



Santa Fe Area
Green Building
Guidelines

**Santa Fe Area Home Builders Association
&
Sustainable Communities, Inc.**

Santa Fe Sustainable Building Task Force
with Aysha Griffin

Santa Fe Green Building Guidelines

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WHY THIS HANDBOOK?

Our Mission:

To increase awareness of and interest in Green objectives, methods and benefits, with the intent of conserving resources (natural, human and financial) in construction and related fields.

Building for the Future

By designing homes and landscaping which minimize environmental impact and constructing them from components which make efficient use of resources, the building industry and its customers can take immediate and practical steps to provide new homes while placing less stress on our regional and global resources. In doing so, we may extend our resource base and protect the environment, thus ensuring the quality of life for future generations.

In communities around the nation, responsible citizens are developing their own guidelines for residential Green Building programs, based on their growing awareness of environmental issues and desire to apply resource and energy-efficient principles to the design and construction of homes.

This handbook is intended as a resource to help define and illuminate the Green Building Rating Program being developed by The Santa Fe Sustainable Building Task Force, a volunteer committee of the Santa Fe Area Homebuilder's Association and Sustainable Communities, Inc.

In mid-1999 a group of local builders, landscapers, community directors, architects and designers met and formed the Santa Fe Green Building Coalition. The next year, the SFAHBA convened the Santa Fe Sustainable Building Task Force to develop a Rating Program that would form the basis of a usable guidebook. The Rating Program (then unpublished) became an offering in the 2001 Hacienda Parade of Homes for builders wishing to promote themselves as "green builders."

With this publication, our goal is to promote Green Building in the Santa Fe area consistent with the standards developed and outlined in this handbook for building professionals, governmental agencies and the general public.

The challenge of our times is in developing and applying new materials and techniques to reduce the negative impact of construction AND implement systems which minimize operational energy use. As a community of builders and homeowners, we believe we can address these challenges by considering and changing conventional ways of approaching the design, building and maintenance of homes.

We hope you will join us in continuing conversations and mindful actions to make our homes, communities and planet greener, healthier and more sustainable .

The Santa Fe Sustainable Building Task Force

WHAT IS GREEN BUILDING?

Green Building is linked to the concept of “sustainability,” which is defined as “... meeting the needs of people today without destroying the resources that will be needed ... by persons in the future; based on long range planning and the recognition of the finite nature of natural resources...” (United Nations World Commission on Environment and Development).

Specifically, green building refers to energy and material efficiency, which is a complex issue. It must take into account the natural resources used to heat and cool and make materials as well as resources to process, transport, install, maintain and, ultimately, dispose of the built environment.

Building in a “green” manner considers not only materials but also design and construction methods which use less water, energy and material, result in less waste and create durable, high-functioning buildings. The most resource-efficient buildings are designed for the particular climate and built from regionally-available materials.

Green building employs environmentally-sensitive planning, design, specification, labor management and construction methods and technologies in a holistic building strategy. The end ideal is more sustainable homes and communities.

INVITATION

The Santa Fe Sustainable Building Task Force invites both building industry professionals and the general public to participate in resource-efficient “green” building by:

- (1) learning more about design, materials and construction practices which promote resource conservation and
- (2) implementing these ideas in your building projects.

Comments, suggestions and information are welcome.

Contact:

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Green Benefits

Green buildings are much cheaper to heat, cool and light. Because they consume so much less energy, they produce correspondingly less pollution. Lower utility bills make them more affordable. They are healthier spaces in which to work or live – important now that typical Americans spend 80% of their time indoors.

– A Primer on Sustainable Living, Rocky Mountain Institute

THE SANTA FE GREEN BUILDING RATING PROGRAM

*The ultimate measure of a man is not where he stands in moments
of comfort and convenience, but where he stands at times
of challenge and controversy.*

– Martin Luther King, Jr.

Green Standards

*The Green Building Rating
Program is a set of
standards to help evaluate
the “green-ness” of new
or extensively-remodeled
buildings.*

In recent years, with growing interest among builders to highlight and market the environmentally-sound decisions that have gone into their projects, “Green Building” in the Santa Fe area has been largely an informal self-designation.

This Handbook, and its encompassed Rating Program, form the foundation for what will be a functional and on-going program for evaluation, certification and administration of a local Green Rating Program.

A number of procedures must yet be created and implemented to streamline the process for building professionals to apply for Green designation and then verify (through a variety of criteria) that these guidelines have indeed been met.

A certifying agency will be designated, forms created, point systems established and fee schedules set before a formal “Green Building” designation can purport to signify particular compliance.

As in other cities, such a program requires “buy in” from many aspects of the local citizenry concerned with the building industry – from professional organizations and governmental agencies to manufacturers and tradespeople; from architects and designers of all kinds to homeowners and business owners. **Your support and participation is needed.**

The value of Building Green lies not only in the interest of our human health and future natural resources, but also makes good economic sense.

NOTE TO BUILDING PROFESSIONALS

For Green Building Guidelines to become the normal standard for residential construction in our community, we need your participation and support! This means not only choosing sustainably-harvested woods and other more environmentally-friendly materials and methods, but educating your suppliers, subcontractors and clients to the value of such choices. As suppliers respond to demand, choices will increase and costs should decline.

Over time, your commitment to Green Standards will make a positive difference in the public's perception of our industry and in the environment as a whole.

Thank you for your interest. Please let us hear from you.

NOTE TO HOMEOWNERS

Living in the Santa Fe area, you know about our City and County water conservation measures, which are imperative given our semi-arid landscape and growing population. However, the conservation of other resources is also an area ripe for increased awareness – individually and as a community.

Your willingness to educate yourself to the ideas and standards of Green Building puts you in a powerful position as a force for positive change.

You, the consumer, hold the keys to ensuring the future of our natural resources by requiring accountability from planners, builders and legislators.

For this Green Building Program to be effective, the public must make their preference for energy, water and other resource-efficiency known to our City and County officials by encouraging them to adopt codes and standards that are consistent with those in this handbook. Additionally, sharing your desire for green building standards with realtors, lenders, designers and planners will raise the level of support for builders who make the effort to build green, thus constructing a community that is even more environmentally sustainable.

Begin Now

*To those who have not yet
learned the secret of true
happiness, begin now to
study the little things in
your own door yard.*

– George Washington Carver,
American botanist

HOW TO USE THIS HANDBOOK

The Handbook is divided into six sections, coinciding with the six categories of The Green Building Rating Program:

1. Site Guidelines
2. Water Management
3. Energy Efficiency
4. Materials Selection
5. Indoor Environmental Quality
6. Occupant Education

Green Building

Benefits

Integrating house and site design provides the opportunity for the homeowner to benefit from:

- greater comfort
- energy-efficiency
- enjoyment of plants and wildlife

Each section begins with an introduction which identifies the topic and its environmental relevance.

Each section is further divided into subsections with separately identified aspects, or actions, that may be taken to comply with these Green Building Guidelines.

As the future Green Building program develops, each of these aspects will be assigned a potential number of points, based on its relative importance. Therefore, within each of the six categories there will be a potential number of cumulative points. The higher the total points in each category and overall, the greater the Green rating.

It is assumed that many of these statements are common-sense, self-explanatory or required by current building codes or other regulation. In the case of more obscure or unusual standards a sentence or two has been included to illuminate.

All these Guidelines are intended to enhance resource-efficiency and, in many cases, yield long-term savings. The challenge, and purpose of this Guidebook is to empower building professionals and our citizenry with knowledge and understanding, addressing the issues of demand, availability and up-front costs. To further illuminate the hard costs involved in implementing various actions, icons are used:

- C** = Little or no additional cost
- \$** = Moderate Cost
- ⌋** = Significant Cost AND Added Value to Homeowner

1. SITE GUIDELINES

Buildings must always be built on those parts of the land that are in the worst condition, not the best.

