ROMANIA GREEN BUILDING COUNCIL

Green Building Information Guide for Homes and Small Buildings

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This guide is a brief summary of widely accepted green building principles applied to home and small-building renovation and new construction. It is broken down into the different areas of which green building is most critical. If you have any further questions we would love to hear from you.

Planning

People generally look at architecture and engineering costs as non-essential elements because they are not hard materials. But the fact is, good architecture and design reduce costs and increase the value of a building by not only the reducing quantity of materials needed in your design, but by also making the building safer, more energy efficient and more comfortable to live in. Investing in good planning and design not only makes good financial sense but is a core green-building principle. Good project planning will also prevent delays in the construction process by ensuring that all the materials and plans are available when they are needed.

Building Performance

Whether constructing a small building from the foundation up or renovating an existing small building, there are a number of performance goals that you will want to strive for as you design your green building or renovation.

Water Efficiency

Reduced Water Consumption –The first thing to consider is a system that is easy to maintain so that water will not be lost to leaks. Replace gaskets and taps as they wear, according to manufacturer's advice and common sense. Employ appliances and fixtures that intelligently reduce the amount of water used but provide the level of function you require. Aerated shower heads, faucets and dual flush toilets are simple and effective examples of what this could look like.

Water Reuse – After reducing the amount of water used, why not get smart in how water is disposed of? Most household water is not harmful to human health until it is combined with solid waste. Many rivers and lakes in Romania are green with algae because of the wastewaters that are poured into them. As soaps break down they release phosphor compounds that are excellent fertilizers for plants. Water from showers, dishwater and clothes washing are all clean enough for gardens and are excellent sources of fertilizers for plants. Putting this water into gardens or, in winter, discharging it below the frost line into the soil will decrease the negative impact on lakes and rivers and keep their waters clear.

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Thermal Energy Efficiency – The Goal: Free Climate Control. One of the most important aspects of a building is how it regulates internal temperature, which translates directly into the comfort of the occupants. There are two different ends to the spectrum of thermal efficiency. On one end is a small building that requires huge amounts of energy to maintain an indoor climate that is comfortable for the occupants. Through air conditioning and heating we can transform almost any space into a desired climate. This is an active climate control system. The other end of the spectrum is a small building that requires no additional energy to maintain comfortable temperature levels. This is a passive system. Some ideas on how to achieve it are natural ventilation; intelligent passive solar design; using water resources and vegetation for cooling; heat pumps and earth-based cooling; excellent insulation; energy-efficient windows and doors; and building -envelope design.

Passive solar design involves calculating an area of window surface that faces south to bring in enough warmth to heat the building. It is important to provide shading for summer months so that you can "turn off" this natural heat source. Another very simple technique for keeping homes cool in summer is light-colored roofing that absorbs less heat from the sun. In the winter, when roofs are covered with snow the loss of warming potential is less important. The opportunities to realize these goals are endless and diverse.

Mechanical thermal systems – When we have done our best to reach the goal of passive temperature regulation we may still need some energy input to make the building comfortable. Replacing old furnaces and air conditioners with newer, more energy-efficient units and investing more up front in higher efficiency units are great ways to realize energy systems and both usually pay for themselves in savings. Other important energy savings can be realized by insulating pipes and duct-work and installing pipe and duct work so that they are well within the building envelop and do not lose heat to the outdoors. This will reduce the drain on the heating system and ensure heat is delivered to the faucets and radiators rather into the walls.

Electrical Energy Efficiency – The Goal: Low Energy Bills. While the cost of electrical power is currently heavily subsidized, it is projected to rise dramatically over the coming years. Effective power saving systems provide homes with increased long-term value by future-proofing them from increases in energy prices while simultaneously delivering immediate short term savings.

Lighting – Natural light should be used as much as possible. The goal should be to optimize natural light and reduce artificial lighting needs. Good green design ensures lighting layouts use as few bulbs as possible and the most efficient fixtures to reduce the power drain of our system. LED and fluorescent lighting are both much more efficient than incandescent bulbs but are both suited to different tasks based on the quality of light they produce. Fluorescents produce "warmer" (more like sunlight) lighting but are less efficient, so use LEDs for exterior, walkways, task lighting and art lighting but use fluorescents for ambient room lighting. This combination will give you the highest efficiency with the best results. Lastly, we can give our lights a brain so that they intelligently manage the lighting of the building, dimming lights when some natural light is available, turning off the lights when occupants leave a room.

Appliances – The use of efficient appliances is another way to reduce energy consumption. Appliances such as refrigerators, washing machines and stoves have all improved in terms efficiency. From 1995 to 2000 alone refrigerators improved by 15%, washing machines up to 33% at high spin rates and stoves 7% Replacing old inefficient units with newer units will reduce your consumption and can create savings that make the change pay for itself.

