building Program
Entry certification level	Certified	Bronze	Entry Green Building	Bronze	Entry Level
Consensus built	USGBC process	ANSI process	Scottsdale GB Advisory Committee & Open Meeting Law process	Pima County GB Advisory Committee & Open Meeting Law process	Coconino County Sustainable Building Advisory Committee
Third Party certification	Yes, and legally binding accountability form signed by Builder for unverifiable field items	Yes	Yes, field verifiable items done by bldg. inspectors; Certificate of Completion req'd for unverifiable field items (i.e. – recycled content, zero VOC)	Yes, field verifiable items done by bldg. inspectors; Submittal req'd for unverifiable field items (i.e. – recycled content, zero VOC)	Yes, certification done by selected Coconino County Sustainable Building Advisory Committee Members
Energy: Key Measures - Energy Star or equivalent - 3 rd party performance test - Meet code	Mandatory Mandatory Yes	Optional (points) Optional (points) Not in CA	Mandatory Mandatory (10/09) Yes	Mandatory Mandatory Yes	Optional (points) Optional (points) Yes
Water: Key Measures - Types of measures - High-efficiency water fixtures	Indoor and outdoor Points only for total home compliance	Indoor and outdoor Points per fixture	Indoor and outdoor Mandatory for indoor; Points for outdoor	Indoor and outdoor Points per fixture	Indoor and outdoor Some mandatory, some optional (points)
IEQ: Key Measures - MERV 8 filters - No unsealed/unvented combustion appliances - No air handling equip. in garage	Mandatory Mandatory Mandatory	Optional (points) Optional (points) Optional (points)	Mandatory Mandatory Mandatory	Optional (points) Optional (points) Optional (points)	N/A Optional (points) Optional (points)
Materials: Key Measures - Construction waste mgmt plan - Minimize excess lumber in framing - Storage and collection of recyclables	Mandatory Mandatory (max of 10% excess for home compliance N/A	Optional (points) Points available per framing area N/A	Optional (points) Optional (points) Mandatory (recycling area in or near kitchen)	N/A Options (points) available per framing technique Optional (points)	Optional (points) Optional (points) Optional (points)
Site: Key Measures - Erosion controls during constr. - Landscaping measures - Protected entrances	Mandatory Mandatory N/A	Optional (points) Optional (points)	Optional (points) Mandatory Mandatory (protection from direct summer sun)	Mandatory Optional (points) Enclosed Vestibule (points)	Optional (points) Optional (points) Optional (points)
Program Fees - Single family home - Production homes	Members: \$375/unit Members: \$107/unit	Members: \$200/unit Members: \$200/unit	No fees No fees	No fees No fees	No fees No fees
Verification Fees	TBD by market	TBD by market	Other than city inspections, TBD by market	No fees if participating in utility energy program, or using prescriptive path	No fees

Scottsdale Green Building Outreach



Free Admission



2011-2012

**Green
Building
Lecture
Series**

at

**Granite Reef
Senior Center**

1700 N. Granite Reef

Northwest corner of

McDowell &

Granite Reef

For more information
on the Green Building
Lecture series

Please call 480-312-3111

To receive a reminder
about these and other
Green Building Events,
Subscribe at:
<https://eservices.scottsdaleaz.gov/listserve/>

Sept 1, 2011 - 7:00 to 8:30 pm

What Happens When Green Becomes Code?

Scottsdale City Council recently adopted the International Green Construction Code (IgCC) as the core of the city's voluntary Commercial Green Building Program. Learn about the IgCC and how it will make it easier for developers of commercial and multi-family housing to "go green."

Oct 6, 2011 - 7:00 to 8:30 pm

Energy Efficiency Technologies

Can advances in technologies reduce or even reverse negative impacts on our natural resources and environment? Hear about new and cutting-edge technologies that reduce our energy consumption, curtail our reliance on external energy sources, and lower our energy bills.

Nov 3, 2011 - 7:00 to 8:30 pm

Sustainable Cities

Can cities exist in balance with our Sonoran desert ecosystem? Scottsdale planning staff will discuss on-going efforts to protect our desert ecology, mitigate the urban heat island effect, increase pedestrian connectivity, enhance bicycle mobility, support urban compact development, and minimize nighttime light pollution.

Dec 1, 2011 - 7:00 to 8:30 pm

Rainwater and Graywater

Is there enough annual rainfall in the desert to collect and reuse? Is rainwater the same as stormwater? What is graywater and what can we do with it? Learn about successful rainwater harvesting and graywater projects and what you can do to reduce demand on the desert's most precious resource.

Feb 2, 2012 - 7:00 to 8:30 pm

Green Neighborhoods

Green isn't just about buildings. Hear about efforts to create compact, walkable, mixed-use neighborhoods and spaces that encourage social interaction. Explore community gardens that promote a sense of community and physical activity while providing access to fresh, locally grown produce.

Mar 1, 2012 - 7:00 to 8:30 pm

Cooling and Heating Options for Your Home

Did you know that 43% of all electricity consumed in Phoenix metro area homes is used for air conditioning? How can you improve the comfort of your home and reduce the energy required to cool and heat? Find out about new and alternative cooling and heating systems. Learn how to improve your existing system.

Apr 5, 2012 - 7:00 to 8:30 pm

Water Saving Technologies

Did you know that 70% of city-supplied potable water is used primarily for landscape irrigation and 30% of the remainder is used for flushing toilets? Learn about EPA's WaterSense plumbing products and irrigation technologies that can reduce your water consumption by 20-30%. Obtain landscaping tips to reduce irrigation needs while providing a healthy and beautiful environment.

May 3, 2012 - 7:00 to 8:30 pm

Indoor Environmental Quality and Healthy Homes

Air pollutant levels inside an energy efficient tightly-sealed home can be six times higher than outdoor levels. Learn strategies to improve indoor environmental quality and well-being, including tips on material selection, green labeling, fresh air ventilation, filtration and daylighting.

