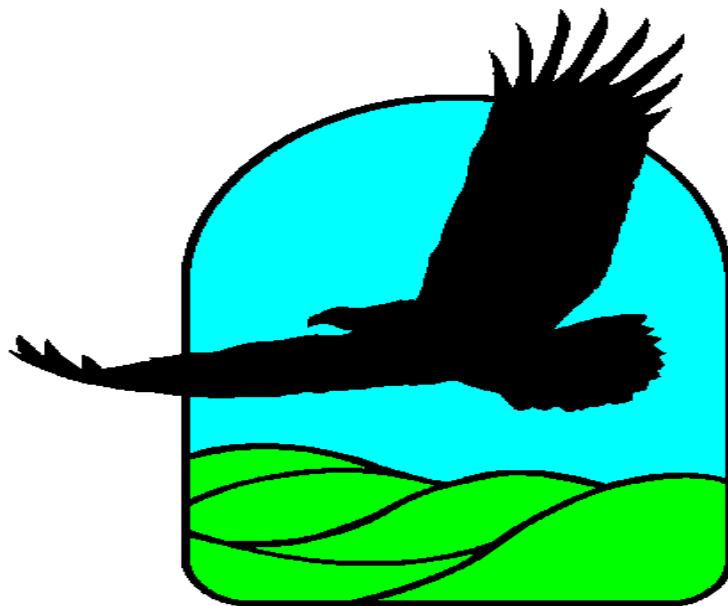


APPENDIX D



CITY OF WATSONVILLE

GREEN BUILDING PROGRAM

Ordinance 1231-07 (CM) codified in Chapter 15 of Title 8 of the Watsonville Municipal Code

GREEN BUILDING GLOSSARY

January 2008

GREEN BUILDING GLOSSARY



There are a number of terms in the Green Building Check Lists that you may not be familiar with. Use this glossary for an explanation of terms for both residential and non-residential applications.

Advanced Framing Techniques—Also called Optimum Value Engineering (OVE) it is a methodology of construction designed to conserve construction materials by using alternate framing methods. Concepts include 19.2-24" framing centers, modular layout, single top plates, individually sized (right sized) headers or no headers or double rim joists in lieu of headers, framing ladders at T- intersections and open corner framing. Some methods may not work in engineered structures, but many will. The overall savings in framing materials and associated costs can be significant. There is an excellent website at www.toolbase.org that describes in detail the concept.

AFUE—Annual Fuel Utilization Efficiency. The higher the percentage the greater the efficiency of the appliance. Standard efficiencies run in the mid-70% range. Higher efficiency furnaces run between 82 and 90+ %AFUE.

ASHRAE—American Society of Heating, Refrigeration and Air Conditioning Engineers. This organization writes many of the standards for installation of these systems.

Alternative Fuel Vehicle—Vehicles which utilize fuel other than gasoline or diesel fuels. Vehicles may be electric, LPG, natural gas, bio-diesel or a hybrid of these fuels.

Brownfield—Abandoned, idle or underused industrial or commercial buildings where expansion or development is complicated by real or perceived environmental contamination.

Certified Wood—See FSC Certified Wood

Cool Roof—Specialized roofing materials designed to reflect the heat of the sun away from the building thus reducing the cooling load and associated air conditioning costs. In Santa Cruz, because of our moderate climate there is less need for cool roofs than in a place like the central valley, however larger buildings can benefit from these roofing systems. There are various manufacturers of "cool roofs". In California, the CA Energy Commission requires a cool roof to have a reflectance of .7 and an emissivity of .75 under the Title 24 requirements.

Dual Flush Toilet—These are toilets that have two different settings, usually 0.8 gallons for liquid removal and 1.6 gallons for full flush solid removal. On the average they use about 2500 gallons per year compared to a 1.6 single flush that uses about 4500 gallons per year.

Earthen Flooring—Literally earth that has been compacted with straw or other fibers and conditioned with various oils to form a hard surface. Fairly labor intensive, but relatively easy to repair and usually very low bodied energy and inexpensive materials.

EER—(See SEER)

Energy Heel Truss—An engineered roofing truss with an elevated portion at the wall plate line to provide for full depth insulation.