Sustainable Use of Materials

There are several major sources of concern when selecting your materials. The first is: Will these materials create an environment for occupants that is safe and healthy? The other concern is: are these materials sustainable? Does their production pollute the environment external to your site? Lastly we have to ask ourselves: are these materials durable?

Sustainable Materials - When we ask how sustainable a material is we generally ask how much damage is done to the planet to harvest the material and bring it to market. A common example of this is wood building material. When harvested sustainably, wood is a great natural material, but if it is not harvested in a sustainable manner the resulting deforestation can cause flooding, landslides and loss of wildlife. The Forest Stewardship Council (FSC) is an organization that certifies lumber that has been harvested in a manner that preserves the forests. Using certified wood and investigating the pros and cons and impacts of other materials does not take a great deal of time, but allows you to make informed decisions on the impacts your project will have. For further information contact the RoGBC.

Reusing and Recycling - instead of using new materials can reduce the financial and environmental costs of newly manufactured materials. Salvaging materials and refurbishing them from existing structure or other sites is a great way to add character to a project and economize on materials. Similarly, using waste products can be very effective. Foundations and retaining walls made of used car tires outperform concrete blocks in many respects. Using products that have been recycled, such as cellulose insulation from newspapers, is a great way to be green too.

Local Materials – Another thing to consider when selecting your materials is how far a material has to travel to get to your project. Construction materials are bulky and heavy and require significant fuel to transport. Reduction in their travel distances can offset price differences, should they exist, and preserves our limited fuel resources.

Durability - like other green building principles is one that places value on an investment in materials that may have a higher initial cost but have greater lifespan. Roofing shingles that need to be replaced every 40 years instead of every 20 years may be more expensive in the short term, but save money and produce less waste because they only have to be replaced half as often.

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Indoor Air Quality, Ventilation and Health and Wellbeing

The health of the building as a system can affect the health of occupants of the building on a holistic level.

Healthy Materials – When deciding if a material is healthy or not, we need to look at health problems caused by the products we use to build our homes. Most green building rating systems acknowledge one of the biggest problems as VOCs (Volatile Organic Compounds). Many products such as polystyrenes, paints, adhesives, carpeting and vinyl flooring are now required to list the VOC levels that their products emit. Even if the emissions levels are not listed on the container, the manufacturer is obliged to provide you with this information; you can get it off the material data sheets or on their websites. All of these products off gas VOCs over very long periods of time. VOCs have been linked to asthma, respiratory problems and even cancer. The easiest way to avoid this problems altogether is to use natural materials such as paints that use natural seed oils as solvents for instance. If you must use these materials, look for providers that have made efforts to lower the VOC emissions of their products. Another major health concern comes from formaldehyde and toxic preservative agents used in OSB and some types of insulation. These should be avoided altogether. A simple internet search of most products will give you a good idea of health concerns associated with it.

Pest control - is a source of indoor toxic chemical emissions. The use of window screens, a well sealed foundation and building envelope and keeping branches from nearby trees off the building will all reduce chances of pests in the home and the need to use chemicals to get rid of them.

Fresh air – While it is important to seal the building envelope for thermal efficiency and moisture control, it is also important that fresh air and oxygen are present in a small building to promote brain activity and good health. Bringing fresh air into a small building without losing climate-controlled air can be challenging but there are many good ideas out there on how to do it. Heat exchangers, for instance, heat or cool air as it enters the building by exchanging its heat with air being exhausted from the home. Plant life in green walls, greenhouses and house plants will also serve the function of cleaning the air and renewing oxygen content.

Mold – is a fungal growth that occurs in specific circumstances when there is excess moisture in a structure. The spores are released into the air were they irritate and damage the lungs. Mold exposure can lead to chronic respiratory illness and asthma. To avoid this create a building envelope that doesn't allow water to enter and avoid warm humid air from the inside condensing on cold surfaces that contact the outside. Internal sources of humidity such as showers and kitchens should be ventilated, exhausted and built of materials that resist mold. Make sure these exhausts do not vent into the attic but directly out the roof or wall to insure that moisture does not accumulate in the attic. Whatever is suggested by building codes, go well beyond it. This is an area where additional effort will dramatically improve the quality and longevity of the home. Another good way to prevent mold is to insulate cold water supply pipes

as condensation can form on them in hotter summer months, introducing moisture into the walls.

Combustion – It may be necessary to cook, heat or generate electricity with combustibles such as gas, wood or coal. Whenever possible it is good to avoid this but when it cannot be avoided, employ a system that is designed to compensate for products of combustion entering the home. Employ exhausts for kitchens, seal fireplaces to prevent leaks, design chimneys to avoid back draft. Provide sealed exhaust and supply for gas water heaters and furnaces so there is no chance that combustion gases can leak into the building. Also, to be sure everything is working, install air quality monitoring devices such as carbon monoxide detectors whenever possible.