Jun 7, 2012 - 7:00 to 8:30 pm

Innovative Green Projects in the Valley

Are you ready for the future? Explore innovative and trendsetting projects that excel in energy efficiency, material resources, water reuse, and unique building design solutions.

- **Green Building Lectures**

- 1st Thursday of each month
- avg. attendance is 45

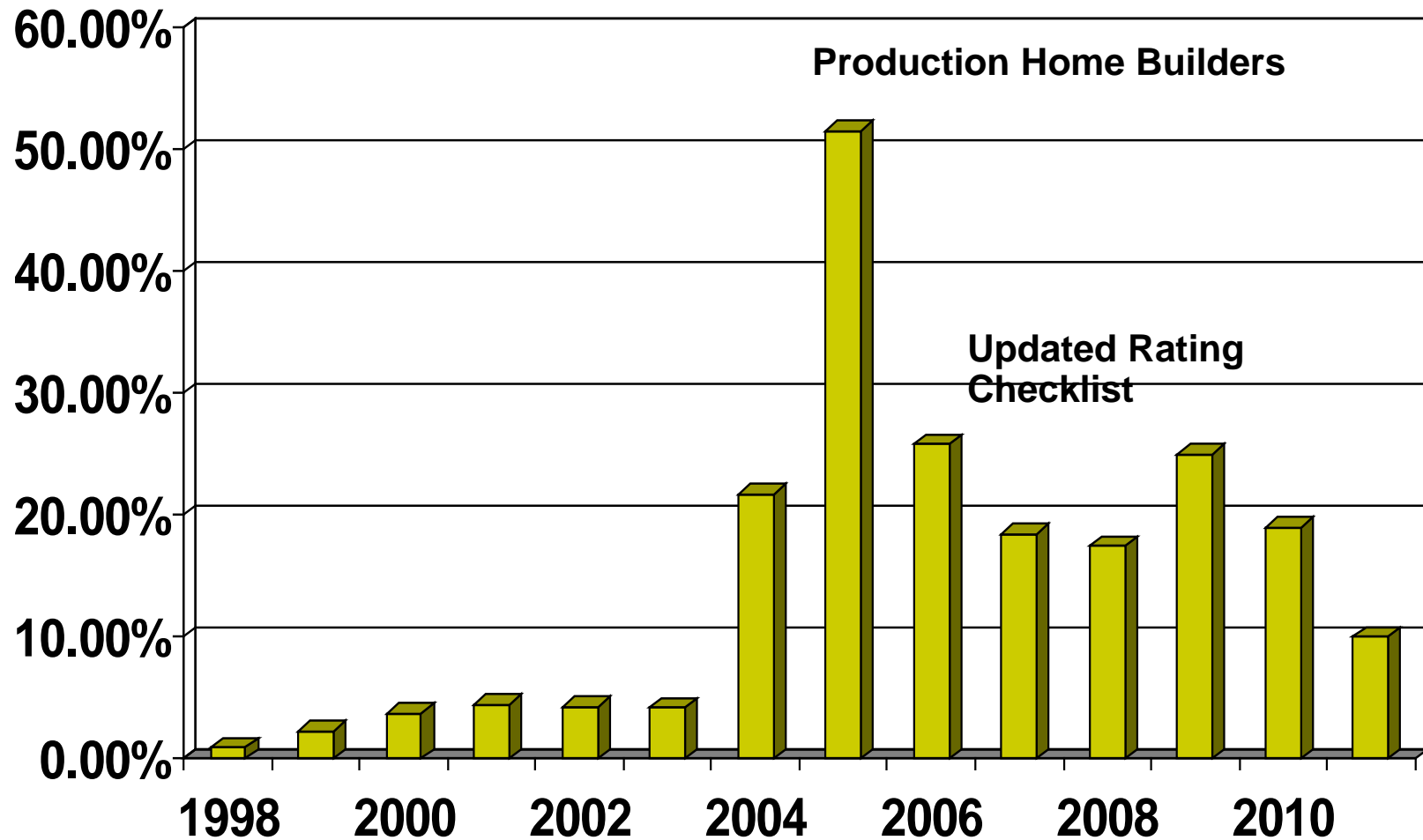
- **Solar Lectures**

- 3rd Thursday of each month
- avg. attendance is 25



www.scottsdaleaz.gov/greenbuilding

Green Single Family Permit Activity



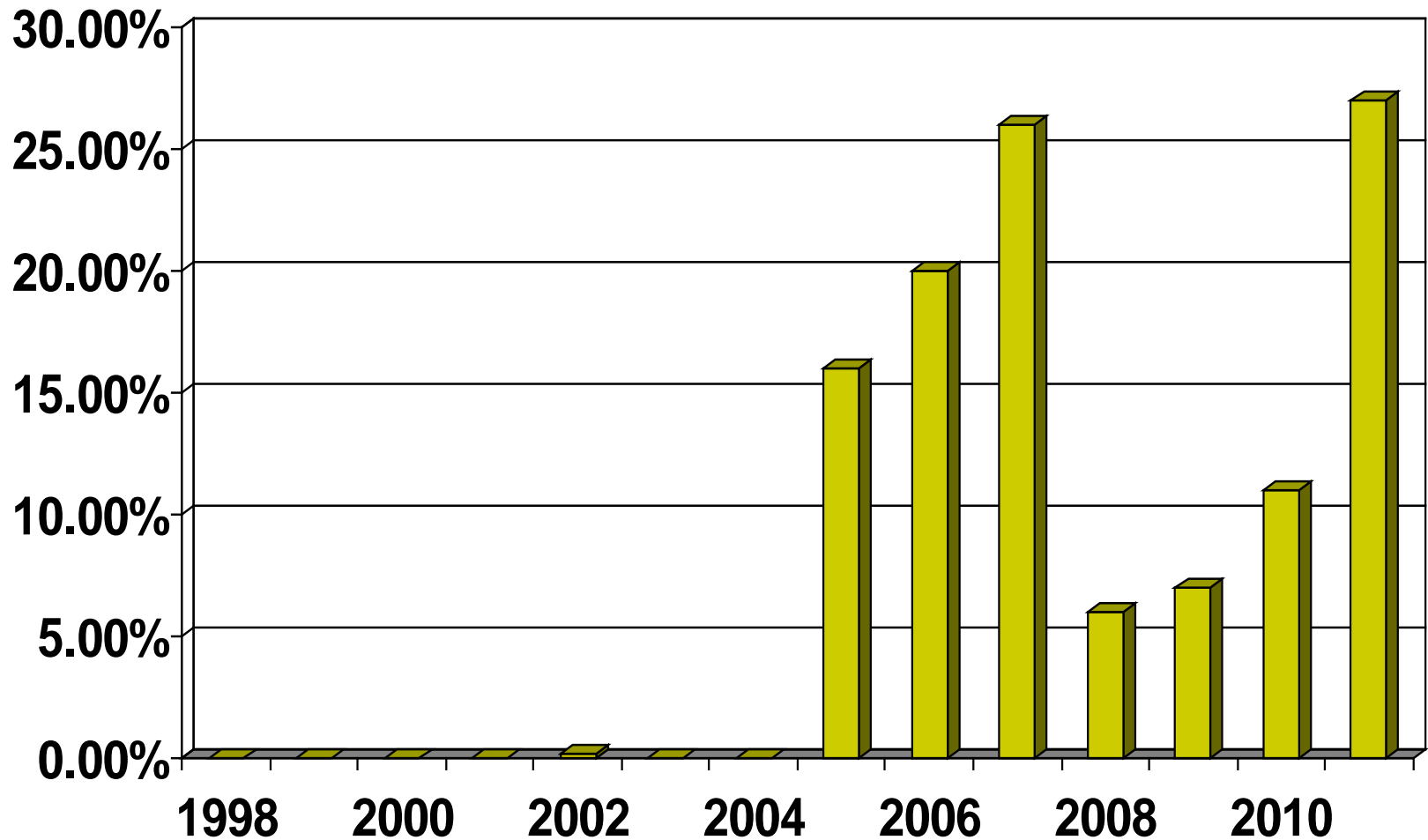
Source: Scottsdale CDS records

Green Single Family Permit Activity (1998 - 2011)

Year	Total Permits	Green Permits	Percentage of Total Permits
1998	2172	20	1%
1999	1554	36	2%
2000	1076	41	4%
2001	843	38	5%
2002	768	33	4%
2003	896	38	4%
2004	1137	247	22%
2005	852	439	52%
2006	685	177	26%
2007	573	106	19%
2008	200	35	18%
2009	121	30	25%
2010	149	28	19%
2011	155	15	10%
Total	11,181	1,283	12%

Source: Scottsdale CDS records

Green Tenant Improvement Permits



Source: Scottsdale CDS records

Green TI and Condo Unit Build-outs (1998 - 2011)

Year	Total Permits	Green Permits	Percentage of Total Permits
1998	1732	0	0
1990	1789	0	0
2000	1366	1	0.07
2001	1003	0	0
2002	832	2	0.2
2003	1149	0	0
2004	982	0	0
2005	1121	181	16%
2006	1328	264	20%
2007	1019	265	26%
2008	638	41	6%
2009	193	13	7%
2010	354	37	11%
2011	227	61	27%
Total			

Source: Scottsdale CDS records

Scottsdale Building Trends

1998 – 2012

- **Energy Efficiency**

- Cathedralized attics (insulation at roof deck)
- All buildings constructed from 2006 to 2012 are 15% or more efficient than national energy code (2006 IECC)

- **Heat Island Mitigation**