Energy Star—Introduced in 1992 by the U.S. Environmental Protection Agency (EPA) as a voluntary labeling program designed to identify and promote energy efficient products to help reduce greenhouse emissions by identifying energy efficient products. Originally designed for computers and monitors, it has now expanded to include office products, major appliances, lighting, home electronics and more.

GREEN BUILDING GLOSSARY



New expanded programs now also include complete buildings such as homes, commercial and industrial buildings.

Engineered Lumber—Generally engineered lumber is construction materials designed to reduce the amount of material needed for framing a building. By designing away from full dimension sawn lumber, less large growth trees need to be cut and smaller dimension lumber can be assembled in various configurations to span long distances with equal or superior strength. Trusses have always been a good example of engineered lumber by using smaller dimension lumber and distributing forces more efficiently, the materials needed are a fraction of that required to span the same distances with sawn lumber.

Engineered Studs — A little different than engineered lumber, usually smaller diameter stock is shredded and reassembled by forming them into nominal sized framing materials. The material is combined with a binder and compressed into large billets that are then cut to dimensional size. Similar products have been around for many years in the form of oriented strand board (OSB) and other laminated wood beam products. An advantage of engineered studs is that they are dimensionally stable and less susceptible to warping. These studs are considerably heavier than sawn wood, cost about twice as much and may be subject to water damage.

Finger Jointed Studs — Often the lumber being cut today is a shadow of the old growth lumber of yesterday in quality, density and overall suitability for construction. However, by conserving the shorter sections of lumber and removing the undesirable wane and knots, these sections can be fitted with special splicing techniques to form longer and more dimensionally stable lumber. The application is usually limited to vertical installation because of this splicing technique.

Flow Reducer— A device attached either just downstream from the water shutoff valve to a building or at the outlet of a fixture designed to reduce or limit the amount of water flow in relation to the delivery pressure from the street. Flow reducers can cut the flow of water dramatically saving thousands of gallons each year in a dwelling or even more in larger buildings. Flow reducers are never installed on automatic fire extinguishing systems for obvious reasons.

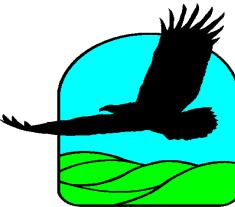
Flyash— A byproduct of a coal burning furnace, usually from power generation equipment. Consisting mostly of silica, alumina and iron, these fine glass like particles, when mixed with lime and water it form a cementitious material similar to Portland cement. The cement produced is hard, smooth and easily worked. Other uses include fills for abandoned coal mines, sealing liners for hazardous waste sites and seaside docking areas.

FSC Certified Wood—The Forest Stewardship Council is a non-profit organization that certifies various forests around the world exhibiting good sustainability and management practices based on a specific management criteria. The wood from these forests are often quickly renewable often using hybrid timber and advanced forestry methods. Other forests are simply carefully managed by limiting the impact on both the environment and the people and demonstrating a social benefit in the process.

Granny Flat—Another name for an accessory dwelling unit. Granny flats are usually associated as being attached to the main dwelling unit, but may also be detached. City regulations limit the number and size of these units.

Graywater— Waste water from lavatories, showers, baths and sinks only. This water can be stored in special equipment and may then be used to water lawns, gardens or other relatively benign non-potable uses such as

GREEN BUILDING GLOSSARY



groundwater recharge. Graywater systems must comply with the requirements of California Plumbing Code Appendix Chapter G to qualify as a green element. Water from toilets is called black water and is not eligible for any type of reuse under this program and must be properly drained to the sewer or septic system.

Green Power-Generally this is the production of electricity from environmentally friendly sources such as photovoltaic, geothermal, hydroelectric, biomass, hydrogen fuel cells, ocean energy and wind power. As with all forms of electricity generation, there are significant costs involved and in some cases undesirable byproducts such as vane noise and unsightly appearance or diversion of wild waterways. While large scale versions of these methods are not practical within an urban environment, many homes and businesses are taking advantage of solar systems that not only make electricity but also heat water and interior environments. In the future if clean fusion process electrical production can be developed the use of fossil fuel generation can be greatly reduced or eliminated. Another advantage of green power is the reduction on carbon dioxide generation.

