

Green Building in Transit-Oriented Neighborhoods

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1. Intro

Green building is an effort to minimize the environmental impact of our new and renovated buildings. One important aspect of smart growth strategies and green building is making that it is located near transportation and downtown communities. (See the Parking and Traffic fact sheet for more information regarding transportation.) Green building design relies on the principle that replication of natural systems is a win-win situation. By developing buildings that work as systems, we save money by reducing energy use and the cost of materials. We minimize environmental impacts by reducing and diverting waste products. And we make people's lives better by creating an enjoyable, natural atmosphere in the midst of urban development.

For in-depth fact sheets and guidelines for green building, refer to the 'Build It Green' website. (www.builditgreen.org)

2. Green Building Standards¹

One of the main standards of green building is proposed by the US Green Building Council. The LEED™ system (Leadership in Energy and Environmental Design) is a voluntary, national standard for developing green, sustainable buildings. LEED™ was originally developed for commercial construction and is piloting standards for homes and neighborhood development. LEED™ rating systems exist for new construction, existing buildings, commercial interiors and specific project types.

One of the most relevant LEED™ rating systems for station area plans is LEED™ for Neighborhood Development. This new rating system is designed to integrate green building, urbanism and smart growth into neighborhood design. The criteria reflect the Smart Growth Network's "Principles of Smart Growth" and the Charter for New Urbanism. It emphasizes the importance of building location, compact development, proximity to transit, mixed-use development, and pedestrian- and bicycle-friendly design.²

The State of California and a growing number of local governments have adopted LEED™ as the standard for their public facilities. Executive Order S-20-04 directs state-funded buildings to achieve a LEED™ Silver standard as a key part of Governor Schwarzenegger's plan "to reduce grid-based energy purchases for state-owned buildings by 20% by 2015, through cost-effective efficiency measures and distributed generation technologies."

The *Build It Green Residential Green Building Guidelines* are the most widely recognized standard for residential construction in California. These are distributed by local governments throughout California or for purchase from Build It Green. *GreenPoint Rated* is Build It Green's third-party rating program, which is based on the Residential Guidelines. It provides a consumer label that indicates how well a home performs above California codes. Some local governments have incentives for private projects that participate in GreenPoint Rated or LEED™. Also see Build it Green's 2006 local government survey for specific green building program descriptions.

California has also developed a standard for green schools, the Collaborative for High Performance Schools (CHPS). Compliance with the CHPS standard is the basis for accessing new state bond financing. CHPS now also offers third party verification of projects. For more information, see www.chps.net.

3. Sustainable Site Development

a. Planning and the Development Team:

The development team should include the architect, planner, general contractor and engineers, familiar with green design. It is important to start the planning process early, and to work with city or county planning staff to resolve any problems with codes. By including goals for green design early in the process, substantial efficiency can be realized through integrative systems design. The earlier green techniques are utilized, the bigger the efficiency paybacks and the lower the cost.

See the Campaign Planning handouts for more information.

b. Efficient Land use

To be considered green, new buildings should be built within existing urban areas ("infill development"), rather than paving over natural areas or farmland. Redevelopment of brownfields is an option after they have been remediated. Also, when feasible, units should be located in mixed-use areas where schools, shops, and offices are in walking distance from each other.

c. Transportation Choices

Developments should be in mixed-use communities which are pedestrian and biker friendly. Buildings should be conveniently located within walking distance of transit stations in order to increase transit usage. This will reduce land requirements for parking lots and roads, and reduce air pollution and greenhouse gas emissions from car exhaust.

See the Parking and Traffic fact sheet for more information.

d. Make green developments affordable

According to the Urban Land Institute, the costs to build housing using green building materials is no more than 3% higher than using standard materials³, and sometimes is cheaper than conventional construction. Green building can have significant paybacks from saving energy, which benefits building owners. By reducing monthly energy and water bills, housing can be more affordable for residents. For private commercial developers who own and manage their properties after construction, there is a clear financial incentive to utilize energy- and water-efficient technology. In the Bay Area, there are a plethora of green developers dedicated to affordable housing. Refer to the *Build it Green* website for a directory of developers and contractors.

See the Affordable Housing fact sheet for more information.

4. Water Savings

Why?

Reducing water intake through sustainable conservation methods can reduce the water bill. It saves energy associated with the maintenance, treatment and delivery of water from distant reservoirs. In addition to saving money, reduced energy consumption translates into reduced air pollution from power plants, and reduced emissions of greenhouse gases.

How to reduce water use:

a. Indoor water use reduction

Basics- Reduce indoor water use from toilets, sinks and showers.

