

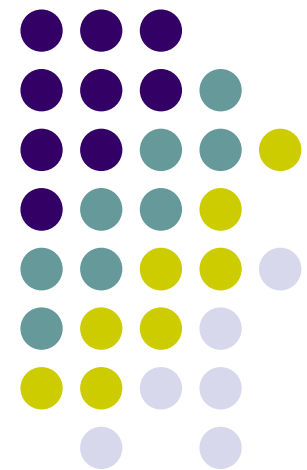
Scottsdale 2017 Green Building Trends



City of Scottsdale Green Building Program

February 9, 2018

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





City of Scottsdale Green Building Program

- **Established in 1998**
 - Rating criteria based on Sonoran Bioregion
- **Verification Process**
 - Integration with city plan review, permits and inspections
- **Public Outreach**
 - Green pre-apps with new permit applicants
 - Engagement with architects, builders, owners
 - Green Building Lecture Series
- **Periodic Updates**
 - Release of Green Home Rating Checklist v4.0
 - Adoption of International Green Construction Code (2015 IgCC) for commercial buildings





Program Incentives

- **Scottsdale Green Building Designation**
- **Streamlined Documentation & Verification Process**
- **Technical and Permit Process Assistance**
- **No Application or Certification Fees**
- **Enhanced Market Niche**
 - city designation and listings
- **Promotion Material and Educational Programs**
 - logos, brochures, handouts, job site signs, lecture series



Green Building Program Collaboration with other City Programs & Initiatives

1. General Plan Elements
2. Planning & Zoning Ordinances & Stipulations
3. Sensitive Design Principles
4. Energy Code
5. Water Conservation Ordinance
6. City Facility Management
7. Housing Rehab Office

SCOTTSDALE

AZ



Green Building Lecture Series

- 1st Thursday of month
- Granite Reef Senior Center
- Average attendance - 30



Sustainable Building in the Desert

SCOTTSDALE



GREEN BUILDING PROGRAM

CITY OF SCOTTSDALE GREEN BUILDING LECTURE SERIES 2016/2017

Scottsdale
Granite Reef Senior Center,
located at
1700 N. Granite Reef Road
(NW corner of McDowell & Granite Reef)

7 to 8:30 pm

Free Admission

October 6, 2016

Rooftop Solar: An Exciting Future for All

Join us for a lively discussion and update on rooftop solar, net-metering, evolving solar incentives, milestones, and the future of photovoltaics (PV) in the Desert Southwest.

November 3, 2016

Green Renovations in Southern Scottsdale

It's easy to incorporate the latest energy efficient, healthy and environmentally responsible features in new buildings but what about 60+ year old buildings? Hear about a major upgrade to Scottsdale's first all-electric model home (circa 1950's) and a 1960's retrofitted apartment building.

December 1, 2016

Getting Toxins Out of Your Home and Workplace

Indoor air pollutants can be six times higher than outdoor air. Learn strategies to improve indoor environmental quality, including tips on material selection, green labeling and fresh air ventilation.

February 2, 2017

Living an Edible Landscape Life

Join urban gardeners as they share the benefits and how-to's of growing your own healthy food, herbs, edible flowers and fruit trees in our desert environment. Learn about our planting and harvesting seasons. Find out about the wide range of community gardens available for you to participate in and how school gardens provide students with valuable skills.

March 2, 2017

Doing Better with Less: Water Efficient Products and Treatment Alternatives for the Home

Did you know that in a residential setting, up to 70% of city-supplied potable water is used for landscape irrigation and 30% of the remainder is used for flushing toilets? Learn about high-efficiency water using products and alternative water treatment systems.

April 6, 2017

Guaranteed Fresh Air: How to Get It Indoors and Keep It

As homes become more energy efficient, they become tighter. Besides opening windows, homes built prior to 2012 get outside air through infiltration around doors, windows, walls and ceiling penetrations. Hear about options for getting whole-house fresh air ventilation while keeping your home air tight and energy efficient.

May 4, 2017

Using Radiant Barriers to Keep the Heat Out

Radiant barriers and reflective insulation are used in astronaut suits and spacecrafts to protect against thermal radiation in fluctuating temperatures of space. Here how these materials can be used to keep your house cooler and more comfortable while reducing air conditioning costs.

June 1, 2017

Repurposed Materials: Finding Treasures for Reuse

Learn creative ways to reuse materials while saving money and natural resources.