- Shaded building entrances, courtyards, outdoor living spaces and limited hardscape surfaces

- **Water Efficiency**

- Low-water use landscaping and efficient irrigation systems
- High efficiency plumbing fixtures
- Efficient hot water delivery systems (recirculation pumps)

- **Passive and Active Solar Systems**

- Significant increase in permits for photovoltaic (solar electric) and solar hot water systems

“A cynic is a man who knows the price of everything, and the value of nothing.”

Oscar Wilde



Green equates to Quality

- It's not a question of whether one can afford green building, but whether how much one is able to afford
 - Health
 - Performance
 - Safety
 - Durability
 - Comfort





Costs are Relative



- **Depends on how far you go**
 - Standard Quality versus High Quality
- **If a green product costs more, it is often**
 - More durable
 - High performing
 - Multi-functional
 - Aesthetically valued
- **You generally get what you pay for**

Green Saturation into the Market

- **Most environmentally responsible products are no more expensive than average costs**
 - composite decking (recycled plastic/scrap wood) that is highly durable with low maintenance
 - comparable to higher grade cedar or redwood
 - high efficiency toilets (1.28 gpf)
 - WaterSense label is the industry standard



Green Saturation into the Market

- **Engineered lumber products**
 - standard component of wood construction
- **Energy efficiency products**
 - highly competitive market
- **Recycled content materials**
 - economic benefit for most manufacturers
- **Regional and Indigenous materials**
 - economic advantage for locally recovered, harvested, extracted or manufactured building products