Implementation-

- Repair dripping fixtures (1 drop/second will amount to over 2500 gallons of wasted water per year!).
- Use faucet aerators and low-flow heads in sinks and showers.
- Install high efficiency toilets and high efficiency clothes washers.⁴

b. On-site stormwater management⁵

Basics- By containing and treating as much stormwater as possible on-site, one can reduce flooding and non-point source pollution, minimize stormwater infrastructure costs, and maximize groundwater recharge.

Implementation-

Permeable pavement:

- Basics- By providing spaces in the pavement, run-off is reduced as water is allowed to pass through the surface. These systems help to recharge local aquifers, reduce run-off pollutants, and reduce the need for curb gutters and storm sewers.
- There are 3 general categories: Conventional asphalt or concrete with the fine materials left out of the mix, grids that are filled with aggregate and planted with vegetation, and paving blocks that are spaced apart.

c. Water efficient Landscaping⁶

Basics- By designing landscapes which respond to the local ecological systems, one can reduce runoff into streams, which improves watershed water quality. It also reduces the water bill, and preserves water supplies for other uses.

Implementation-

- Irrigation: Use drip or controlled irrigation systems to place the correct amount of water directly at the base of each plant.
- Selection of plants: Use native plants or ones which require little or no watering. Plant trees and shrubs for shading, cooling, wind protection, noise reduction

5. Energy Savings

Why?

More than 40% of the energy used in the United States is related to buildings.⁷ Within office buildings, 50% of energy used is for interior climate control and lighting. Lowered energy use signifies huge savings!⁸

Methods to save energy:

a. Orientation and building design:

Basics- The design of the building should be appropriately situated according to climate and orientation to the sun and shade.

Implementation-

- A south facing building helps to collect maximum day time sunlight, particularly in the winter.
- Carefully drafted floor plans and proper overhang design will allow significant daylight without unwanted heat gain, allowing for reduced electric lighting

b. Passive solar cooling/heating

Basics- Passive solar design saves energy by maximizing the home's natural heating, cooling, and ventilation. Reduced energy consumption lowers utility bills, and reduces air pollution from power production plants.

Implementation⁹-

- Orient the building to take full advantage of seasonal changes in sunlight, use appropriate overhangs, and be strategic with window space.
- Include thermal massing in the building in order to retain heat and cool
- Install low-E (emissivity) windows to reduce the potential for summertime overheating and retain heat indoors during winter¹⁰
- Include high levels of insulation in walls to retain heat and cool and reduce drafts from the outside

c. Produce on-site renewable energy

Basics-Renewable energy on-site saves money for property owners who pay the electricity bills and reduces the dependency on fossil fuels. Examples of on-site energy production include solar energy, wind energy, and bio-mass.

Implementation-

- California has government rebate programs to encourage use of solar panels and small wind turbines through the Emerging Renewable Program (ERP).¹¹
- Net energy metering is a type of program that allows customers with an eligible power generator to offset the cost of their electric usage with their on-site produced energy they export to the grid.¹²

d. Purchase green power

Basics- Clean and green power supplies us with the electricity that we need to live in a modern world but with far fewer negative impacts on the environment. For those who can not generate green

energy in their home, utility companies such as PG&E offer options to purchase renewable energy such as solar, wind, and biomass.

Implementation-

- PG&E's ClimateSmart program: PG&E calculates the amount of green energy needed to match the amount of greenhouse gas emissions produced by the individual's business or home. Individuals are charged for this calculated energy and the funds are allocated towards new greenhouse gas emission reduction projects in California.¹³
- Deregulation has resulted in some small, "green" energy providers entering the market.

6. Recycled Materials Selection

Why?

In the United States, construction debris makes up 35% of the solid waste in landfills.

The cement industry contributes is responsible for 5-8% of the world's greenhouse gas emissions.¹⁴

Methods of using recycled materials:

a. Recycled content carpet

Basics- Nationwide, carpet makes up at least 2% of landfill waste, and 2.5 million tons are discarded yearly.¹⁵ Recycled content materials save resources and divert waste from landfills.

Implementation- Each square yard of recycled carpet is made of approximately 40 two-liter soda bottles. It can also be made from recycled paper, recycled wool or recycled cotton. Also, consider options in carpet leasing services for commercial buildings (carpet squares are replaced as needed, and recycled into new squares).

b. Plastic and wood composite lumber¹⁶

Basics- Using virgin wood perpetuates the deforestation of our natural resources. Plastic and composite wood can be used for decking, door and window frames, and exterior moldings.

Implementation- Holds up well to water, sun, insects, and salt air; has an indefinite life span, is made of 90-100% recycled materials, doesn't rot, splinter, or crack.

c. Construction and demolition waste diversion

Basics- By reusing materials, builders save money and divert the potential land-fill materials for reuse, thus reducing the environmental impact.