– Christopher Alexander, A Pattern Language

Site Guidelines refer to the way in which the building site is developed, or readied for construction, the overall site design plan, (including landscaping and hardscaping,) and then how it operates over time.

In Green Building projects, the site is first evaluated for all characteristics, as it plays a crucial role in future performance of the building and enjoyment of the occupants.

A holistic approach to site preservation and use yields extensive benefits. Among them are:

- being aware of and responsive to such factors as sun, wind, noise, view, vegetation, wildlife and slope in order to work with, rather than against, the site;
- preserving native vegetation can greatly reduce the need for additional water and pesticide use;
- protection of trees and shrubs can provide wind and solar protection for buildings, thus reducing heating and cooling needs;
- planting native vegetation reduces the amount of water needed to grow;
- maintaining a habitat for native species preserves environmental balance;
- existing trees add to property value;
- adding trees and shrubs help create a microclimate and stabilize topsoil;
- creation of swales and terraces retain water from precipitation on the ground where it lands, nurturing the plants there as well as recharging the aquifer below, rather than running off to arroyos taking with it precious topsoil.

To maximize the effectiveness of these Green Building Guidelines, a team approach is necessary. Architect/designer, general and sub-contractors, landscaper and homeowner must work together to incorporate ideas into a cohesive whole.



Wise Choices

The intention of site guidelines, consistent with green building, is to maximize wise choice and application of materials, resources and energy, using recycled products and recycling when possible, and minimize damage to the natural ecosystem and dependence on resource-intensive systems.



PRESERVATION

1. Do not build on critical habitats, wetlands, farmland, flood plains, wildlife corridors, or highly erosive areas. C \$

2. Fence in construction area to protect areas outside the construction envelope and to minimize site impact. \$

3. Designate washout pits for concrete and plaster clean-up, and maintain these throughout the project. C

4. Develop sediment control and storm-water management plan from pre to post-construction, and install permanent hard-scaped erosion-control devices. C

This is rapidly becoming a mandated process by law with the National Pollution Discharge Elimination System. Construction sites have large areas of bare soil combined with newly constructed impermeable surfaces. This combination is most susceptible to erosion.

The City and County of Santa Fe require ponding to be designed and built as part of the construction planning. Ponding inspection and sign-off is required prior to final inspection. These "ponds", which can be gravel or rock-lined areas following the natural contour of the site, are intended to slow-down and retain the flow of water so it does not leave the site. The total square footage of the ponds is relative to the square footage of the disturbed area. The concept is based on the idea that the man-made structure has disrupted and accelerated the natural flow of water, and care must be taken to remedy this disruption and minimize erosion.

5. Bury utilities under roadways to minimize disturbance to vegetation. C \$

6. Use porous material for roadways, drives, pathways and uncovered patios. C \$

7. Limit impervious surfaces to 3,000 square-feet on single-family lots. C

8. Build in R-5 zoned (5 units per acre, or greater density) urban neighborhoods. C

More Waste, Less Resources

Construction and demolition waste makes up about 25% of solid waste in the U.S.

* * * * *

Twenty years ago the average tree harvested from our National Forests was 24" in diameter.

Today the average is 13.

- U.S. Green Building Council

9. Capture and infiltrate 100% of runoff generated by a one-inch storm flow to maximize benefit to landscape and recharge aquifer. ☺

This was determined as a reasonable goal for almost any property. During “monsoon season,” Santa Fe can expect almost an inch of rain in one hour, every other year; and an average 1 inch in one half -hour, once every 10 years. To fully capture and use this water requires planning of grade, surfaces and vegetation. Maximizing the benefit to the landscape requires distribution of the water via active or passive systems.

10. Re-vegetate all land affected by construction using only native plants or non-invasive, non-native plants regionally adapted for drought and frost tolerance. \$ ☺

The landscape surrounding a house plays a large role in the comfort and attractiveness of the home. Considerations such as shading paved areas and planting for wind breaks can create micro-climates which should be integrated with the home’s orientation and energy systems. The selection of landscape materials has a significant impact on the quality and usability of outdoor areas and outdoor water use. By using native, drought-resistant plants which preserve the local ecosystem, water and energy use to maintain the landscape can be minimized. The goal is to create shade, habitat, erosion control, and beauty without much water. This type of planting will establish itself in one or two years and then will require little or no supplemental water.

11. Protect pristine areas by siting development on more-disturbed areas. C \$



Paving over our wealth

Our civilization is literally paving the Earth. Each American child born will require about an acre of impervious surfaces for their portion of streets, parking lots, stores, services, airports, driveways, workplaces, and residences. This causes rainfall to run off where it once recharged our soils and aquifers.



SITE USE

Fill ‘er Up

Americans today generate over 4 pounds of household waste per person per day; only 17% of that gets recycled. Waste generated goes to increasingly crowded landfills and some waste virtually never breaks down. Typical new construction creates literally tons of debris per house. Home construction can produce up to 5 tons of waste per house. Job site wastes include metals, wood and cardboard, which represent over 50% of the debris normally taken to landfills.

12. Properly store and re-use topsoil for landscaping. **C**
Topsoil contains most of the life-supporting nutrients in the soil. This includes the beneficial microorganisms and humus that are necessary to healthy plants. It also must be done in the cold time of year when trees are dormant. Transplanting should be done (or supervised) by someone with experience.
13. Chip cleared site vegetation and use for mulch. **\$**
14. Transplant Piñon trees larger than 4-inch caliper and protect remaining trees. **\$**
This technique must be done in conjunction with firescaping and proper spacing and health of the trees.
15. Minimize and balance both cut and fill. **C \$**
The above four points have the common theme of removing as little as possible from the site. This reduces pollution, landfill problems and costs.
16. Build in a neighborhood subdivision that has an on-site water-harvesting system. **C for builder C for developer**
Good active and passive water harvesting systems provide the necessary moisture for the streetscapes that make a neighborhood attractive.
17. Use minimum outdoor lighting controlled by sensors or timers consistent with safety and prevention of lighting pollution. **\$ up-front C long-term**
18. Site home to minimize negative impact to neighbor’s scenic views and their solar gain. **C**
19. Site home to optimize solar gain. **C**
20. Site home and landscaping to mitigate cool/winter winds and hot/dry summer winds. *(See comment #10)* **C**

21. Provide space during construction for separate storage of materials to be recycled. Provide trash cans for construction crews for lunch and miscellaneous trash. C

Our area dumps and transfer stations provide free recycling of cardboard, glass, aluminum and newspapers. By recycling, contractors not only save on refuse fees but add less to the landfill.

22. Use rocks excavated during construction as part of landscape theme. C

(See comment #15)

23. Do not disturb vegetation around structures or roads except water retention areas and to reduce fire hazards. C

24. Site the long wall of house within 15 degrees of solar south to the east and 25 degrees to the west. C

25. Mulch around water infiltration systems and plants. C

Mulching is one of the most effective water conservation techniques. Mulch protects the soil surface and plant roots from the drying effects of sun and wind. It also protects the soil surface from wide temperature swings. In the long run, it also adds to the topsoil it has protected.

26. Do not use pesticides/herbicides on the site. C

27. Use recycled (broken up) concrete slabs for landscaping retaining walls. C



An Inch of Topsoil

In Santa Fe's dry climate, the formation of an inch of topsoil will generally take longer than a human lifetime.

– Richard Jennings
Earth & Water, Inc.

How Much Water Falls on Your Roof?*	
<i>based on a average annual precipitation of 14 inches</i>	
your roof sq. ft.	gallons of water
800	6,995
1200	10,493
1600	13,990
2000	17,488
2400	20,985
3000	26,231
4000	34,975

* the potential for water harvesting



2. WATER MANAGEMENT

When the well's dry, we know the worth of water.
– Benjamin Franklin

Finally Coming to our Senses

“It is not too late to build a society that is environmentally sustainable; where water is safe to drink, air is safe to breathe, and communities – even countries – share resources equitably. Let us work toward a future where our great-grandchildren can look back and say, ‘Thank goodness they finally came to their senses.’”