Green Roof—Essentially this is a growing roof system utilizing a specialized undercarriage for the waterproof membrane and excess water removal. Various types of vegetation are set into a special growing media and help to replace displaced vegetation in the building footprint as well as greatly reduce the heat island effect of a roof, especially in hot climates. Depending on the species of plants chosen, significant increases in watering requirements may be required. On the other hand, on large walk able roofs pleasing garden atmospheres can be created and watering requirements can be reduced by the installation of storm water recovery systems. Green roofs can also regulate the flow of excessive storm water by metering the release of the water from the roof area.

Heat Island Effect-As cities replace natural landscaping with streets, buildings and other infrastructure, the average ambient temperatures within these areas begin to rise, as much as 10 degrees F higher than less developed rural areas. This increases the need for cooling energy, can exacerbate pollution problems and may be contributing to the problem of global warming. Heat islands can be effectively reduced by shading streets with trees and improving the urban forest overall. Ironically, heat islands can be beneficial in cold climates in the winter by reducing heating demands, however the overall effect is much more on the negative side.

HVAC—The acronym for Heating, Ventilation and Air Conditioning

Hydronic Radiant Heating—This is a system of heating a building by using a central boiler or hot water heater to distribute heat under a floor through a system of tubes just under the flooring surface. A single heater may be zoned to provide independent heat to different parts of a building as needed. The heating system is efficient and provides a comfortable conditioned room.

IAQ-The acronym for Indoor Air Quality. As buildings become tighter, indoor air quality suffers unless specific measures are taken to improve the exchange of fresh air without sacrificing heating/cooling economy.

Infiltration-This is the entrance of exterior unconditioned air to a building through various means into a building. Under the older codes, a dwelling generally had the equivalent of a four-foot diameter hole in infiltration leakage. While newer buildings greatly improve this leakage, other problems such as poor indoor air quality and transpiration of moisture to internal stud bays now occurs and must be remedied with such items as air-to-air exchangers and specialized waterproofing techniques.

GREEN BUILDING GLOSSARY



Insulated Concrete Form (ICF)-Expanded polystyrene foam (EPS), high density polyethylene (HDPE), polyvinyl chloride (PVC) or polycarbonate (PC) is cast or injection molded in various panel shapes and form the permanent forming method for reinforced concrete walls. These highly insulated forms have various thermal resistance values (Rvalues) ranging from about R-22 up to about R-40. In hot or cold climates, these forms can significantly reduce heating and cooling loads. The panels are usually pre-engineered and produce a fire resistive barrier up to 4-hour rated.

LEED— Leadership in Energy and Environmental Design. The LEED program was developed by the U.S. Green Building Council as a system for rating new and existing commercial, institutional and high-rise residential buildings. It evaluates the overall environmental performance during the lifecycle of a building and provides a tangible methodology for analyzing the standards of a green building. The version currently being used in the City of Santa Cruz Green Building Program is NC 2.1.

Light Pollution—Light pollution comes from many sources, but generally from unshielded lighting that allows light on a site to escape. Some lighting cannot be effectively reduced by shielding such as parking lot or street lights that reflect off of structures and bounce light away from the site. However, simple hooding of the “naked” light source directing the light to the ground or limiting its outward influence can significantly reduce light pollution.

Manufactured Locally— Generally this refers to products that are manufactured within a relatively short distance from the job site. Depending on who is making the definition, this can be within 100 to 1000 miles. The main intent is to be cognizant of long distance shipping and the energy expended and pollution created to move a product from greater distances.

MDF— Medium Density Fiberboard. An engineered panel product that can be used for such things as cabinets and wall panels while other MDF products can be shaped into moldings, ceiling tiles, flooring, interior doors and a variety of other uses. Exterior grades of MDF can be made into garage doors, sheds and other outdoor applications. A middle grade called “moisture resistant MDF” can be used externally but must be protected from water intrusion by sheltering.

Oriented Strand Board (OSB) -a manufactured wood structural panel generally cut to the size of standard plywood sheets and in various thicknesses. It is made by chipping very specific species of wood from smaller growth trees and “orienting” the grain of these chips into a pattern that provides optimum strength in the panel. The chips are then saturated with glue and pressed into production sizes.

