



An analysis of the new California Green Building Code and the adoption process for local jurisdictions

Prepared by:
Michael Whitaker
City of Santa Rosa Chief Building Official
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The code adoption cycle with the new California Green Building Code (CALGreen)

California is presently in the process of updating the California Codes. The new code is scheduled for publication in early July of 2010. Local jurisdictions such as the City of Santa Rosa will be drafting ordinances to include local amendments to the California Codes for adoption into our Santa Rosa City Code. The new codes become effective on January 1, 2011. There is a new section within the California Building Code that now includes green building regulations. This is referred to as CALGreen.

The CALGreen code includes mandatory requirements that all occupancies will be required to comply with throughout the State and includes a list of voluntary measures as appendices to the code that can be included through a local amendment process. In lieu of including voluntary measures as mandatory, the local agency may adopt through an amendment to the CALGreen code a point system certification by a 3rd party program such as Build It Green for residential and LEED for nonresidential that the City of Santa Rosa presently has in effect. There have been some comparisons of Build IT Green and LEED to CALGreen. The level of required compliance is often slightly different so a direct comparison is difficult.

A City or County may adopt the new code through a single ordinance that includes all green building options or they may adopt the new California Building Code in one ordinance and have a second ordinance that established an updated/upgraded green building program with a certification point system. Regardless of which process is used, the local jurisdiction will be obligated to show findings that increase minimum code requirements above the State standards that are based upon climate, geological, or topographical justification.

Summary of CALGreen:

Note: The draft version of CALGreen is available for review on the California Building Standards Commission website at: <http://www.documents.dgs.ca.gov/bsc/documents/2010/Draft-2010-CALGreenCode.pdf>

The following is an attempt to summarize the 197 page draft CALGreen code into 15 pages of text.

Highlights of CALGreen:

- A 20 percent reduction in indoor water use.
- Separate water meters for indoor and outdoor water use in nonresidential buildings.
- Installation of moisture-sensing irrigation systems for larger landscape projects.
- Diversion of at least 50 percent of construction waste from landfills.
- Inspections of furnaces, air conditioners and mechanical equipment in some nonresidential buildings to ensure they are at maximum efficiency.
- Use of low-pollutant paints, carpet, vinyl flooring and other materials.

Administration and General Requirements: Chapter 1 & 3 (Chapter 2 is definitions)

Purpose: To improve public health, safety and general welfare by enhancing design & construction in the following categories:

- Planning & design
- Energy efficiency
- Water efficiency and conservation
- Material conservation and resource efficiency
- Environmental quality

Scope: CALGreen shall apply to the planning, design, operation, construction, use and occupancy of every newly constructed building or structure, unless exempted. The Matrix Adoption Tables specified in Sections 103 – 106 are used to determine which agency has adopted what sections and the enforcing agency relative to each type of occupancy/structure. For instance, schools are under the adopting agency of the State Architect (DSA) who is also the enforcing agency. BSC refers to projects regulated by local jurisdictions by the Building Standards Commission Code.

Appendices: Provisions in the appendices are not mandatory unless specifically adopted by a State or local agency. This adoption shall be in compliance with Health and Safety Code 18930 and 18941.5 respectively.

Local agency amendments:

- CALGreen is intended to set mandatory minimum green building standards and include optional tiers that may, at the discretion of the local jurisdiction be applied. Local modifications shall make express findings based upon climatic, topographical, or geological conditions. Findings are to be filed with the California Building Standards Commission (CBSC).
- Local jurisdictions shall obtain California Energy Commission (CEC) approval for any energy related ordinances consistent with Public Resources Code. Local amendments may be made based upon CEC determinations that standards will require buildings to be designed to consume no more energy than permitted by Part 6 of Title 24.

Building officials can use the alternate materials and methods for approval of construction not specifically prescribed by CALGreen, just like in other portions of the California Codes.

The effective date for enforcing provisions of CALGreen is the application date of the building permit.