– John Schaeffer
founder, Gaiam Real Goods

Water is our most precious natural resource. Homes use hundreds of gallons each day which could be used or saved as "gray-water" to be recycled to water gardens. In a green home today, simple and low-cost measures are taken that reduce water use by about half compared to homes constructed in the 1980's. Water saving is important everywhere, but particularly so in Santa Fe and the Southwest as fresh water resources are depleted by population growth and extravagant demands.

Low-flush toilets, insulated hot water piping, low-flow shower heads and faucets, and dishwashers and clothes washers that have "water-miser" features are all important to lower home water use. How the hot water is produced is important too. Ways to cut down running the tap to get hot water include: installing a main solar-heated tank to provide year-round warm water, and then, if necessary, use an instantaneous or "tankless" water heater near each point of hot water use; planning plumbing so that the shortest possible length of pipe runs from the water heater to each device or tap which uses hot water; installing a recirculating pump.

Another great way to lower water use outdoors is Xeriscaping™, which utilizes creative landscaping design for conserving water, such as using native plants with high drought resistance. Most green-thinking architects, builders and homeowners have learned what plants flourish with little or no watering, or get assistance from their local greenhouse/nursery, university or agricultural extension service to select plants needing little water. Selecting a drought resistant grass, and using lawn chemicals and fertilizer sparingly, also reduces watering needs.

Water conservation is a matter of active participation. While the Green Building Rating System credits Green Builders for the application of minimum techniques, other test systems for Gray or Black Water use are encouraged.

FIXTURES

28. Install less than 1.6 gallons per flush toilets. \$

29. Install composting toilets. C

Composting toilets are self-contained treatment systems for toilet wastes that use the principle of aerobic microbes to break down the waste materials and therefore do not require a septic system. The process results in small amounts of usable compost. Although existing manufactured units can be odor-free and efficient, they do require some maintenance. This factor, along with the necessity of still having to treat graywater wastes, has led most municipal health departments to require a full septic system even if the owner chooses to install composting toilets. Such is the case for the Santa Fe area.

30. Install showerheads that deliver 2.5 gallons maximum per minute. C

31. Do not install garbage disposals. C

Garbage disposals are a common convenience in most kitchen sinks. However, the organic matter that is generally ground in the disposal does not easily break-down in the sewer treatment or septic anaerobic process, thereby adding an unnecessary burden to those systems. Composting organic kitchen waste is the environmentally-sound alternative, and there are many ways to do this creatively and hygienically. Ask your nursery for more information.

32. Install faucets that deliver 1.2 gallons max. per minute. C

33. Install foot-operated faucets. \$

This allows for setting a desired temperature mix at the sink and then easily turning on and off the flow while busy with a manual task.

34. Insulate hot and cold pipes. \$

This helps keep hot water hot and cold water cold.

35. Install insulated recirculating hot water lines or locate hot water heater within 15-ft of all faucets. \$

Popular water circulating pumps deliver almost-instant hot water to the various points of use, thus saving water. The energy required to operate the pump can be minimized by installing a timer so the pump is working only during peak-use times in the household.



**1.6 Gallons =
3.5 Billion**

Americans flush five billion gallons of water down their toilets every day. We could conserve 3.5 billion gallons per day if all toilets met the current code of 1.6 gallons per flush.



36. Install tankless water heaters at tap. ◡
These “on-demand” water heaters may require more maintenance than a central-control water heater but are very efficient.
37. Install in-line hot water heaters at jetted tubs. ◡
38. Install waterless urinals, or dual flush toilets, or toilets with hand-washing tank lids. \$
These will become more common as people demand greater water efficiency.

Waste Water Reduction

Reducing the average house’s water use by 30% would avoid the creation of over 4 million gallons of wastewater over its 30-year lifetime.

– A Primer on Sustainable Living,
Rocky Mountain Institute

APPLIANCES

Water-efficient appliances also save electricity or gas, detergents and drying time.

39. Install dishwasher(s) that use 7 gallons max. per load. \$
40. Install horizontal axis front-loading washing machines using 15 gallons or less per load. ◡
- OR
41. Install vertical axis washing machine using 20 gallons or less per full load. \$
42. If icemaker is installed it shall not be a “clear ice” type. \$

OUTSIDE THE HOUSE

The following three items provide recycled water for landscape irrigation:

43. Plumb appropriate fixtures in the whole house for future graywater use. \$
- OR
44. Install Environmental Improvement Division (EID)-approved whole house graywater system. ◡
Difficult and expensive under current regulations but, if done, can provide up to 60% of the household’s used water for irrigation.
- OR
45. Install EID-approved whole house effluent treatment system connected to irrigation system. ◡
Currently the most expensive, this relates primarily to homes with septic systems. However, this can be cost-effective where an engineered waste system is required for percolation problems. New technology will be available within the next few years to make these options less expensive.

46. Install roof water catchments which use passive direct flow. C

Passive flow means that no electromagnetic devices are used. The system operates by gravity. This is the least expensive way to store water. It is also totally dependent on timely precipitation or it may require supplemental watering.

47. Install roof water catchments which use cisterns, pumps and drip systems controls. C

These are active systems, highly effective in the appropriate applications.

48. Capture pre-construction sheet flow for landscaping. C

This involves contouring and taking care to prevent compaction outside the building envelope.

49. Use only harvested water for recirculating outdoor fountains. C

MORE ABOUT XERISCAPING

"Xeriscape" is another word for water friendly landscaping. It comes from the Greek prefix "xeri" meaning "dry". The purpose is to promote landscapes that are appropriate for arid environments. Xeriscape does not mean zero-escape! There are hundreds of native and introduced plants that thrive with little water. Xeriscape offers an attractive diverse landscape that saves time, money, and water with lower maintenance needs.

In our arid environment, water conservation is an important year round responsibility, whether we're in a drought emergency or not. As water demands have increased over the past decade, our supplies are limited even in a year with normal precipitation.

– excerpted from Sangre de Cristo Water website

See Resources (appendix) for local Xeriscape contacts.



Catching Raindrops

The quickest and easiest way to contain rain water is to put rain barrels under all your canals or downspouts. A single 1-inch rain (typical for a good summer thunderstorm) on a 1500-square-foot roof will yield almost a 1,000 gallons of water – that's more than 30 garbage cans!

– David Morgan, Stormwater As A Resource (City of Santa Fe Planning Department), 2002



SANTA FE'S WATER CRISIS 2002

An Opportunity for Change

*If we don't change direction,
we're likely to end up where we are headed.*

– Ancient Chinese proverb

We're All In This Together

"Sustainability is the [emerging] doctrine that economic growth and development must take place, and be maintained over time, within the limits set by ecology in the broadest sense - by the interrelations of human beings and their works, the biosphere and the physical and chemical laws that govern it . . . It follows that environmental protection and economic development are complementary rather than antagonistic processes."

– William D. Ruckelshaus,
"Toward a Sustainable World,"
Scientific American, Sept. 1989

Editor's Note: *We would be remiss to not address the current water crisis, since water conservation is an integral part of Green Building. As you will see throughout this Guidebook, Green Building is not just some trendy idea. It is about making changes in the way we think about, manage, design and use all our natural resources, which are rapidly being depleted. Without a major change in attitudes and actions, the residents of Santa Fe, along with all citizens of Planet Earth, will find ourselves increasingly faced with resource crises. No amount of legislation can enforce the wisdom of conserving our natural resources. Now is the time to commit to personal resource management and to supporting those businesses and organizations which make wise choices for our future.*

WATER SOURCES

The City of Santa Fe provides drinking water to more than 70,000 people. Water usage ranges from 10 million gallons average in winter to 15 million gallons per day average in summer, when tourism and landscape usage soars. In our high desert region, a "normal" year averages 14 inches of rain. In 2001, less than 10 inches fell, or 30 percent below average.