Ozone Depletion—Destruction of the earth’s ozone layer by the photolytic breakdown of chlorine and/or bromine containing compounds (chlorofluorocarbons or CFC’s) which catalytically decomposes ozone molecules. Commonly used as refrigerants, CFC’s have been found to damage the stratospheric ozone layer, creating holes and allowing harmful ultraviolet radiation to leak through.

Permeable Paving—Pavement that allows the passage of water into the ground. There are a variety of permeable pavement methods including spaced pavers with soil infills and newer specialized asphalt and concrete applications that actually allow rainwater to pass through the surface and help to keep the water table from being depleted.

Photovoltaic Panel— These are panels that are either roof or ground mounted that collect solar energy and through the use of special solar voltaic cells, convert the energy to direct current electricity. A special controller then converts this electricity to alternating current, making it usable in most residential and commercial applications.

GREEN BUILDING GLOSSARY



Electricity made in this fashion can be stored in batteries for later use, consumed as it is made to help offset the overall electrical use of a building, or placed into the commercial electrical grid for use in other locations. These panels only work when there is light, but surprisingly produce electricity even on cloudy days.

Pressed Earthen Block— Like adobe, pressed (or compressed) earthen block is made from a mixture of soil and aggregate with no chemical additives. Often machine manufactured at the construction site. Because there is relatively no quality control routine compared to other types of manufactured block, its use may be limited, especially in high seismic zones. Careful engineering will be required to use this material in structural applications.

Public Transit Stop—A neighborhood or business area location where public transportation such as a bus can be accessed. To be effective, public transit stops need to be conveniently located so people do not have to walk long distances (generally less than 1/4 mile), weather protected in severe climates and inter-connected to either transit hubs or continuation lines.

Radiant Barrier Roof Sheathing—Usually a foil faced plywood manufactured with proprietary methods that is used as the roof sheathing under the roofing material itself. The reflective surface of the material actually reflects heat back away from the roof back through the shingles without significantly increasing the thermal load on the material, usually only 2 to 5 degrees. Other methods are rolled materials that are applied after the regular plywood or OSB sheathing is applied. Both materials can reduce attic and subsequent living area cooling loads significantly. Some manufacturers claim up to 97% effectiveness.

Rammed Earth—Essentially, this is a soil-cement mixture that is rammed into forms to create walls that are generally 18 to 24 inches thick. The screened soil is usually engineered to assure the correct clay to sand ratio and is mixed with about 3% cement and sprinkled with water to provide cohesion and is compacted in 5 or 6 inch lifts to a relative density of around 120 to 130 pounds per cubic foot. Often concrete tie beams are incorporated to help stabilize the lateral strength of the material. The material is relatively labor intensive and the cost of a rammed earth house can be significant. One company in Arizona sets the price at around \$375,000 for a 2000 square foot house. In California, the costs would be even higher due to labor costs and the necessary engineering for high seismic zones.

Rastra®—Rastra is a commercially manufactured insulated concrete form (ICF). It is manufactured from recycled, post-consumer plastics and according to the manufacturer offers the structural strength of concrete paired with high insulation values, sound attenuation and fire resistance.

Reclaimed Lumber— Exactly as the term implies, this is lumber that is reclaimed by “deconstruction” of a building or structure. This lumber can be used for non-structural applications such as paneling and flooring and if re-graded can be used in structural applications. Major advantages include usually higher quality surface characteristics (it often came from tight grained old growth lumber), less cost than new lumber and reduction in landfill wastes (although it can easily be mulched). Major disadvantages are that it is fairly labor intensive to “clean up”, is often very hard to nail after many years of drying and may need to be predrilled, increasing installation cost.

Recycled Content Aggregate— Often concrete salvaged from demolition projects can be crushed and reused. Some can be introduced as a percentage of the aggregate in new concrete, while some can be used for roadbed underlayment. The actual use of the product is limited to imagination and the structural requirements of the project. Use of the material also reduces the amount of new aggregate that must be mined from quarries and the associated environmental concerns associated with the operation.

Recycled Content Material— As the name implies, many products can be manufactured using “post

GREEN BUILDING GLOSSARY



consumer" materials such as plastic, fiber, wood, glass and so on. Deconstruction of various structures can also

produce a variety of "raw" materials to create new products from, everything from tiles to carpeting to composite flooring materials and beyond. Recycled content materials help to reduce the need for new raw materials and the accumulation and manufacturing processes involved.