Foster Residence - 2004

AAC walls, Daylighting, Solar Power, Metal Framing - Edwards Design Group



Hovey Residence - 2004

Scottsdale's first
Building Integrated Solar PV System

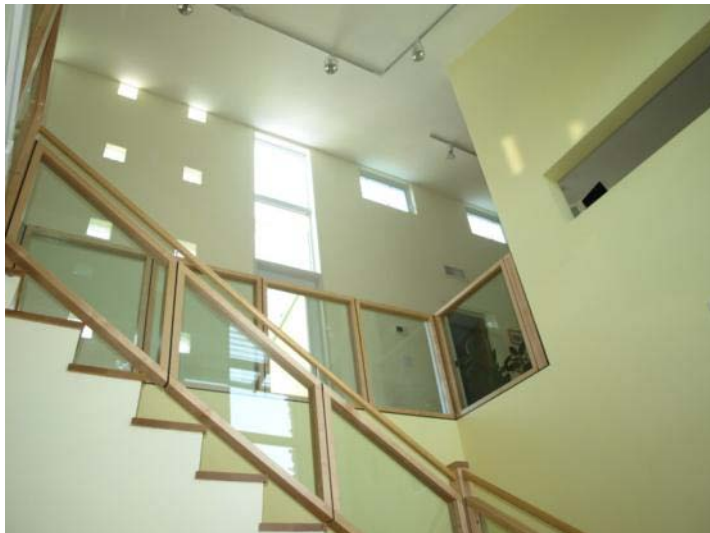




McDonnell Residence - 2005

Downtown in-fill development
Live-work remodel and addition

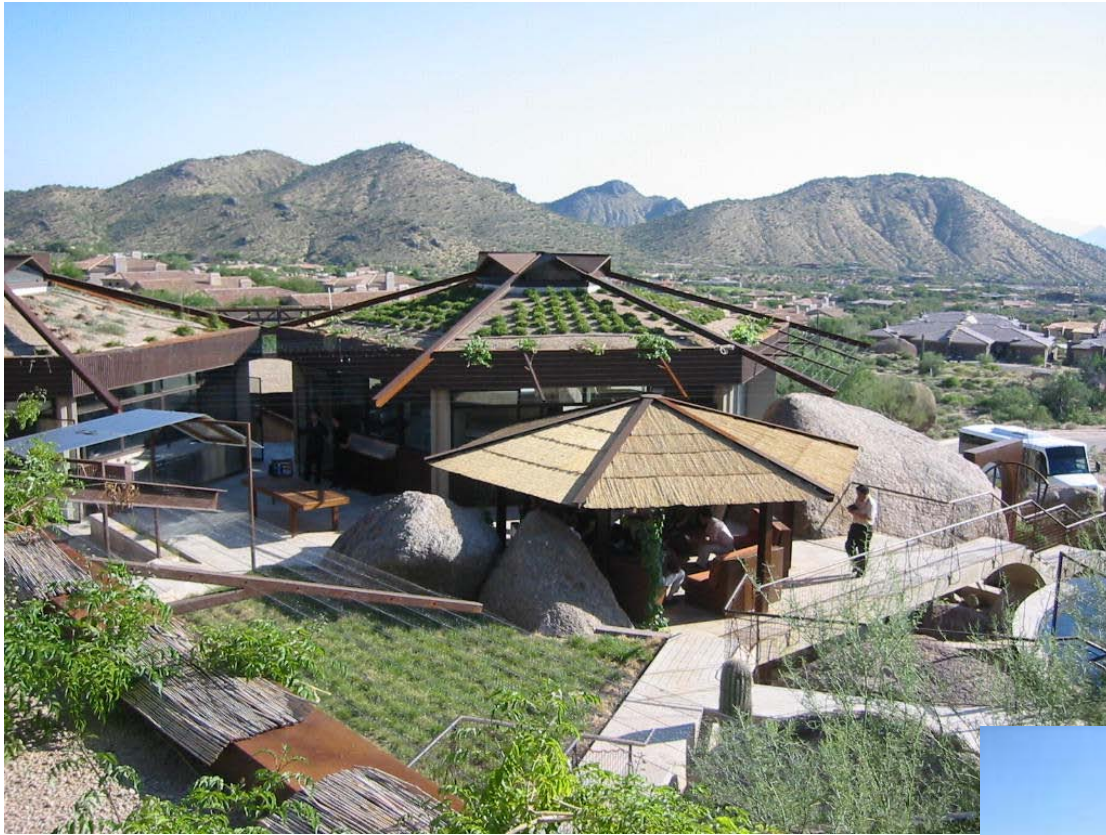
Daylighting, solar control
energy efficient building envelope





Strata International – 2005

Saebi Alternative Building System – Load bearing foam foundation, walls and roof



Scottsdale's
Highest Rated Green Home

Beaulieu Residence - 2006

Earth sheltered, renewable energy,
passive cooling, vegetated roofs,
site integration, outdoor living,
indoor natural ventilation,
gray water recycling



Post Occupancy Energy Audit of Scottsdale Green Homes

Project	Building Completion Date	Size (sq. ft.)	Governing Building Code (at time of permit)	Energy Audit, Performance Testing and Rating (8/09 to 5/10)
Becker Residence (exterior insulated masonry wall construction)	8/02	2,654	UBC 1997	HERS Index - 73 27% better than 2006 IECC
Loloma 5 Town Homes (exterior insulated masonry & wood frame construction)	10/04	1,612	UBC 1997	HERS Index - 76 24% better than 2006 IECC
McDonnell Infill Office/Residence (exterior insulated masonry wall construction)	12/04	2,241	UBC 1997	HERS Index - 61 39% better than 2006 IECC
Krahman/Wallenmeyer Residence (exterior insulated wood frame wall construction)	8/08	5,508	IRC 2003	HERS Index - 10 (65 w/o solar) 90% better than 2006 IECC
Moore Remodel (exterior insulated masonry wall construction)	4/10	1,842	IRC 2003	HERS Index – 8 (55 w/o solar) 92% better than 2006 IECC