Sixty percent of our water comes from aquifers which are not being replenished as fast as the water is being pumped out, and 40% comes from surface water, i.e., the reservoirs. Fifty percent of the water is used by residential customers, and 50% by commercial facilities.

The City of Santa Fe owns the water supply utility system (Sangre de Cristo Water) and relies upon three separate and independent sources of supply:

1. Two reservoirs in the Santa Fe Canyon – McClure and Nichols – hold back and store the water of the Santa Fe River. The City's water treatment plant is located down stream. Water from all sources is treated with chlorine, a disinfecting agent that kills any disease-causing bacteria. Fluoride is also added to help control tooth decay. Periodic water testing is conducted to meet state and federal regulations and water quality standards.

2. City Well Field, consisting of six wells (drilling began in the late 1940's).

3. The Buckman well system, consisting of eight wells (production began in 1972).

2002 WATER SHORTAGE

According to *Santa Fe Trends 2002* (an annual report produced for the City and County), Santa Fe's current annual water demand is 11,500 acre feet, or 143 gallons per person per day. The water system, figured at an average annual supply of 12,700 acre feet would barely be sufficient. However, in the past five years, rainfall (and snowfall) has been below average, causing reservoirs to dip to all-time lows and aquifers to be greatly diminished. Without previously instituting long-range water management measures, the City has been forced to mandate various water restrictions.

At the time of publication (June 2002), Stage 3 water restrictions are in effect and Stage 4 are being considered. Forest fires, often caused by human neglect, are raging in nearby forests, fanned by spring winds, and many of our city trails have been closed due to extreme fire danger. All this points to the necessity for adherence to strict water conservation measures and, concurrently, involvement in the political process which will determine the future course of water resource development and use in the City and County.

For more information on current restrictions, go to the City's website: <http://www.ci.santa-fe.nm.us>

For free water conservation kits or a free copy of the Santa Fe Xeriscape Council's low-water plant list, visit the Sangre de Cristo Water office at 801 W. San Mateo, Santa Fe.

To get more actively involved, join Santa Fe Water Coalition, a group dedicated to lobbying and educating the city and community about effective and sustainable water use policy. Contact Catherine Clemens, president and founding member, at (505) 982-4005.



More Sustainable Water Management

Droughts can serve as a catalyst for positive change, a move to ward new and more sustainable approaches to managing water. During a long-term drought water managers and farmers are forced to change their behavior and manage water more carefully. If changes are institutionalized, you have a system that's less vulnerable to drought and generally more productive. If not, once there is plenty of water in the reservoir again, everyone goes back to business as usual until the next crisis hits.

– International Water
Management Institute



3. ENERGY EFFICIENCY

We are like butterflies who flutter for a day and think it is forever.

– Carl Sagan, 20th century scientist & writer

Since the oil shortages of the 1970's, homeowners have become interested in ways to reduce heating and cooling costs – from weatherstripping and added insulation to more efficient appliances and mechanical systems, and ever-improving performance of windows and recycled or environmentally-conscious building materials.

In addition to materials selection, energy efficiency can be enhanced by using design principles which consider such aspects as solar orientation and gain, thermal mass, transition zones, increased insulation, natural lighting and landscaping.

The energy consumed by a building (heating, cooling, lighting and appliances) is important in terms of operating energy; but there is a huge energy investment required to locate, extract, process, transport, install and, ultimately, dispose of building materials. This is referred to as “embodied energy” and should be considered as part of the energy consumption attributed to a building. In a well-built house, embodied energy can equal as much as 30 years of operating energy.

Reducing the embodied energy included in a building is one of the goals and results of Green Building. This can be addressed by making choices for products that have a longer life expectancy and require less maintenance. Also consider that minimally-processed building materials have far less embodied energy than highly-refined materials, local products require less transportation than imported ones, recycled materials usually have less embodied energy than new materials, and salvaged or reused materials require even less energy than recycled ones.

While operating energy is reflected in the residents' comfort and utility costs, considering both operating and embodied energy in design results in a lessened impact on the environment as a whole.

Passive Solar Checklist

- *Small is beautiful*
- *East-West axis*
- *South-facing glazing*
- *Overhangs*
- *North side earth berming*
- *Thermal mass inside building envelope*
- *High insulation levels*
- *Radiant barriers in roof*
- *Open airways to promote internal circulation*
- *Tight construction to reduce air infiltration*
- *Air-to-air heat exchanger*
- *Best high-tech windows available*
- *Reduce glazing on north & west sides*
- *Day lighting*
- *Invest in any energy-saving features possible*
- *Pay attention to the little details*
- *Keep it simple*

- Solar Living Sourcebook

BUILDING ENVELOPE

50. Seal all penetrations. C
51. Fully weather-strip exterior door edges to prevent air leakage. C
52. Use continuous R-5 or better insulation under floors. C
This is particularly important under floors with radiant heat. The payback is but a few years.
53. Use blown-in insulation to maximize R-value and minimize heat loss. S
Traditional batt insulation is prone to infiltration around the perimeter of each batt. Blown-in insulation seals tightly against the perimeter of the space it is filling.
54. Select materials and strategies to achieve an EPA Energy Star rating. C \$ C
For more on Energy Star, go to <http://www.energystar.gov> or call 1-888-STAR-YES
55. Use Low-E windows with thermal breaks to achieve R-3 value or better. S
Low-E glass also reduces ultra-violet ray damage to furnishings.
56. Incorporate workable insulated window coverings or shutter treatments into design. S C
Coverings can add up to R-11, thus reducing night-time heat loss.
57. Implement natural daylighting strategies, such as clerestories and skylights. C \$ C
58. Use airtight electrical receptacle/switch at wall perimeter, or use expandable foam to eliminate air penetration. C
59. Use spray-on foam roof insulation. S
60. Use ceiling insulation above R-38. S
61. Use increased glazing (at least 15%) in the south wall. C
62. Glaze less than 15% of the heated wall area on east, west and north walls. C
63. Incorporate solar glazing strategies that use a 3:1 ratio of mass to glass (1 sq.ft. south glass to heat 3 sq.ft. of mass, either floor or wall). C



Passive Solar Design

“... it has never been more practical and economical for homebuilders to use the ancient art of passive solar design.”

– Perter van Driesser
The Passive Solar House



Energy Efficiency is Common Sense

Save money, be comfortable, and protect the environment. A well-insulated, well-sealed home with efficient windows, appliances, lighting and equipment is an absolute basic in green building. Incorporating passive solar design and solar water heating is cost effective and a prudent investment to reduce exposure to future energy cost increases. And all energy efficiency measures are vital to protecting our environment.

– Colorado Built Green program

64. Use blower door test to verify whole house air-tightness. \$

Blower door testing is available in Santa Fe from “El Paisano” a local non-profit organization providing weatherization assistance to those in need. (505) 983-7743. Blower door testing determines the air infiltration rate of the home and is measured in air changes per hour (ACH). Houses breathe by exchanging outdoor air with indoor air through cracks and penetrations in the envelope. The less air exchange there is, the more energy efficient the home. The blower door test determines how much air the house loses through infiltration. (Below 0.35 ACH requires makeup air or ventilation to provide sufficient fresh air for health).

65. Use pressure testing of ducts. \$

Duct leakage is a major source of energy loss and a contributor to poor air quality in buildings with forced air &/or air conditioning systems. Testing should be done once while the ducting is still exposed to work on and again prior to occupancy.

BUILDING LANDSCAPE

66. Use arbors for seasonal shading and to form transition zones. \$

67. Use windbreak shrubs and trees. \$

68. Use summer shading to create a cooler dwelling. C

Shading is particularly important on the west side of the home.