Implementation- California requires a 50% construction and demolition recycling rate. Use salvaged materials to avoid environmental impacts related to the extraction, processing, and transportation of virgin materials.¹⁷

7. Indoor Environmental Quality¹⁸

Why?

The air in new homes can be up to 10 times more polluted than outside air due to volatile organic compounds (VOCs) and other chemicals used in product manufacturing.¹⁹ More than 40% of doctor-diagnosed asthma among U.S. children is due to residential exposures.²⁰ Furthermore, most people spend 90% of their time indoors. It is important that indoor air quality is clean and healthy!

Methods to improve indoor air quality:

a. Ventilation

Basics- For improved ventilation, spaces should have good air movement. It is important to identify different contaminants, such as chemicals from building materials, excessive moisture, and carbon monoxide poisoning from stove or furnace leaks.

Implementation-

- Design window placement for good cross ventilation
- Use fans throughout the house or have a mechanical ventilation system that allows occupant control of both exhausting indoor air as well as filtration of outdoor air.
- Locate air intake to avoid drawing in unnecessary fumes, moisture, particulates, etc.

b. Floors²¹

Basics- Conventional flooring such as old growth wood, carpet and vinyl are not sustainable nor healthy because of ecological impacts of deforestation and manufacturing, potential for chemical offgassing, their tendency to encourage mold and allergens, and the bulk of space taken up in landfills.

Implementation- Install hard surface flooring such as composite wood, cork, concrete, tile, or linoleum in place of carpet.

c. Paints

Basics-Paints with VOC can cause eye, nose, and throat irritation; and potential damage to the liver and central nervous system.²²

Implementation-Use low or no-VOC interior paints and finishes (under 50 g/L).

d. Cabinets and counters

Basics- Particleboard contains formaldehyde, which can offgas for 10-15 years and is a probable human carcinogen. Exposure can cause eye, nose and throat irritation, skin rashes, headaches, and nausea.

Implementation- Use formaldehyde-free or fully sealed materials.²³

e. Green Appliances²⁴

Basics- Appliances account for 20% of an average American household's energy consumption.

Implementation- Select ENERGY STAR labeled products, which typically use 10-15% less energy than conventional appliances.

8. Case Studies

Betty Ann Gardens Family Apartments,²⁵ San Jose

- Stats: 3 story affordable rental apartments, 20 units/acre (76 units, 3.9 acres)
- Sustainable materials: Low-VOC interior paints and varnishes were used throughout the project. All carpet contains recycled materials, and carpet tiles were used so that worn or damaged tiles can be selectively replaced rather than replacing the entire carpet. Natural linoleum - made from renewable resources - was used for kitchen and bathroom flooring.
- Community design: A bus stop is located in front and the developer provides residents with free yearly "Eco-passes" for unlimited use of local public transportation. Surrounding area includes a community center, computer learning center, and office space to support the mixed needs of community members. The site protects heritage trees and open space.

Plaza apartments,²⁶ San Francisco

- Stats: 9 story affordable rental apartments for low income, formally homeless people, income at 12-20% AMI. The development is mixed-use with ground floor office and retail space, and has a density of 549 units/acre (106 units). There is no parking provided.
- Sustainable Materials: It is San Francisco's first affordable housing development built to the standards of the LEED™ Silver criteria. The building incorporates recycled materials such as carpets, steel framing, and sustainable floor materials such as linoleum and bamboo. It has an on-site energy production using solar panels, conserves water with low-flow plumbing fixtures and a rainwater catchment system.

- **Community Design:** The building is within 500 feet from bus stop, within ½ mile from BART. The first floor has offices, retail, and houses social services such as money management, health services, vocational programs.

Earth Justice's Headquarters²⁷, Oakland

- **Stats:** 4 floors/20,000 sq. ft. renovated office building. This redevelopment earned one of the first LEED Silver Commercial Interiors ratings in the nation.
- **Sustainable Materials:** The office was redone with exposed concrete walls, salvaged wood for shelving and high recycled content furniture and flooring made of recycled rubber tires.
- **Community Design:** The building has bicycle storage and changing room facilities. It is in the heart of downtown Oakland, near several major bus routes and a BART station.

9. Dig a little deeper

Multifamily Green Building Guidelines

<http://www.stopwaste.org/home/index.asp?page=291>

An extensive guide for architects and housing developers about specific measures and green building methods, costs, and case studies on green development around the San Francisco Bay Area. New version coming out in 2008.

Build It Green

www.builditgreen.org

Great resource to provide information on specifics about green building guidelines, finances and tools. They offer listings of certified green building professionals, product directory of green materials, free Ask-An-Expert hotline, fact sheets on the specific elements of green building, case studies and workshops for individual residents and developers.