Subscribe to Green Building Events at <http://subscriptions.ScottsdaleAZ.gov>
Visit the Green Building website at www.ScottsdaleAZ.gov and search "green building"

Scottsdale Building Trends 1998 – 2017

● Energy Efficiency

- Energy and Green Code adoptions with enhanced performance
- Cathedralized attics (insulation at underside of roof decks)
- Energy Star products, LED lighting and solar ready zones
- Inspections and testing with 3rd party energy raters

● Indoor Environmental Quality

- Outside fresh air intake for whole-house mechanical ventilation

● Water Efficiency

- Xeriscaping and efficient irrigation systems
- High efficiency plumbing fixtures
- Efficient hot water delivery systems

● Heat Island Mitigation

- Recessed entrances, shaded outdoor spaces and courtyards

● On-Site Solar Generation

- Growing number of solar PV installations and battery storage⁶



Green Home Standards Update

Updated Mandatory Baseline Measures in accord with Changing Codes, Industry Standards and Market



City of Scottsdale

Green Home Rating Checklist

New Construction, Major Remodels & Additions

Version 4.0 (July 2015)

Plan Check # _____ Building Permit # _____ GB Rating _____
 Project or Owner's Name - _____
 Project Address - _____
 Designer Name - _____
 Builder Name - _____

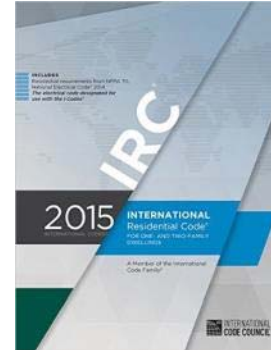
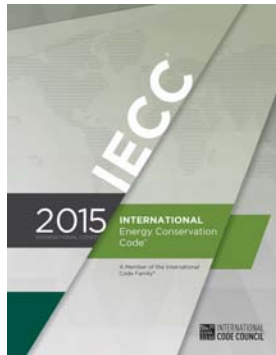
Use this rating worksheet to qualify projects under the Green Building Program for one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories in height with a separate means of egress (International Residential Code - IRC Section R101.2).

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

Tier 1 - Baseline GB Designation	Tier 2 - Advanced GB Designation
<ul style="list-style-type: none"> Meet all <u>30 mandatory measures</u> (p. 2 – 7). 	<ul style="list-style-type: none"> Meet all <u>30 mandatory measures</u> (p. 2 – 7). Accumulate <u>30 or more points</u> from the rated options in the checklist (p. 8 - 17).

Advanced Level - Rating Categories and Maximum Available Points			
1. Site	12 pts	6. Lighting and Power	6 pts
2. Structural Elements	21 pts	7. Plumbing System	5 pts
3. Energy Rating/Renewables	33 pts	8. Roofing	11 pts
4. Thermal Envelope	7 pts	9. Exterior Finishes	5 pts
5. HVAC	16 pts	10. Interior Finishes	4 pts
		11. Doors, Cabinetry, Trim	10 pts
		12. Flooring	8 pts
		13. Solid Waste	6 pts
		14. House Size	+/- varies
		15. Innovative Design	8 pts

Building Code Updates with amendments



- **Code Amendments related to energy efficiency, water conservation and indoor environmental quality**
 - International Energy Conservation Code (IECC)
 - International Residential Code (IRC)
 - International Plumbing Code (IPC)
 - International Green Construction Codes (IgCC)
- **Effective date – Jan. 1, 2017**
- **Training and instructional materials – Jan. thru Dec. 2017**