HEATING AND COOLING

69. Use programmable thermostats. \$

70. Use triple-glazed skylights and windows. \$

71. Use skylights with insulated curbs. C

The insulated curb implies a thermal break, such as plastic placed between the inner and outer parts of a window frame, which reduces the flow of heat or cold, making the skylight more energy efficient.

72. Properly size and seal ductwork with low toxic mastic. C

Ducts lose air at each joint like a hole in a bucket. Duct tape dries out in a few years and loses its sealing ability. Mastic stays flexible for much longer, assuring that heat gets to where it is supposed to go. Sealed ducts are also safer, reducing the potential for combustion gasses to enter the living space.

73. Install energy recovery ventilators. \$

These bring in fresh outdoor air and exhaust stale indoor air. While doing so, they cool hotter air and heat cooler air.

74. Install 3-speed, dual-direction ceiling fans. \$
OR
75. Preinstall wiring and structural capacity for future ceiling fan use. C
76. Install a solar water heater. C
While initial cost of this system is higher than conventional water heaters, the fuel (sunshine) is free. Homeowners usually see a simple payback in 4 to 8 years. The National Remodelers Association reports that adding a solar water heater to an existing home raises the resale value by the entire cost of the system. Performance varies due to many factors and a conventional back-up system is usually needed. The solar system should be sized to manufacturer's specs to optimize performance. Check with covenants to find out about any restrictions.
77. Use separate heating zones (relevant to radiant heating systems) in bathrooms, bedrooms and living spaces. \$
Controlling individual rooms or zones independently can save energy by not keeping the entire house at the same temperature throughout the day, and can add flexibility to individual comfort needs.
78. Use Trombe walls for heating 50% or more of south walls. C
An effective passive solar concept, the Trombe wall, now largely supplanted by other techniques, is a simple solar collector comprising a south-facing glass wall with an air space between it and a blackened mass wall.
79. Use radiant in-floor heat. C
This provides comfort at a lower air temperature than forced air heat and has air quality benefits of no duct work or blown particulates.
80. Install active solar heating system. C
81. Use low-polluting, certified efficient woodstoves that use less wood. \$
82. Install lighting sensors activated by body heat or movement to turn lights on and off as occupants move in and out of rooms. \$
83. Use energy-efficient light bulbs throughout the structure. \$
84. Reduce outdoor lighting waste with timers and sensors. \$
85. Use high-efficient appliances. (e.g., Energy Star rated). \$ C



Lighting Savings

Compact fluorescent lights typically last 10 to 13 times longer and use one-fourth the energy of standard incandescent lights. The U.S. Congress Office of Technology Assessment calls compact fluorescents the best investment in America today, with a 1.2 year payback.

4. MATERIALS SELECTION

Whatever befalls the earth befalls the sons and daughters of the earth. We did not weave the web of life; we are merely a strand in it. Whatever we do to the web, we do to ourselves.

– Chief Seattle, Native American (Suquamish) leader



Wood Woes

Framing accounts for about 70% of the 11,000 board feet of lumber used in an average home, and over 90% of new homes built in the U.S. are wood framed. Today a variety of engineered wood alternatives and new types of steel framing options are available to provide effective, efficient substitutes for solid wood framing.

– Guide to Resource Efficient Building Elements

The intent of this section is to use cradle-to-cradle analysis when making material choices. This full life-cycle analysis looks at the effects on the environment of making, using, recycling and/or disposing of a product.

While most homes are constructed with wood framing, (and the status of wood resources is hotly debated), many Santa Fe area builders have already shifted some lumber use to products made from recycled or engineered wood and/or purchased “certified” sustainably-managed wood products.

Others have embraced new technologies substituting concrete or steel for walls, or even traditional wall-building methods like “earth” (e.g., adobe, stone, brick, rammed earth) or strawbale. While a choice for locally-or sustainably-produced, less-toxic, more long-lasting, higher-performance materials can be more environmentally sound, it is important to remember that exterior walls comprise only a small portion of a home’s overall performance and budget. Therefore, as is stressed throughout the Green Building Guidelines, an integrated and whole-house approach must be employed.

Unlike many other western cities, Santa Fe has an edge on the use of natural materials due, in part, to the popularity (and regulation) of our historical use of vernacular materials in the home, such as exterior stucco (as compared to sheet siding) plastered interior walls, and floors of tile, brick, concrete, stone and earth. Adhering to this tradition, while combining new toxin-free technologies and judicious use of precious materials, should result in “greener” materials selection.

REGIONALLY PRODUCED, RECYCLED, RECLAIMED AND/OR SUSTAINABLY ACQUIRED

86. Use concrete high in natural mineral aggregate. C \$
Concrete consists of cement (usually Portland), aggregate and water. It is high in embodied energy due to the tremendous heat required to make cement. The aggregate component accounts for 60% to 80% of concrete volume. Some aggregates, (such as fly ash, crushed brick, cinder), are made with recycled materials which may be a source of contamination and possible health risk. A contractor should verify aggregate content with the concrete supplier prior to ordering.
87. Use regionally-produced (within 300-mile radius) block, brick or other available material. C
88. Use man-made alternative materials for wood, (e.g., Rastra, Autoclave, SIPS, steel studs, etc.) for all exterior heated walls. \$
89. Use certified sustainably-harvested wood and wood products for all framing material. C \$
90. Reuse lumber scraps in construction. C
91. Use carpet padding made from non-toxic recycled content material. C \$
92. Use flooring material with a minimum 50% recycled content, free from harmful emissions. C \$
93. Use non-toxic recycled-content insulation (e.g. cellulose). C \$
94. Use wood doors, decorative millwork, wood flooring, etc. made from re-milled, reclaimed lumber (for a minimum of 50% of project needs). \$
95. Build outdoor structures made from reclaimed and recycled content materials. C \$
96. Use wallboard made from recycled newsprint & gypsum. \$
This is currently tough to get in the Santa Fe market, but increased demand will promote increased availability.
97. Use paints and finishes with recycled content for exterior use. C \$



The Four-R's:

*Reduce, Recycle,
Renewable and Rethinking.
When our homes are built
or remodeled with these
important tools in mind,
each one becomes an
"engine" pulling to help
the environment.*

DURABILITY

98. Use alternatives to tar & gravel built-up roofing system. \$
99. Use minimum 30-year roofing material (e.g., steel). C \$
100. Use stucco instead of sheet siding. C
Since stucco is the exterior “finish of choice” in the Southwest, there is really not an extra cost.



Act Locally

The use of locally-available and indigenous earth materials has several advantages in terms of sustainability: they typically are not hauled great distances (reducing transport costs, fossil fuel use and resulting pollution); they have no active chemical off-gassing; don't require additional surface finishing procedures or materials; can be easily and safely recycled; and, using them supports local businesses and resource bases.

– Sustainable Building Sourcebook, City of Austin, TX

NOT DESTRUCTIVE TO THE ENVIRONMENT

101. Do not use toxic or off-gassing additives in concrete formula. C
102. Use non-petroleum, non-toxic release agent on concrete forms. C
103. Use natural alternative materials for wood, (e.g., adobe, pumice-crete, strawbale, rammed earth, etc.) for all exterior heated walls. \$ ◡
104. Do not use lumber treated with toxins such as arsenic and creosote, i.e., CCA-pressure-treated lumber or railroad ties. C
105. Use a living roof (i.e., a roof made of sod or other kinds of lightweight, regionally-appropriate vegetation). ◡
106. Use earth-based materials, e.g., mud plaster finishes. \$ ◡
107. Only use rain forest products when harvested from internationally-certified sustainable forests. \$
108. Use flooring made from natural materials, e.g., clay tiles, brick, flagstone, earthen, exposed concrete, etc. C \$
109. Choose floor coverings made with biodegradable or recyclable materials. C \$
110. Use non-toxic paint, free of solvents and VOC's (Volatile Organic Compounds), made from water-based materials without biocides or fungicides. C \$

111. Use non CFC/CFH-generating insulation. C §
CFCs, like freon, have been shown to be a major contributor to the depletion of the ozone layer. Until recently, most manufacturers used CFCs as blowing agents for foamed-in-place insulation.