Green products and retailers: www.builditgreen.org/guide

Fact Sheets: <http://www.builditgreen.org/resource/index.cfm?fuseaction=factsheet>

GreenPoint Rated

California home rating program and consumer label administered by Build It Green. Currently available for single-family and multifamily new construction, and expanding to including remodeling and existing homes in 2008. Visit www.greenpointrated.org for a list of certified GreenPoint Raters and to learn more about the program.

LEED™

<http://www.usgbc.org/DisplayPage.aspx?CategoryID=19>

The U.S. Green Building Council provides a comprehensive guide to how to secure LEED™ certification for a building and development project.

Green Affordable Housing

The Green Affordable Housing Coalition, a joint program of Bay Area LISC and Build It Green, offers ongoing educational programs, networking opportunities, and other resources for affordable housing developers. For information about funding affordable, green multifamily buildings in the San Francisco Bay Area, refer to *The Materials Handbook: Guidelines for Affordable Sustainable Housing* (available from www.andnet.org). Bay Area LISC's Green Connections program and Enterprise Community Partners' Green Communities program are two potential sources of grant and loans for green affordable housing.

Natural Resources Defense Council (NRDC): Building Green

<http://www.nrdc.org/buildinggreen/>

An extensive website with tools, case studies and fact sheets on green building design, construction and financing.

References

¹ <http://www.builditgreen.org/index.cfm?fuseaction=guidelines>

² *Smart Growth Resource Library*. Smart Growth Online.

<http://www.smartgrowth.org/library/articles.asp?art=2465&res=1024>

³ *Development industry says, Building Green is here to stay*. CoolTown Studios.

<http://www.cooltownstudios.com/mt/archives/001046.html>

⁴ <http://www.greencommunitiesonline.org/things-to-know06.asp>

⁵ http://www.builditgreen.org/resource/index.cfm?fuseaction=factsheet_detail&rowid=16

⁶ *Bay-Friendly Landscaping for Professionals*. Alameda County Waste Management Authority.

<http://www.stopwaste.org/home/index.asp?page=188>

⁷ <http://www.lgc.org/energy/greenbuild.html>

⁸ <http://www.sflivingbyexample.org/sflivingbyexample/attachments/GreenBuilding4.pdf>

⁹ <http://www.builditgreen.org/pdf/24-PassiveSolarP1.pdf>

¹⁰ <http://www.builditgreen.org/pdf/12-GreenIdeas.pdf>

¹¹ *Emerging Renewables Rebate Program*. California Energy Commission.

<http://www.consumerenergycenter.org/erprebate/>

¹² *Generate your own Power*. Pacific Gas and Electric Company.

http://www.pge.com/suppliers_purchasing/new_generator/index.html#whichprogramshouldyouapplyfor?

¹³ *Climate Smart-How it Works*. Pacific Gas and Electric Company.

http://www.pge.com/about_us/environment/features/climatesmart_how_it_works.html

¹⁴ *U.S. EPA Characterization of Construction and Demolition Debris in the United States, 1997*

Update.<http://www.epa.gov/epaoswer/non-hw/debris/about.htm>

¹⁵ *Insulation and Air Sealing*. Build it Green. <http://www.builditgreen.org/pdf/8-Insulation.pdf>

¹⁶ http://www.builditgreen.org/resource/index.cfm?fuseaction=factsheet_detail&rowid=19

¹⁷ http://www.builditgreen.org/resource/index.cfm?fuseaction=factsheet_detail&rowid=22

¹⁸ <http://www.builditgreen.org/pdf/12-GreenIdeas.pdf>

¹⁹ <http://www.builditgreen.org/index.cfm?fuseaction=whatis>

²⁰ *The need for Green Now*. Green Communities. <http://www.greencommunitiesonline.org/things-to-know02.asp>

²¹ *Flooring*. Build it Green. <http://www.builditgreen.org/pdf/6-Flooring.pdf>

²² *Low Costs Strategies of Going Green*. <http://www.greencommunitiesonline.org/things-to-know06.asp>

²³ *Low Costs Strategies of Going Green*.<http://www.greencommunitiesonline.org/things-to-know06.asp>

²⁴ <http://www.builditgreen.org/index.cfm?fuseaction=whatmakes>

²⁵ <http://www.stopwaste.org/docs/gettingstarted.pdf>

²⁶ *Green Housing Projects: Plaza Apartments*. Design Advisor.

<http://www.designadvisor.org/green/plaza.htm>

²⁷ *Case Studies*. Green Building in Alameda County.

<http://www.stopwaste.org/home/index.asp?page=773>