Over 1400 homes issued Green Certificates of Occupancy



Silversmith Residence - Tate Studio Architects



Eldorado on 1st Condos – Will Bruder Architects

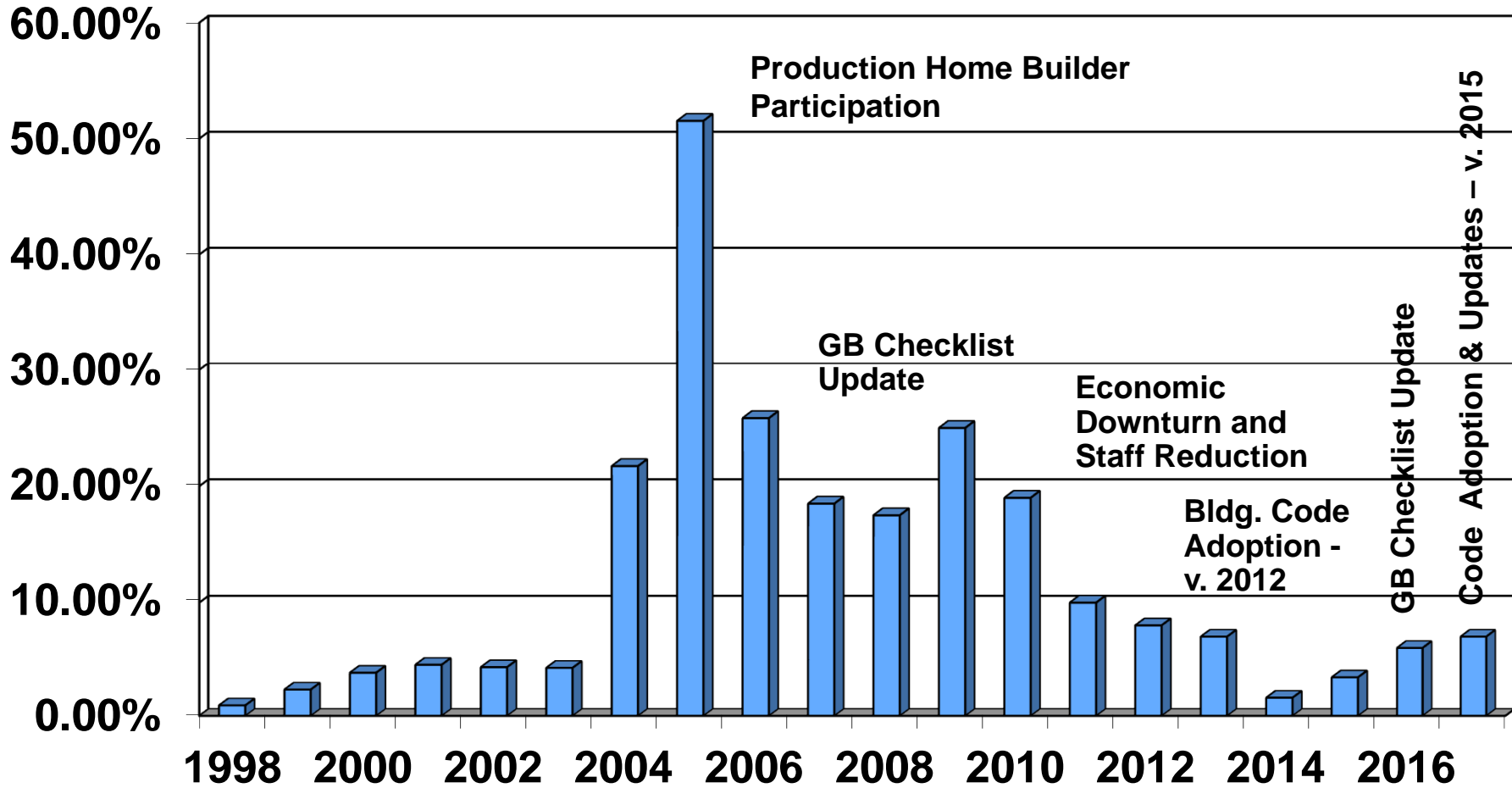


Becker Residence – Perry Becker Architect



The Douglas Scottsdale – John Douglas Architects

Percentage of Green Single Family Permits 1998 - 2017



Source: Scottsdale CDS records

Green Single Family & Townhomes Permits (1998 - 2017)

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%
2012	265	21	8%
2013	400	26	7%
2014	440	7	1.6%
2015	438	15	3.4%
2016	525	29	6%
2017	560	38 (7 SFR; 31 townhomes)	7%
Total	13,809	1,419	10.3%

Source: Scottsdale CDS records

Green House Gas Reduction – 2017



Equivalent of **1048 cars** removed from the street representing **11,994,807 miles** driven by average cars as a result of the energy savings of **1,419 green homes**



Energy Savings and Environmental Impact Reduction of Small Custom Green Homes

Estimated energy savings and equivalent greenhouse gas reduction resulting from houses completed under the Green Building Program.

Green Home Energy Measures	Annual Energy Savings and Pollution Reduction	
	Per Home	Total Savings for 1,419 green homes in 2017
Typical <u>Small</u> Custom Home¹	2,700 square feet	
Average Annual Energy Reduction¹	4,634 Kilowatt hours (kWh)	6,575,646 Kilowatt hours (kWh)
Average Annual Energy Cost Savings	\$554.23 per year (0.1196 per kWh) ²	\$786,447.26 (0.1196 per kWh) ²
Equivalent Annual Greenhouse Gas Reduction³	3.8 tons of carbon dioxide (CO ₂) avoided	5,392.2 tons of carbon dioxide (CO ₂) avoided
Equivalent Passenger Vehicles removed from Street³	0.738 passenger vehicles	1048 passenger vehicles
Equivalent miles driven by an average passenger vehicle³	8,453 miles	11,994,807 miles

Sources: ¹Scottsdale Green Home Energy Study (2009); ²electricitylocal.com/states/arizona/scottsdale; ³epa.gov/energy/greenhouse-gas-equivalencies-calculator

Energy Savings and Environmental Impact Reduction of Average Custom Green Homes

Estimated energy savings and equivalent greenhouse gas reduction resulting from houses completed under the Green Building Program.