RESOURCE EFFICIENT

112. Use engineered lumber (free from urea formaldehyde) for all floors, roofs, beams, joists, sheathing, decking, underlayment and headers. (Except for exposed structural beams, vigas, posts and decking). C §

Engineered lumber products include truss joists, gluelam & microlam beams and finger-jointed studs. All provide structural members using less wood and smaller diameter trees for the same structural return. They also have less tendency to bow, twist and warp than dimensioned lumber.

113. Do not use dimensional lumber larger than required by the Universal Building Code (UBC). C

114. Use optimum value framing. C §

Optimal value framing uses framing lumber very efficiently – studs are spaced at a minimum and not used for non-structural uses, such as attachments for sheathing. This system also promotes increased design awareness, with roof members bearing judiciously and directly on wall members.

115. Use finger-jointed or other engineered wood studs. C §

116. Use less material by combining function and architectural interest. (e.g., all exposed wood ceilings should have structural functions). C



Alphabet Soup

Nearly 100,000 organic chemicals are available to the building industry (all produce VOC's).

A primary goal in the creation of healthy buildings is to reduce the overall amount of VOC's.

* * *

Toxic-free, energy-efficient materials are becoming increasingly available.

Requesting them from your suppliers may encourage them to be more proactive in carrying these materials.

ST

5. INDOOR ENVIRONMENTAL QUALITY (IEQ)

*In the concert of nature it is hard to keep in tune with oneself
if one is out of tune with everything else.*

– George Santayana, American poet & philosopher

Healthy House

There is, in fact, nothing complicated about creating a healthy building. The process is composed of many simple, but important steps. Safer alternative materials and methods of design and building are becoming readily available. Nevertheless, the homeowner who desires to create a healthy building or remodel an existing one is still a pioneer facing major obstacles.

– Prescriptions for a Healthy House

The intent of IEQ is to create housing that supports human health and vitality throughout the life of the structure. The concepts of Green Building are based on healthy choices – for the environment at large and, particularly, within our homes.

In recent years, a growing body of scientific evidence has indicated that the air within homes and other buildings can be more seriously polluted than the outdoor air in even the largest and most industrialized cities. Other research indicates that people spend up to 90 percent of their time indoors. Thus, for many people, the risks to health may be greater due to exposure to air pollution indoors than outdoors.

In addition, people who may be exposed to indoor air pollutants for the longest periods of time are often those most susceptible to the effects of indoor air pollution. Such groups include the young, the elderly, and the chronically ill, especially those suffering from respiratory or cardiovascular disease.

Indoor pollution sources that release gasses or particles into the air are the primary cause of indoor air quality problems in homes. Inadequate ventilation can increase indoor pollutant levels by not bringing in enough outdoor air to dilute emissions from indoor sources and by not carrying indoor air pollutants out of the home. High temperature and humidity levels can also increase concentrations of some pollutants.

While pollutant levels from individual sources may not pose significant health risks by themselves, most homes have more than one source that contributes to indoor air pollution and it is the cumulative effects that can be a serious risk. Fortunately, there are steps to take both to reduce the risk from existing sources and to prevent new problems from occurring.

(See Resources for helpful publications).

PREVENTION OF BIOLOGICAL CONTAMINATION

117. Locate in-floor drains at all laundry and mechanical rooms and drain to daylight. \$

When a washer or water heater breaks, the drain to the outside (not underground) helps prevent mold growth.

118. Provide mechanical ventilation or operable window in all bathrooms and laundry rooms. C \$

119. Provide humidity sensor, wired to exhaust fan, in all bathrooms and laundry. \$

#117-119 address prevention of moisture damage which leads to mold contamination.

120. Select hard floor and food preparation surfaces that are non-absorbent and easily cleaned and maintained. C \$

BENIGN MATERIAL SELECTION

121. Use insulation manufactured without the use of formaldehyde additives or toxic binders. C \$

122. Clean petroleum coatings off metal materials, i.e., ductwork, using biodegradable cleaner. C

123. Use formaldehyde-free drywall joint compound. C

124. Use low-VOC, formaldehyde-free wet applied finishes and adhesives. C \$

This includes paints, varnishes, stains, sealers and glues which emit toxins damaging to human health.

125. Use sheet goods that do not contain urea formaldehyde. C \$

Standard interior-grade plywood, press board and medium-density fiberboard (MDF) used for interior sheathing, cabinetry, shelving and carpentry contain urea formaldehyde glues, which are a volatile and long-lasting source of indoor pollution.

Ideally, substitute exterior grade plywoods and other formaldehyde-free products. If this is not an option, seal products with a vapor barrier sealant.

ST

Chemical Truth

According to the EPA, of more than 80,000 chemicals common in commercial use today, fewer than 1,000 have been tested for toxic effects on the human nervous system.

ST

126. Use materials (such as tiles) free from lead, cadmium and other harmful heavy metals. C

127. Do not use vinyl flooring. C \$

128. Use PVC-free water supply lines within structure, such as copper or polyethylene. C

129. Use screening on all vents and other benign methods of insect protection, e.g., sand barriers, borax. C
Keep critters out so pesticide use is not necessary.

130. Do not use fibrous internal duct lining. C
Insulate outside of duct to avoid fibers and accumulated particulates from being broadcast in home.

Chemical Sensitivities

In 1986, the National Academy of Science estimated that 15% of the population suffered from chemical sensitivities. Based on current unofficial reports by physicians specializing in environmental medicine, that number is rapidly rising.

WATER, ELECTRO MAGNETIC, ACOUSTICS AND LIGHTING

131. Install filtration for drinking and bathing water. \$
Water may contain chlorine, pesticides, radon, biological contaminants or heavy metals. Water should be tested and a filtration strategy chosen accordingly. Test information and maintenance criteria for filter system should be included in Occupant Guide.

132. Use lead-free faucets and fixtures. C

133. Water from sodium-based water softeners should not be used for potable water. C

134. Verify, with gauss meter, the absence of net current due to wiring error. C
Net current in wiring is prohibited by the National Electrical Code (NEC) because of its fire hazard potential. However, magnetic fields due to wiring errors are common and can pose a health threat. They are easily detected with a gauss meter once the electrical system is activated.

135. Provide a bed wall in each bedroom placed away from elevated magnetic fields, i.e., electrical service panels, refrigerator(s) and other frequently-running motorized equipment. C

136. Do not run major electrical raceways where people spend extended periods of time, i.e., living room or bedrooms. C

137. Provide acoustical attenuation to reduce interior noise transfer. C \$

Methods of reducing noise transfer include staggering studs, providing additional layers of sheetrock, and/or soundboard, or insulation where areas should be isolated one from another.

138. Provide sound buffers to reduce outside noise. C \$

139. Use blown insulation, sound board or adobe. \$

140. Provide full range of light spectrum in lighting, and ample natural light. \$

141. Where there is fuel combustion, such as a boiler room, provide carbon monoxide monitors. \$

142. Provide direct-vented or power-vented furnace and water heater, with only exterior access to them. C \$

This ensures that combustion gases do not penetrate the house; use a closed system of outside venting OR mechanical room sealed from house and accessed from outside. As with many other health/safety features, if designed into the project, little or no additional cost is required.

ST

Sick Insides

“Indoor air pollution in residences, offices, schools and other buildings is widely recognized as one of the most serious potential environmental risks to human health.”