Post Occupancy Energy Audit of Green Homes



Becker Residence



Krahman/Wallenmeyer Residence



McDonnell Infill Office/Residence



Loloma 5 Town Homes



Scottsdale City Resolution LEED Gold Certified City Buildings

March 2005



Granite Reef Senior Center
1st LEED Gold certified city
facility - 2006

Gabor Lorant Architects

Solar partnership with SRP
solar electric (PV) shade canopy
roof mounted solar electric (PV)



Lost Dog Wash Trailhead Building - 2006



B. Timmerman



Scottsdale certified

Weddle Gilmore Architects

LEA Architects



**1st LEED Platinum
certified city facility**



Downtown Fire Station 2 - 2009

DSAA / DWL Architects



J. Jones

Appaloosa Library - 2009

Weddle Gilmore Architects



C. Brown

**Gateway Access
Trailhead Building - 2009**



Richard + Bauer Architects

Arabian Library – 2008/2009 certification



McCormick-Stillman Model Railroad Building - 2011



**LEED Gold
certified city facility**

Holly Street Studio Architects

WLC Architects



**LEED Platinum
pending**



Fire Stations #1 and #8 - 2012

SkySong

ASU Scottsdale Innovation Center



SkySong - 2009
Phase I & II Office Buildings





General Dynamics Facility

Certified Green under the new LEED

Operations and Maintenance designation – EB/OM

- 2009 – General Dynamics became the first industrial site of its size to receive the LEED-EB/OM designation
- 2005 - General Dynamics received the first EB certification during the LEED pilot program
- Conversion of 250,000 square feet of lawn to a Xeriscape
- Diverted 575 tons of recyclable materials from local landfills



Optima Camelview Village



Optima Development



Largest Scottsdale Green Building Project (Phase I-III, 2005-2012)

11 buildings - 700 residential units - 24,000 sq. ft. retail – 13 acre site
18 acres of vegetated terraces – Seeking LEED Silver certification

Hyatt Regency Scottsdale at Gainey Ranch

Largest Solar Hot Water System Installed in a Hotel

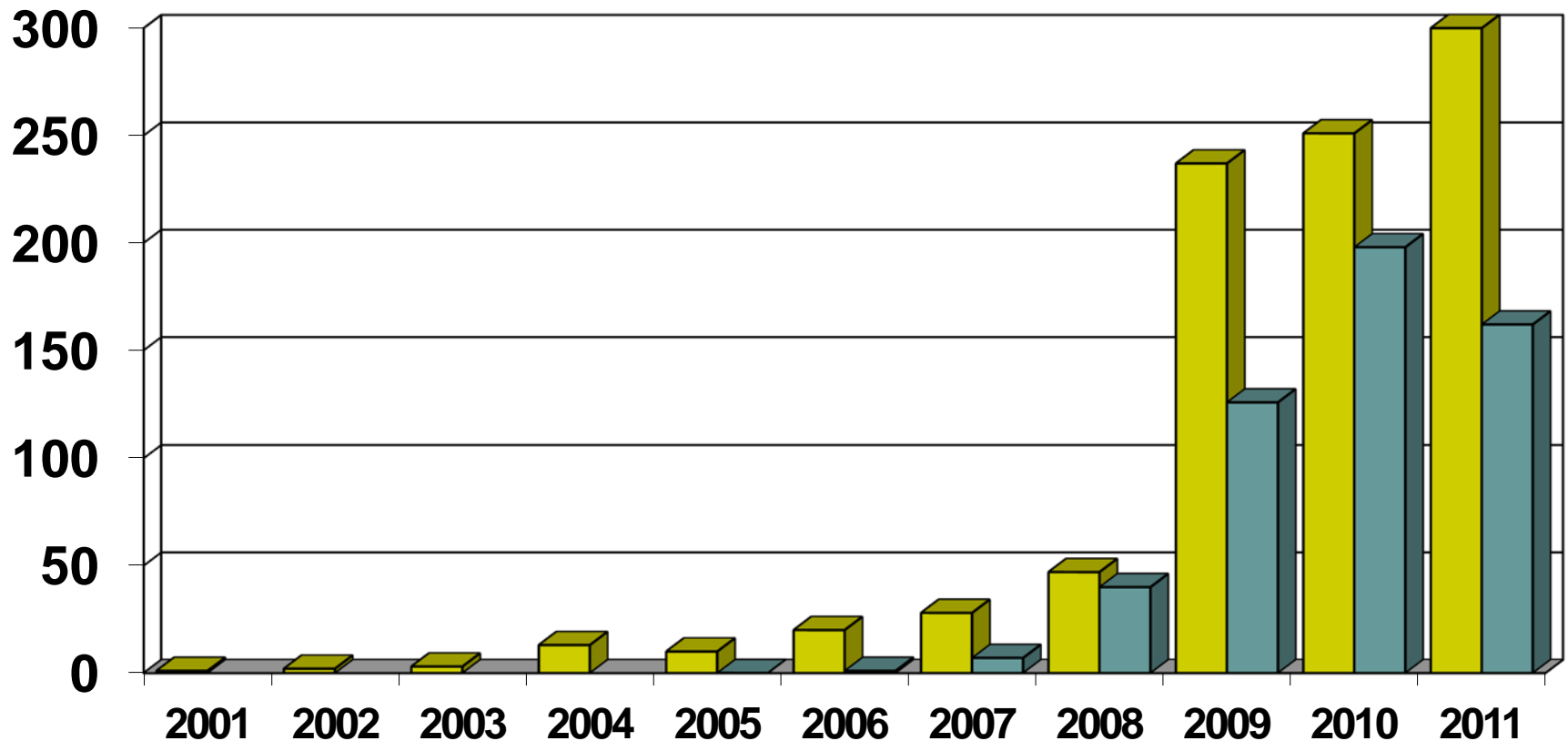
- Domestic hot water for
 - 492 guest rooms
 - main laundry services room
 - restaurants
- Designed to reduce the resort's energy use by 50%
- Estimated 3-year payback on investment beginning in 2009