Recycled Content Steel Studs – Most new light gauge metal studs are manufactured from a combination of new

and recycled steel. About 66% of the total make up is recycled content. Considering that the production of new steel is one of the highest embodied energy manufacturing processes, the use of recycled steel not only redirects a virtually ever reusable resource, but significantly can reduce the impact on other environmental concerns. The use of light gauge metal studs on interior infill and demising walls lessens the amount of wood studs needed for construction, however more specialized skills are needed to install the material properly.

Roofing Materials

Safe and Durable— This can have a variety of definitions depending on one's point of view but essentially these are roofing systems designed to last a significantly longer time to delay having to remove them and sending them to the landfill. Modern fiberglass roofing materials now carry warranties between 20 and 40 years. Of course slate, concrete and fired clay tiles can last significantly longer. Additionally, a safe roof generally refers to a fire safe roof and with modern roofing systems, various degrees of fire resistance ranging from class C to class A define the fire retardance of a roof. As a result of the firestorms of recent years, in which literally hundreds of homes were destroyed by flying brands from untreated wood shingles and shakes, the State Fire Marshal has mandated that all roofs in California shall be at least Class B or better in fire retardance.

SEER-Most air conditioners use electricity to produce cooling. The efficiency at which they produce cooling is referred to as a SEER or EER number. SEER stands for Seasonal Energy Efficiency Ratio, and is a ratio of the amount of cooling produced (BTU) divided by the amount of electricity (watts) used. The higher the SEER, the greater the efficiency.

Solar Water Heating—Generally, this is a method of heating domestic water by allowing ground or rooftop mounted panels to collect solar rays as the water flows slowly through a series of small tubes. The heat transfer is then stored either in a potable drinking water vessel (your water heater) or introduced into a closed loop transport system to provide environmental space heating.

Straw Bale-This is a methodology developed to use special tightly bound straw bales as either bearing or infill walls in a variety of structures including homes. The straw bale system was an offshoot of the Nebraska straw house where their construction over a hundred years ago solved the basic problem of no lumber. The bales provide a substantial increase in insulation value but their installation can be rather labor intensive. The State of California has set down very specific criteria for construction of straw bale houses in the Health and Safety Code. All straw bale structures built in the city must meet Seismic Zone 4 engineering requirements.

Structural Bamboo-Bamboo as a construction material has many uses. Because the material is very hard it has recently found a niche as flooring material. However, the material is also very strong and with new methods of handling the material, structural uses of bamboo are finding their way into the construction industry. They can be derived into trusses, supporting poles and simple beams. However most building departments are not familiar with the capacity of the material and builders will have to supply significant engineering and detailing to satisfy plan check requirements.

Sustainable Deck Materials— Most of us are familiar with the wooden deck. However, new materials on the market are making a dramatic impact in the form of recycled content decking and railing systems. Usually manufactured with recycled plastics, wood chips and binders, the materials hold up well to hostile environments and generally outlast even naturally durable woods such as redwood and cedar. The intent is to select materials



GREEN BUILDING GLOSSARY

that are sustainable or easily replaced with limited effect on the ecology. These new materials are easily worked similar to wood, however are considerably more expensive. The trade off is the longevity of the material. While there are variations to the support structure under these materials, treated wood is still the primary structural system.

Tankless Water Heater—Most of us have a 30 or 40 gallon storage water heater in our house. However, when you are not home or sleeping, that water heater is diligent in keeping your hot water ready at all times. Modern advances in storage tank water heaters reduces the amount of times it must fire to maintain temperature, but the basic operation remains the same. Tankless water heaters are designed to wait until you actually need the hot water and on demand, fire up raising the water temperature very quickly to operating level. The term instantaneous is often used for these heaters and generally by the time the water clears the heat exchanger inside, it's ready for use. Additionally, these water heaters take up less space than a storage tank type, but the amount of fuel needed to reach temperature quickly usually exceeds most storage types, but in a lot less time and a lot less often.

Title 24-Title 24 is contained in the California Code of Regulations (CCR) and is the embodiment of most of the construction and energy conservation requirements for the state. All cities and counties are mandated to enforce the requirements of Title 24.