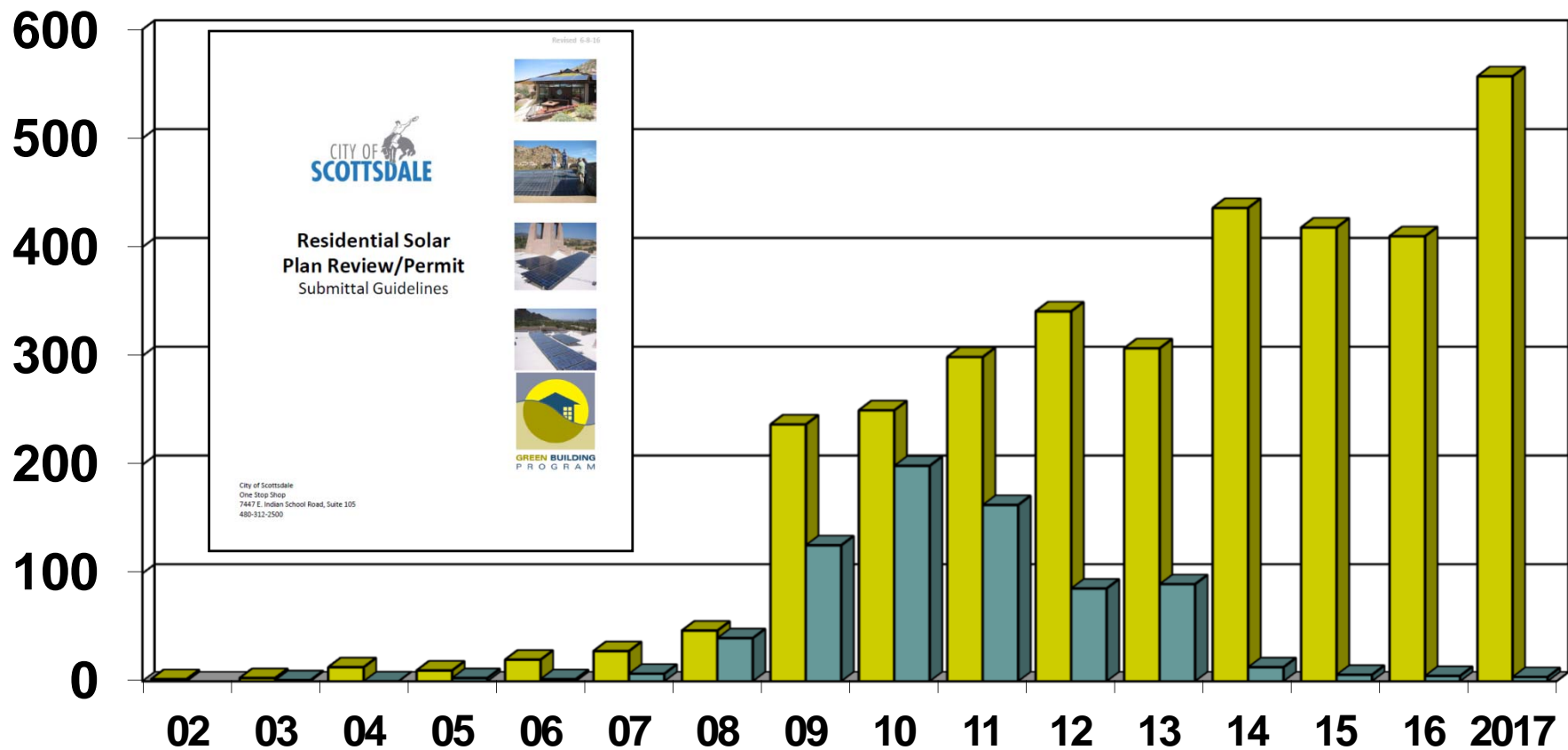
Green Home Energy Measures	Annual Energy Savings and Pollution Reduction	
	Per Home	Total Savings for 1,419 green homes in 2017
<u>Average Size Custom Home</u>¹	5,500 square feet	
Average Annual Energy Reduction¹	11,183 Kilowatt-hours (kWh)	15,868,677 Kilowatt-hours (kWh)
Average Annual Energy Cost Savings	\$1,337.49 per year (0.1196 per kWh) ²	\$1,897,893.77 (0.1196 per kWh) ²
Equivalent Annual Greenhouse Gas Reduction³	9.2 tons of carbon dioxide (CO ₂)	13,054.8 tons of carbon dioxide (CO ₂) avoided
Equivalent Passenger Vehicles removed from Street³	1.8 passenger vehicles	2,555 passenger vehicles
Equivalent miles driven by an average passenger vehicle³	20,398 miles	28,944,762 miles