Solar Permits 2001 to 2011

Solar Demand Continues to Grow

■ PV ■ Hot Water



Source: Scottsdale CDS permit records

Solar Permits 2001 to 2011

Solar Demand Continue to Grows

Solar Electric (PV)

Year	01	02	03	04	05	06	07	08	09	2010	2011
No. of Permits	1	2	3	13	10	20	28	47	237	251	300

Solar Hot Water

Year	01	02	03	04	05	06	07	08	09	2010	2011
No. of Permits	-	-	-	-	0	1	7	40	126	198	162

Source: Scottsdale CDS permit records

Solar Design Guidelines



Without esthetic consideration of solar panel placement, panels requiring southern exposure could look like this lunar landing.

Solar System Submittal Guidelines

Residential Solar Plan Review Quality Submittal Guidelines

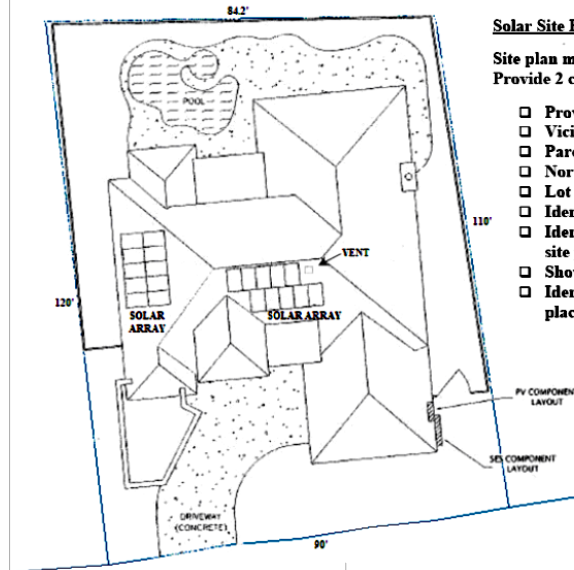


This packet applies to roof-mounted solar photovoltaic and hot water systems only.

City of Scottsdale
One Stop Shop
7447 E. Indian School Road, Suite 105
480-312-2500

September 2009

SOLAR SITE PLAN CHECKLIST/EXAMPLE

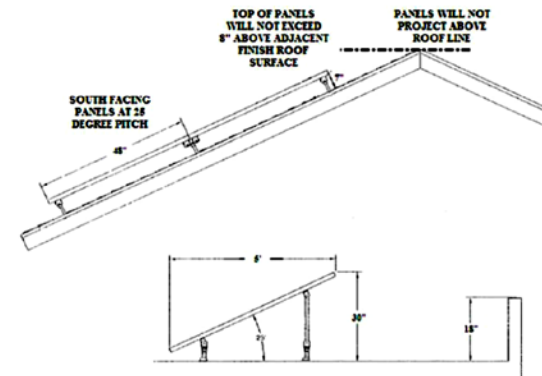


Solar Site Plan Checklist:

Site plan must be legible, show entire lot, and be proportional in scale. Provide 2 copies of site plan.

- ☐ Provide Zoning
- ☐ Vicinity Map
- ☐ Parcel # (APN), lot & subdivision
- ☐ North Arrow
- ☐ Lot dimensions
- ☐ Identify street
- ☐ Identify easements (i.e. NAOS or drainage easement—represent on site plan with dashed lines)
- ☐ Show all ridge lines, and/or parapets
- ☐ Identify all vents, chimneys, or other apparatus that may affect placement of panels

SOLAR ELEVATION EXAMPLE





City of Scottsdale
Green Building Program
 "Sustainable Building in the Sonoran Desert"

**SOLAR PANEL PLACEMENT DESIGN GUIDELINES
 FOR SINGLE FAMILY HOMES**

The following guidelines are to be used in the design and placement of solar panels (photovoltaic and solar thermal systems) on pitched and flat roofs of single-family dwellings for the purpose of compatible design. With a little foresight and planning, a solar system can be effectively integrated into the design of new and existing roofs. Those projects which comply with the design guidelines qualify for over the counter plan review. All other proposals will be required to be submitted for plan review.

A. South Facing Pitched Roofs (within 45° east or west of due south)

- 1) Solar panels should be low profile and parallel with the plane of the pitched roof.
- 2) Top of the panels should not exceed 8 inches above the adjacent finish roofing surface (e.g. - tile, shingles). Panels should not project above the roof ridge line.
- 3) Placement of panels should be uniform. Consider the panels as part of the overall roof configuration. Match the shape and proportions of the array with the shape and proportions of the roof.
- 4) Color of panel frames and support structure should be neutral and compatible with roof surface color (exposed frames and components should have a non-reflective surface).



- + Per guidelines
 - Not per guidelines

- **Solar PV Panel Placement Design Guidelines**
 - South Facing Pitched Roofs
 - North and East/West Facing Pitched Roofs
 - Flat Roofs







Building Integrated PV Systems



SunPower SunTile

is a roof-integrated solar tile for flat and S-Tile roofs.



Building Integrated PV Systems



Desert Mountain Residence, Scottsdale



Optima Biltmore Condo Project, Phoenix



Scottsdale Granite Reef Senior Center

Building Integrated PV Systems



Beaulieu Residence, Scottsdale



The Smart Energy House

The Smart House

Xcel Energy's Smart Grid Consortium is imagining a future that would allow you to communicate your energy choices to the power grid and automatically receive electricity based on your personal needs.