Site Stewardship and Landscaping

Consider how to have as little impact on a site as possible. The protection of trees and plants during construction or renovation may require some effort and consultation with specialists at times, but it will be well worth the time to protect the natural ecology of the site and work existing flora and fauna into the new home property. Indigenous plants and species on the site provide low-maintenance sustainable landscaping options and reduce the cost of landscaping in both the immediate and long term. They save money by requiring less watering, fertilizer and insecticides. Native bird and bat populations will provide enjoyment and free mosquito control. Increased pollinating insects will create healthy gardens with more beautiful flowers. Ponds and water features are excellent ways to store excess rainwater and dramatically improve biodiversity. Make sure you keep the water moving and aerated to prevent mosquitoes and excess algae growth.

Another common problem in construction projects in the destruction or loss of soils. Often, if left unchecked, disturbed soils on a building site will be washed away, with the rain ending up in storm drains as sediments that need to be removed by the city. If they are not removed, they can block sewers, creating problems with sewer gases and local flooding. Simple measures can be taken to avoid the loss of material due to erosion. Stockpiling soils for reuse in landscaping and construction is an important part of site stewardship and also reduces cost of removing soils and aggregate and their eventual replacement.

Effective landscaping is also very important for the durability of the structure. Water should be prevented from collecting around the foundation by ensuring it flows away from the house and ensuring good subsurface drainage paths for water.

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The RoGBC "Is My Green Project Green?" Checklist

Design and Planning

- ☐ Were planning and design a central and well developed component to the project?
- ☐ Was a team brought together that integrates the diverse elements of building design into a holistic design?
- ☐ Was material use optimized, reducing quantities of materials used to minimums?
- ☐ Has the use of passive solar orientation and design principles been integrated into the design?
- ☐ Have passive ventilation design principles been integrated into the design?
- ☐ Did I try and keep the size of building as small as possible to suit the requirements of the occupants?
- ☐ Were active heating and cooling systems designed based on an energy analysis of room sizes and insulation?

Water Efficiency

- ☐ Is the water system designed to be low maintenance and have existing systems been maintained to prevent leaks?
- ☐ Have low flow or aerated faucets and shower fixtures been installed in the kitchen and bathroom?
- ☐ Have dual-flush efficient modern toilets been installed in bathrooms?
- ☐ Is rainwater being collected for irrigation or other use?
- ☐ Are modern water efficient appliances being used?

Thermal Energy Efficiency

- ☐ Is the building well insulated in the walls, attic and roof (U<0.4)?
- ☐ Has an effort been made to avoid and in existing systems identify and fix problems with thermal bridging (sections were insulation is incomplete or inadequate)?
- ☐ Are heat sources modern and efficient, furnaces and hot water heaters?
- ☐ Are pipes insulated to prevent condensation on cold water pipes and heat loss in hot water pipes?
- ☐ Are windows well insulated (U<0.4)?
- ☐ Do doors provide a good seal and are they well insulated?
- ☐ Has the feasibility and payback period (the amount of time for the cost to be offset by the savings) of solar hot water and air heating been explored and implemented if economical?

Electrical Energy Efficiency

- ☐ Have incandescent light bulbs been replaced with more efficient LED and fluorescent options?
- ☐ Has the lighting plan been reviewed to ensure best locations for lights?
- ☐ Is natural lighting being used as much as possible?
- ☐ Have changes like skylights and light tubes been employed to reduce lighting needs?
- ☐ Has an intelligent lighting system been installed?
- ☐ Are modern high efficiency appliances being used?
- ☐ Has the building been evaluated by a third party auditor for energy performance and possible improvements?

- Has the feasibility and payback period (the amount of time for the cost to be offset by the savings) of onsite renewable power production like wind, solar or micro hydro been explored and implemented if economical?

Sustainable Materials Use

- Have materials that emit VOCs been limited in their use, especially within the building envelope?
- Have materials emitting VOCs been checked for levels of emissions and the use of the lowest emitter within that product category been used?
- Has formaldehyde-free OSB and insulation been used?
- Are the materials used sustainably harvested, processed and their impact on the planet minimized?
- Is the lumber used FSC or PEFC certified?
- Are the materials locally sourced?
- Were materials salvaged from other projects or waste products reused?
- Were materials that contain recycled post-consumer water used?
- Did a structural engineer review and design the structure to conserve material? (Load specific wall design can save a lot of concrete or timber)

Air Quality and Ventilation

- Is the small building well ventilated and is the air fresh?
- Has a building envelope that prevents mold-growth been created?
- Has an exhaust that completely removes all threats from combustion products and moisture been installed?
- Have safeguards for the monitoring of possible air quality issues been installed?

Site Stewardship

- Did the project protect existing plants, trees and habitat?
- Did the project create new habitat?
- Were the soils protected from erosion and were disturbed soils reused on site?

Landscaping

- Does the landscaping encourage water to flow away from the foundation?
- Does landscaping exist at proper distances from the structure to prevent it being used as an access point for pests?
- Is the landscaping making use of indigenous plants that require little irrigation, fertilizer and pesticide use?