– EPA report: "The Inside Story: A Guide to Indoor Air Quality"

ST

HEATING, COOLING AND VENTILATION SAFETY

143. Locate air intakes away from building exhausts and other pollution sources. C

144. Provide ventilation and exhaust for special functions, i.e., hobby rooms, exercise areas, etc. C §

145. Provide range hood ventilation to exterior of house. §
Unburned hydrocarbons can result from cooking. More than smells, these particles are not healthy to breathe. Range hoods vented directly outside eliminate exposure to hydrocarbons, over heating and excess moisture build-up.

146. Provide natural cross-ventilation in all living areas. C

147. When using forced air, provide heating and cooling design with easy access for duct and mechanical inspection and cleaning. C

148. Provide whole-house mechanical ventilation system with fresh air intake. C

While there is a major debate between air quality and energy efficiency, a certain amount of fresh air exchange is required to replace stale air created by human habitation, even in houses built to high green (healthy) standards.

149. Provide a filter and heat exchanger for the above ventilation system. §
(See comment #73)

150. Provide buffer zone from outside to inside. § C
This helps prevent infiltration of dust, dirt and pesticides from outside into the home. e.g., a covered entry and easily-cleaned shoe removal area.

Energy Lost

Each year in the U.S., about \$13 billion worth of energy – in the form of heated or cooled air – or \$150 per household, escapes through holes and cracks in residential buildings.

– American Council for an Energy-Efficient Economy

CONSTRUCTION AND BUILDING COMMISSIONING PROTOCOLS

- 151. Provide construction protocols that protect the health and well-being of construction workers and future occupants, e.g., prohibition of smoking, pesticide use or the use of any unspecified materials on the job site. C
- 152. Use materials that are dry and free from contamination at the time of installation, or replace any items that are found to be contaminated. C
- 153. Provide adequate ventilation for proper and safe curing of all materials. C
- 154. Prohibit use of open combustion appliances during the curing process. C
- 155. Ensure that ductwork is protected from debris during construction. C
- 156. Use benign cleaning products. C
- 157. Confirm that all life-safety features, such as smoke alarms, are operational. C



Appealing to Clients

Though some people tend to separate the indoor environment from the outdoor environment, the two are integrally related, and the health of the building occupants should be ensured in any "sustainable" building. With many clients, this is the issue that first generates interest in broader concerns of environmentally sustainable building.

*– Environmental Building
News*

6. OCCUPANT EDUCATION

*We shape our dwellings, and afterwards
our dwellings shape our lives.*
– Winston Churchill

Declaration of Interdependence for a Sustainable Future

*... "We commit ourselves
as members of the world's
architectural and building-
design professions,
individually and through our
professional organizations,
to: . . . Educate our fellow
professionals, the building
industry, clients, students,
and the general public about
the critical importance and
substantial opportunities of
sustainable design."*

– UIA/AIA World Congress of
Architects, Chicago, 1993

A study by the US Office of Technology Assessment (OTA) reported to Congress in 1992: U. S. consumers utilize greater resources per capita than any other people World-wide. **We use about 20,000 pounds (10 tons) per person per year of 'active' materials.** These include virgin forest products, fuels, steel, glass, cement and plastics. An astounding 90 percent of these materials becomes 'waste' in less than one year. . . . Residential construction processes are still fairly inefficient compared to other industries.

"Home building needs to undergo a process of technological substitution and rethinking to become more environmentally sensitive and sustainable," writes Howard Bion in *Green Building: A Primer for Builders, Consumers and Realtors*. "In a green housing project, many inefficiencies are addressed and overcome, so your home becomes part of the solution. The building industry is acting to incorporate the growing knowledge of green buildings into housing products and services, but consumer demand plays an important role in getting these better products to market."

Designers and builders of green homes give homeowners a powerful tool which empowers them to help protect the environment. Living in a green home encourages reducing waste, implementing recycling, using renewable materials and energy sources, and implementing a better way of producing housing.

It is not enough to simply implement a number of the Green Building Guidelines. Occupants must be educated and empowered to utilize and enjoy the full benefits of the various aspects which comprise the Green Building – site design, water management, energy efficiency, materials selection and indoor environmental quality.

158. Provide a checklist of warranties and product /service contact information. C

159. At the time of occupation, conduct a comprehensive walk-through. C

This is an ideal time to answer questions and remind clients to call if problems arise so you might have the opportunity to remedy them, thus optimizing the home's performance and your reputation.

160. Provide occupant with a manual containing the following information C §:

- maintenance schedules and seasonal maintenance.
- water quality, including test results and appropriate filtration strategies for drinking, bathing and household use.
- on-going water conservation inside and outside, with a target water budget.
- MSDS (Material Safety Data Sheets)
- list of safer cleaning products

Once such a manual is assembled it can be modified and reused for future projects, acting as a wonderful public relations and sales tool for your business. Additionally, your clients can pass along this informative manual (adding material on whatever improvements they make) to future buyers of the home, creating an archival history. Additionally, plans, drawings and photographs of placement of certain systems, construction processes and materials installation could be of significant use to future inhabitants of your Green-Built home.



Green Building Includes Education

Among the definitions of a high-performance green building project is one that educates building occupants and users to the philosophies, strategies and controls included in the design, construction and maintenance of the project.

– Guidelines for Creating
Green Buildings, Pennsylvania
Dept. of Environmental
Protection

GLOSSARY

Active Solar – a system using mechanical devices (pumps, fans, etc.) which transfer collected heat to the storage medium or end-use.

Blackwater – wastewater generated by toilets, kitchen sinks, dishwashers and diaper washing in clothes washers.

Built Environment – all human-built structures (as compared to the natural environment).

Chemical Sensitization – Evidence suggests that some people may develop health problems characterized by effects such as dizziness, eye and throat irritation, chest tightness, and nasal congestion that appear whenever they are exposed to certain chemicals. People may react to even trace amounts of chemicals to which they have become "sensitized."

Chloroflourocarbons (CFC's) – any of a group of compounds containing carbon, chlorine, fluorine and sometimes hydrogen that have been used as refrigerants, cleaning solvents, aerosol propellants and in the manufacture of plastic foams. CFC's have been linked to the destruction of the Earth's stratospheric ozone layer and their use is being phased out.

Composting Toilets - several types based on the goal of water conservation. Waterless and forced-air composting toilets produce a valuable fertilizer. Electric toilets burn the waste. When properly installed, none of them create odor or health problems.

Daylighting – the use of controlled natural lighting methods indoors through skylights, windows and reflected light.

Embodied Energy – all the energy required to grow, harvest, extract, manufacture, refine, process, transport, install and dispose of a particular product or building material.

Energy or Water Conservation – using less energy or water. Conservation can imply a lifestyle change or a reduced level of service. Lowering thermostat settings or installing a shower flow restrictor are examples of energy conservation.

Formaldehyde – a colorless, pungent-smelling material used as an adhering component of glues in many wood products. It may cause respiratory problems, chemical sensitivities and other health problems.

Graywater - wastewater produced from bathroom tubs, showers, sinks and washing machines.

Harvested Rainwater – rainwater captured from the roofs of buildings; can be used indoors and for irrigation.

Impervious Surfaces – e.g., asphalt and concrete. These add to water runoff problems (erosion, pollution of surface waters, flooding); good for high-traffic areas but **pervious materials** are better for most other applications.

Integrated Design – a holistic process that considers the many disparate parts of a building project and examines the interaction between design, construction and operations, to optimize the energy and environmental performance of the project.

Low-E - "low-emissivity" coated mylar film sandwiched between double or triple-glazed windows which allows short-wave radiation (visible light) to pass through, but reflects long-wave (infrared or heat) so heat cannot pass through. Along with the cavity filled with argon or krypton gas, these windows can achieve R-values of 4.5 or higher.