The potential benefits:

- Lower cost of power
- Cleaner power
- A more efficient and resilient grid
- Improved system reliability
- Increased conservation and energy efficiency

Plug-in Hybrid Electric Car

Xcel Energy is studying how plug-in electric vehicles can store energy, act as backup generators for homes and supplement the grid during peak hours.

Smart Meter

Real-time pricing signals create increased options for consumers.

Smart Appliances

Smart appliances contain on-board intelligence that "talks" to the grid, senses grid conditions and automatically turns devices on and off as needed.

Smart Thermostat

Customers can opt to use a smart thermostat, which can communicate with the grid and adjust device settings to help optimize load management. Other "smart devices" could control your air conditioner or pool pump.

High-Speed Connections

Advanced sensors distributed throughout the grid and a high-speed communications network tie the entire system together.

Customer Choice

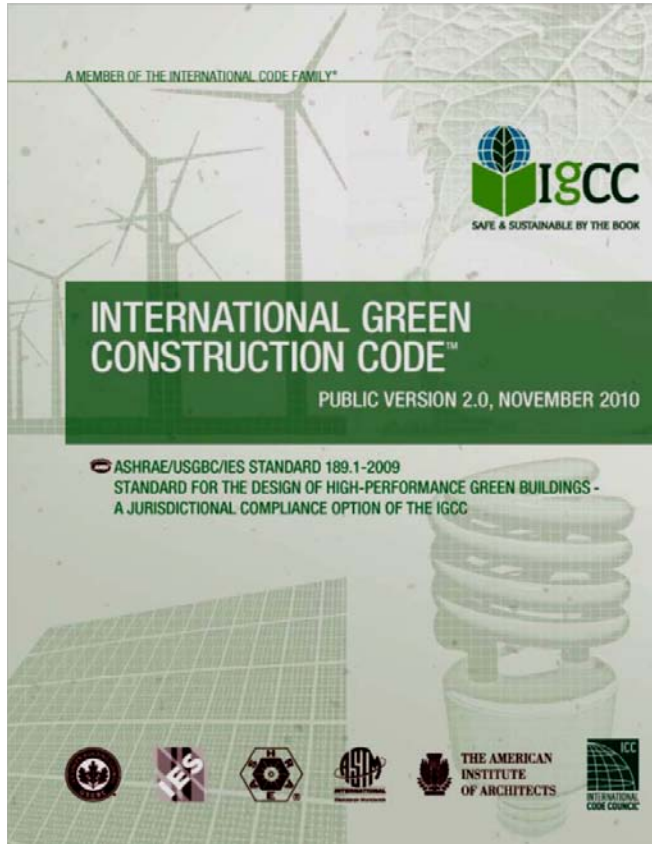
Customers may be offered an opportunity to choose the type and amount of energy they'd like to receive with just the click of a mouse on their computer. 100 percent green power? A mix of sources? The cheapest priced source? In Smart Grid City, it could be up to you.





Scottsdale's IgCC Adoption

July 5, 2011 – Voluntary/Mandatory



- Site Development and Land Use
- Materials Resources
- Energy Efficiency
- Water Efficiency
- Indoor Environmental Quality
- Commissioning, Operation and Maintenance