Treated Wood

CCA-Chromated Copper Arsenate. As the name implies the chemicals used to treat wood to prevent attacks by wood destroying organisms such as boring insects, fungi and dry rot contains arsenic, a rather nasty poison. Since December 31, 2003, the distribution of CCA has been severely limited and is generally not available to the average homeowner anymore once existing stocks are depleted. It can still be manufactured for very specific commercial applications such as underwater saltwater pilings and cross member materials, but not for the decking above water bracing or railings.

ACQ-Alkaline Copper Quaternary (or Quat). This method of treatment uses copper as the primary active ingredient. While the material is effective for direct contact and above ground protection, it is highly corrosive to fasteners and fittings and special precautions must be taken in the selection (usually hot dipped galvanized or stainless steel) and the handling of the material.

CA-Copper Azole. Like ACQ, the primary active ingredient is copper. While not quite as corrosive as ACQ, the material does have a tendency to migrate into the soil. Again special care in selection of fasteners and handling is required.

DOT-Disodium Octaborate Tetrahydrate. DOT or simply borate or boron preserved wood is the least corrosive of the treatments. The material is intended for interior or protected use only and must be protected from direct water exposure which can leach the material out of the wood. Protected in dry conditions, the borates will migrate into the wood even deeper than the initial pressure injection application over time. The material is very effective against many wood pests including the voracious Formosan termite.

TXV-Thermostatic Expansion Valve (Also TEV). A TXV installed on an air conditioning system can dramatically improve the efficiency of the unit. When cooling demand is high, the valve opens up and lets more coolant pass through the indoor coils. When demand is low, the valve closes to reduce the refrigerant flow. AC units not equipped with TXV's have either a fixed orifice or capillary tube system. Because they are not very efficient, they are generally not sold in California, since they cannot meet the CA Energy Commission requirements.

Volatile Organic Compound (VOC)-Many of the products that we buy are made with materials that off-gas VOC's usually in the form of formaldehyde gas, a by-product of hydrocarbon based materials. Building

GREEN BUILDING GLOSSARY



materials such as particle board, plywood, adhesives, paints, varnishes, carpet, drapes and furniture are often made with formaldehyde products. Other sources include some you may not think of like tobacco, burning gas, perfume, cleaning agents, hair-spray and even copy and printing machines. Degrees of exposure to VOC's can cause everything from mild symptoms like irritated eyes, ears and throat to more severe reactions like wheezing and lung, memory and anxiety problems. By using low-VOC products, exposures are reduced and indoor air quality is improved.

Whole House Fan—Essentially a large fan that draws hot air out of a building and replaces it with cooler exterior air as opposed to attic fans that only remove the hot air from the attic. Compared to an air conditioner that can draw up to 6000 watts, whole house fans use about the same amount of electricity as a couple of light bulbs, or around 120 watts for smaller units up to about 700 watts for larger units. New homes of especially tight construction may need to have barometric vents installed a distance away from the exhaust intake to prevent negative pressure problems in the house that could have an adverse effect on fuel burning appliances (or simply open a couple of screened windows). It is important to prevent creating negative pressure around fuel burning appliances that may be in the house and starving them for combustion air as the fire can actually leave the firebox looking for oxygen. Not good. A good whole house fan can reduce the interior temperature of a house by 10 to 15 degrees within about 20 minutes as well as create a “sensible” feeling that the moving air is cooler. The exhaust intake is usually located in the highly heated attic air space and many homes use a gravity damper system in the ceiling that opens automatically as the systems operates and then seals closed upon shut down.

Zero Water Urinal— This is a wall mounted urinal that virtually uses no running water, with the exception of an occasion servicing to clean the unit. The units rely on simple physics, urine has a specific gravity that is greater than a special sealing liquid. Several inches of the liquid are used to create a trap seal allowing the urine to flow into the system. The super slick surfaces do not allow material to remain behind and thus reduces odor and maintenance. The obvious advantage is a significant reduction in water usage over long periods of time. A disadvantage to steel plumbing is a build up of salts on the pipe interiors increasing corrosion. Careful maintenance schedules must be followed to keep systems working properly.