Off-gas/Out-gas - the emitting of fumes into the air. Most new paints, carpeting and many other building materials typically off-gas chemical compounds which are unpleasant and may be hazardous to occupant health.

Organic Compounds- Chemicals that contain carbon. Volatile organic compounds (VOC's) vaporize at room temperature and are a class of chemical compounds that can cause nausea, tremors, headaches and, possibly, longer-lasting harm. They can be emitted by many common household products and construction materials.

Passive Solar - systems that collect, move and store heat using natural heat-transfer mechanisms such as conduction and air convection currents.

Pervious Materials - gravel, crushed stone, open paving blocks can absorb surface water rather than shedding it, while reducing heat absorbing and radiating surfaces.

Photovoltaics (PVs) - solid-state cells (typically made from silicon) that directly convert sunlight into electricity.

R-Value - a unit of thermal resistance used for comparing insulating values of different materials; the higher the R-value, the greater its insulating properties.

Renewable Resources - resources that are created or produced at least as fast as they are consumed, so that nothing is depleted.

Sustainability - meeting the needs of the present without compromising the ability of future generations to meet their own needs.

Swale - a level or gently sloping trench that collects, slows down and diverts runoff water. Swales can vary greatly in width and treatment from small ridges in gardens to multiple long trenches graded across many acres of sloping land using heavy equipment. Swales are most often dug along slope contours, or perpendicular to the way water flows; they may be the single most versatile way to harvest water.

Thermal Mass - materials that have a high capacity for absorbing heat, and change temperature slowly; used to absorb and retain solar energy. They include water, rocks, masonry and earth.

Ventilation Rate - The rate at which indoor air enters and leaves a building. Expressed in one of two ways: the number of changes of outdoor air per unit of time (air changes per hour, or "ach") or the rate at which a volume of outdoor air enters per unit of time (cubic feet per minute, or "cfm").

Wind Power - systems that convert air movement into mechanical or electrical energy. Driven by wind, turbine blades turn a generator or power a mechanical pump.

Xeriscaping™ - landscaping design for conserving water that uses drought-resistant or drought-tolerant plants.

RESOURCES

In this Internet Age, it is tempting to forego a list of resources and, rather, suggest that further information be found by using your favorite search engine and entering any key phrase from this handbook, such as “green building” or “air quality” or “Xeriscape”. This will, in fact, yield vast amounts of useful and current information on any topic, and is highly recommended. In this brief space we can but mention a few publications and websites which provide much greater detail and resource-related matter on the topics mentioned herein.

GREEN BUILDING (GENERAL)

- *Environmental Building News* – www.buildinggreen.com tel: (800) 861-0954.
- *Solar Living Sourcebook – The Complete Guide to Renewable Energy Technologies & Sustainable Living*, Gaiam Real Goods, tel: (800) 762-7325, www.realgoods.com
An established and exhaustive resource for house-building and living-related products, books/tapes and technical support for all things “green”.
- *Mainstreaming Sustainable Architecture* by Ed Paschich & Jan Zimmerman, High Desert Press, Corrales, NM, 2001 tel: (505) 898-6284.
- *A Primer on Sustainable Building*, Rocky Mountain Institute, Green Development Services, 1995, tel: (970) 927-3851, <http://solstice.crest.org/rmi>
- National Association of Home Builders Research Center. Toll-free hotline for current info and problem-solving for residential builders: (800) 898-2842. Free directories, booklets, etc. www.nahbrc.org
- *Before You Build: A Preconstruction Guide* by Robert Roskind, Owner Builder Center Ten Speed Press, www.tenspeed.com
- Natural Home Magazine, www.naturalhomemag.com
- Greenbuilder.com – Information about green building professionals throughout the U.S. “Selecting a knowledgeable, cooperative team is one of the most important tasks in the whole building process.”
- National Renewable Energy Laboratory (NREL), www.nrel.gov
- *The Strawbale House* by Steen, Steen & Bainbridge – This useful book describes the benefits and methods of strawbale construction.
- *Passive Solar House Basics* by Peter van Dresser, Ancient City Press, Santa Fe

WATER

- City of Santa Fe Water Conservation Assistance – Call for water-saving tips brochure, current water restriction information and for a list of nurseries, landscapers, and non-profit organizations that offer free Xeriscape advice. (505) 954-7199
- Local Xeriscaping Info: Visit one of these public xeriscape demonstration gardens:
 - Santa Fe Greenhouses, Inc., 2904 Rufina St.
 - "Geobotany Beds" at Santa Fe Community College, maintained by the Santa Fe Botanical Garden (438-1684)
 - El Rancho del las Golondrinas (471-2261)
- Call your local nursery, landscape professional or Santa Fe County Extension office (471-4711).
- Waterwiser.org – Extensive water conservation website with drip calculator.

ENERGY

- U.S. Department of Energy, www.doe.gov
Office of Conservation and Renewable Energy Inquiry and Referral Service (CAREIRS). Provides consumer information on conservation and renewable energy in residences.
- Affordable Comfort Housing Performance Association, www.home-performance.org
- Energy Efficiency and Renewable Energy Clearinghouse (EREC) – Hotline funded by U.S. Dept. of Energy provides information, technical expertise and hundreds of publications. Call (800) 363-3732
- New Mexico State Energy Office – Free energy-efficiency information and referrals. (505) 476-3308.

MATERIALS

- Efficient Windows Collaborative – All about windows and how to select the best windows for your location. www.efficientwindows.org
- *Green Building Resource Guide* by John Hermansson
Available through www.greenguide.com
- *Environmental Building News Product Catalog*
Available through www.catalog@ebuild.com
- ForestWorld Online Marketplace connects buyers and suppliers of Certified Forest Products. www.forestworld.com
- *REDI Guide* (Resources for Environmental Design Index)
Iris Communications, www.oikos.com/redi
- *GreenSpec*, Environmental Building News. Green building products directory with over 1,500 product listings each reviewed by the EBN editors for its compliance with environmental performance criteria. www.BuildingGreen.com
- *Professional Guide to Building Products*, www.ebuild.com

INDOOR ENVIRONMENTAL QUALITY

- *Prescriptions for a Healthy House* by Paula Baker-Laporte, A.I.A, Erica Elliot, M.D. (both Santa Fe area residents) and John Banta is a complete reference guide for creating healthful homes, with extensive lists of product suppliers. New Society Publishers, 2001.
- "The Inside Story: A Guide to Indoor Air Quality" A free resource-filled guide. United States Environmental Protection Agency and the United States Consumer Product Safety Commission, Office of Radiation and Indoor Air EPA's National Service Center for Environmental Publications (NSCEP). www.epa.gov/ncepihom/
- Indoor Air Quality (IAQ) Information Clearinghouse – For organizations related to environmental quality issues, call (800) 438-4318.
- *The Natural House Catalog* by David Pearson – a sourcebook for creating a healthy home.

ABOUT OUR SPONSORS

Santa Fe Area Home Builders Association is a non-profit trade association affiliated with the New Mexico Home Builders Association and the National Association of Home Builders. SFAHBA represents and serves the diversified needs of their members and the community. It is an active voice in promoting safe, quality, cost-effective and affordable housing. SFAHBA does this by: Encouraging high ethical and professional standards of its members; Serving as an active voice in government affairs and the regulatory process by promoting proper and reasonable codes and regulations; Collaborating with all fields related to the building industry; Addressing political, societal, economic and environmental issues; Being a leading advocate of economic prosperity and quality of life.

Sustainable Communities, Inc. is a non-profit organization started in 1995 by native and long-time Santa Fe residents to research, design and develop projects in the Southwest that are ecologically, socially and economically sustainable. SCI is dedicated to fostering communities and projects which honor the rich cultural heritage of northern New Mexico and function in a responsive and responsible way with the ecosystems of the region. Among other projects, SCI is involved with planning and implementing “green” building practices in the 80-unit development of Contenta Village.

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