Version 2.0 - November 2010

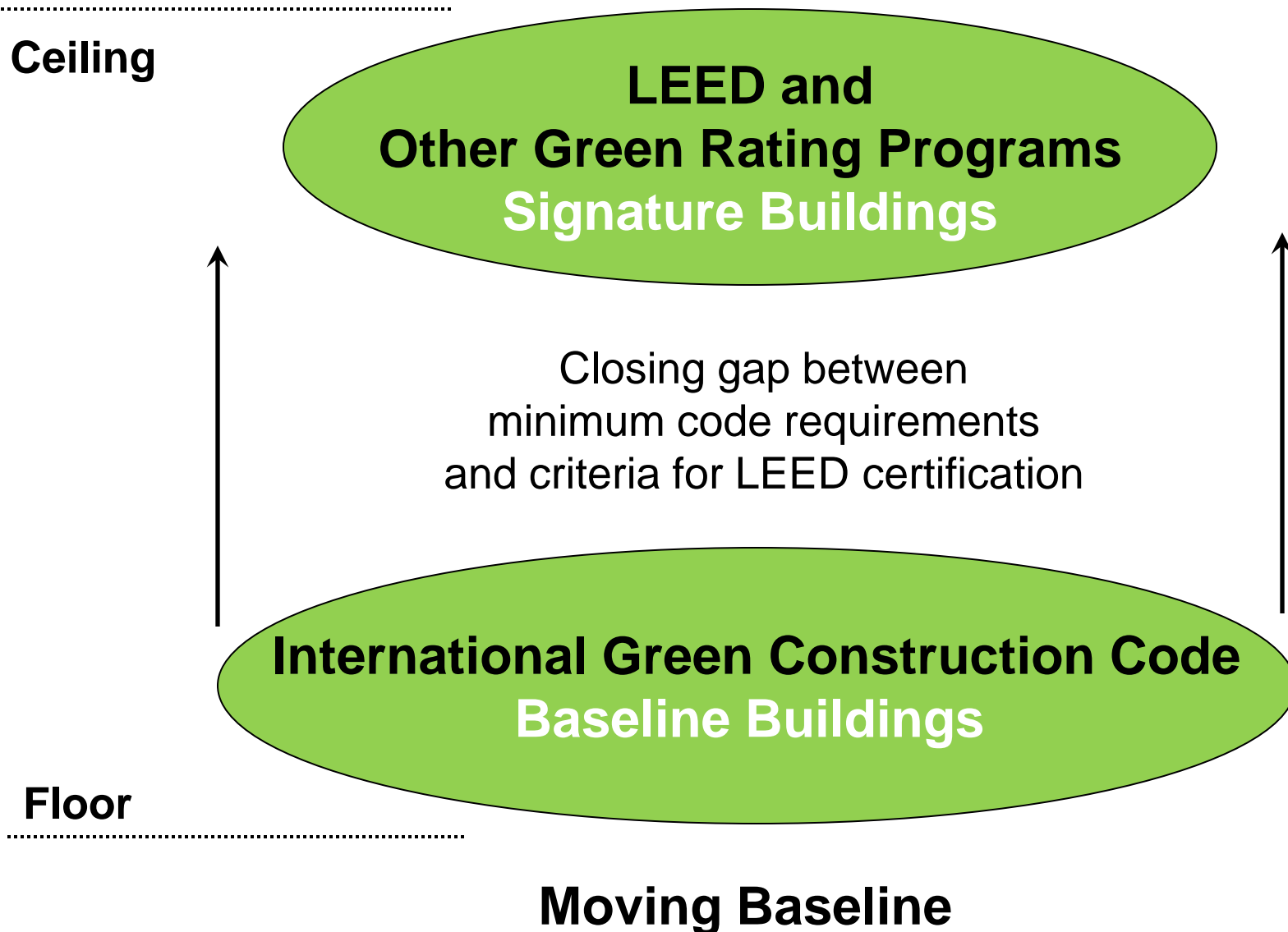


Standards Worldwide - Home



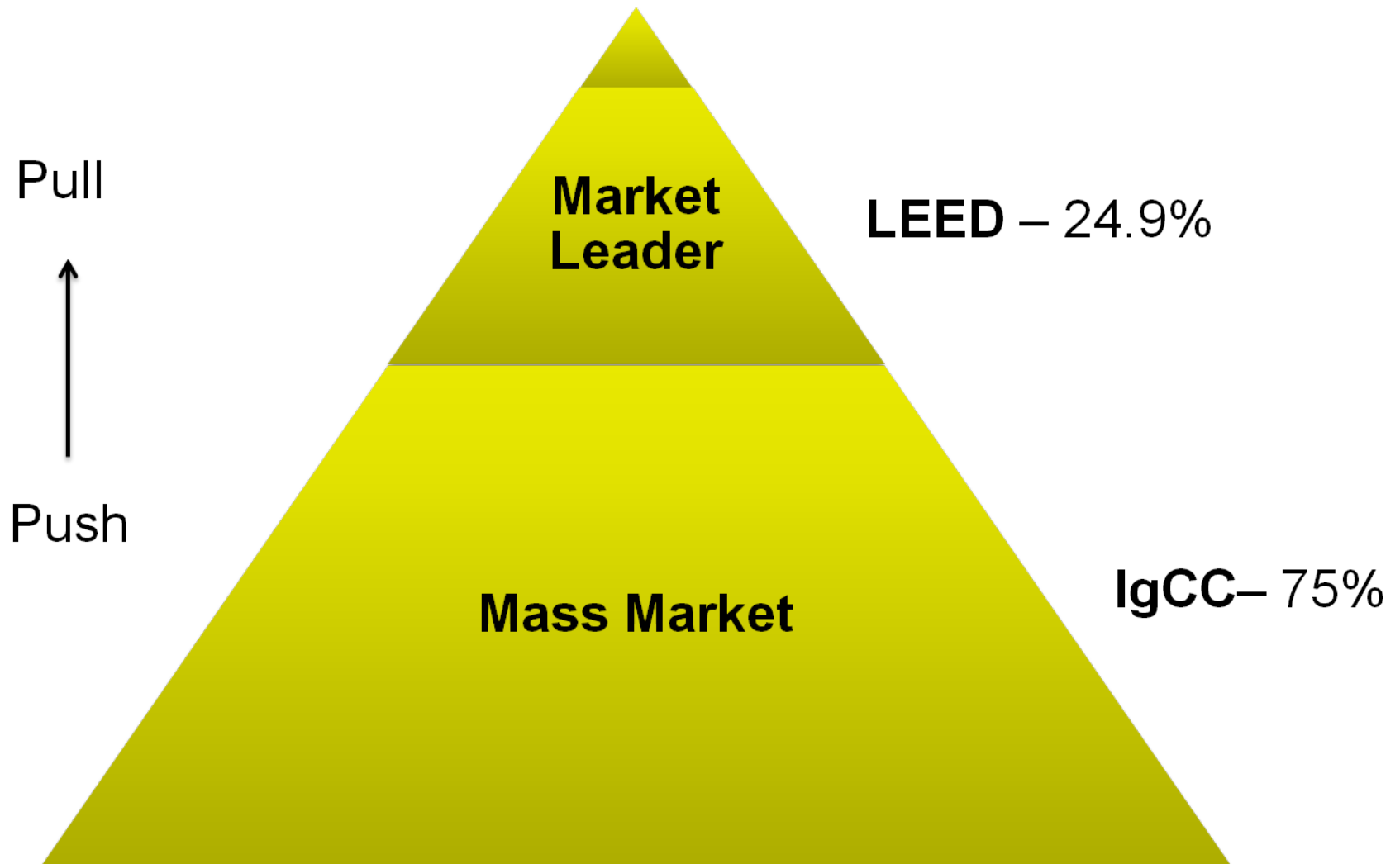
Illuminating
ENGINEERING SOCIETY

Gap between IgCC and LEED



Towards Regenerative Buildings

Living Building Challenge - 0.1%



Alignment of Tools and Instruments

Green Rating Programs

Government Policy

Standards & Codes

Market Supply & Demand

For More Information



Office of Environmental Initiatives

Planning, Neighborhoods and Transportation Division

Green Building Program

Anthony Floyd, AIA, LEED-AP

afloyd@scottsdaleaz.gov

480-312-4202

www.scottsdaleaz.gov/greenbuilding