Sources: ¹Scottsdale Green Home Energy Study (2009); ²electricitylocal.com/states/arizona/scottsdale; ³epa.gov/energy/greenhouse-gas-equivalencies-calculator

Solar Permits 2002 to 2017

■ PV ■ Hot Water

Over 4,000 solar PV and hot water installations



Source: Scottsdale CDS permit records

Solar Permits 2002 to 2017

Solar Electric (PV)

3,378 + solar PV permits issued

Year	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
No. of Permits	2	3	13	10	20	28	47	237	250	299	341	307	436	418	410	557

Solar Hot Water

745 + solar hot water permits issued

Year	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
No. of Permits	-	1	0	3	2	7	40	126	199	163	86	90	13	6	5	4

Note: Many early solar permits (2002 – 2008) were designated as minimum electrical, plumbing or water heater permits.

Source: Scottsdale CDS permit records

On-Site Energy Generation and Environmental Impact Reduction of Solar Electric (PV) Systems

Estimated energy savings and equivalent greenhouse gas reduction resulting from installed roof top solar PV systems in **2017**.

Green Home Energy Measures	Annual Energy Savings and Pollution Reduction	
	Per Home	Total Savings for <u>557</u> solar PV roof tops in 2017
Average PV system size	6 kW	
Average Annual On-Site Energy Generation¹	9,798 Kilowatt hours (kWh)	5,457,486 Kilowatt hours (kWh)
Average Annual Energy Value¹	\$1,062	\$591,534
Equivalent Annual Greenhouse Gas Reduction²	7.6 tons of carbon dioxide (CO ₂) avoided	4,233.2 tons of carbon dioxide (CO ₂) avoided
Equivalent Passenger Vehicles removed from Street²	1.5 cars	836 cars
Equivalent miles driven by an average passenger vehicle²	16,503 miles	9,192,171 miles

Sources: ¹pvwatts.nrel.gov; ²epa.gov/energy/greenhouse-gas-equivalencies-calculator
²epa.gov/energy/greenhouse-gas-equivalencies-calculator

On-Site Energy Generation and Environmental Impact Reduction of Solar Electric (PV) Systems

Estimated energy savings and equivalent greenhouse gas reduction resulting from installed roof top solar PV systems from **2002 to 2017**.

Green Home Energy Measures	Annual Energy Savings and Pollution Reduction	
	Per Home	Total Savings for <u>3,378</u> solar PV roof tops
Average PV system size	6 kW	
Average Annual On-Site Energy Generation¹	9,798 Kilowatt hours (kWh)	33,097,644 Kilowatt hours (kWh)
Average Annual Energy Value¹	\$1,062	\$3,587,436
Equivalent Annual Greenhouse Gas Reduction²	7.6 tons of carbon dioxide (CO ₂) avoided	25,673 tons of carbon dioxide (CO ₂) avoided
Equivalent Passenger Vehicles removed from Street²	1.5 cars	5,067 cars
Equivalent miles driven by an average passenger vehicle²	16,503 miles	55,747,134 miles

Sources: ¹pvwatts.nrel.gov; ²epa.gov/energy/greenhouse-gas-equivalencies-calculator
²epa.gov/energy/greenhouse-gas-equivalencies-calculator



Scottsdale Commercial Projects - 2017

- **Projects approved for construction under the International Green Construction Code (IgCC)**
 - Apple Retail Store at Fashion Square
 - Scottsdale Quarter Retail/Multifamily Complex





Scottsdale City Resolution

LEED Gold Certified City Buildings

Since 2005, 12 LEED certified buildings including 4 Platinum



Airport Operations Center - Silver



Museum of the West - Gold



Appaloosa Library - Gold



Downtown Fire Station 2 - Platinum



Office of Environmental Initiatives

Planning and Development

Green Building Program

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www.scottsdaleaz.gov/greenbuilding