Effective use of CALGreen:

1. Establish type of occupancy
2. Verify which state agency has authority (see Sections 103-106)
3. Find the chapter which covers the established occupancy
4. Use Matrix Adoption Tables at the beginning of Chapters 4 & 5 to identify mandatory measures required
5. Determine voluntary compliance, Chapters A4 & A5, per local amendment
6. Use Application Checklist(s) at the end of each of the voluntary measures chapters, A4 & A5, for ease of verification

Construction documents shall be submitted in one or more sets with each application for a permit. Documentation of conformance shall be provided for verification of conformance to the enforcing agency.

Scope: Buildings shall be designed to include mandatory measures of CALGreen in the application checklists contained in the code. Voluntary measures are only required if specifically adopted as amendments to CALGreen.

In mixed occupancy buildings, each portion of a building shall comply with the specific green building measures applicable to each specific occupancy.

Phased projects: For shell buildings only those code measures relevant to the building components and systems considered new construction shall be required. The provisions of CALGreen shall apply only to the initial tenant or occupant improvements to a project.

The provisions of Appendices A4 & A5 outline means of achieving enhanced levels by incorporated additional measures. Buildings complying with tiers specified for each occupancy contain additional prerequisite and elective green building measures necessary to meet the threshold of each tier. The enforcing agency may grant modification for individual cases if the intent and purpose of the measure is met.

Residential Mandatory Measures: Chapter 4

Planning and Design:

- Provide storm water drainage and retention during construction.
- Plan site to keep surface water from entering building via swales, water collection and disposal systems, french drains, water retention gardens, or other measures.

Energy Efficiency:

- Per California Energy Commission (CEC) Energy Efficiency Standards.

Water Efficiency:

- Requires a 20% reduction in indoor water use (effective July 1, 2011) This is verified through water use baseline tables, fixture flow rates, and standards for plumbing fixtures and fittings.
- Automatic irrigation system controllers utilizing weather or soil moisture based controllers and weather based controllers.

Material Conservation and Resource Efficiency:

- Joints and openings of building envelope sealed in compliance with Calif. Energy Code.
- Construction waste recycling of at least 50%. Requires documentation.
- Construction waste management plan that identifies materials diverted from disposal by recycling or salvage, materials sorted on site, diversion facility, construction methods employed to reduce waste, specifies amount of materials diverted by weight or volume. Requires documentation.

Building Maintenance and Operation

- Requires operation and maintenance manual with the following information: Direction that manual is to remain with the building.
- Manual shall include
 - Operation and maintenance instructions for appliances-roof and yard drainage-space conditioning systems-landscape irrigation systems-water reuse systems.
 - Local utility, water and waste recovery providers on resource and recycling programs
 - Public transportation and/or carpool options available in the area.
 - Educational materials of positive impacts of humidity between 30-60% and occupant methods to maintain within that range.
 - Instruction about water conserving landscape and irrigation design and controllers.
 - Instructions for maintaining gutters/downspouts and importance of diverting water at least 5 ft away from foundation.
 - Information on routine maintenance including: caulking, painting, grading around building, etc.
 - Information on State solar energy and incentive programs available.
 - A copy of all required special inspection reports.

Environment Quality:

- Gas fireplaces required to be direct vent seal combustion type. Woodstoves or pellet stove comply with US EPA Phase II emission limits or local ordinances.
- Cover duct openings and protect mechanical equipment during construction.
- Finish and material pollutant control for low VOC or formaldehyde: paints, coatings, carpets, carpet cushions, carpet adhesives resilient floor systems, composite wood products. All required to be verified with documentation to established standards/limits.

Interior Moisture Control:

- Vapor retarder required for concrete slabs including a capillary break.
- Control of moisture content of building materials: Wall and floor framing shall not be enclosed when framing members exceed 19% moisture content. Verification required.

Indoor air quality:

- Bathroom exhaust fans that are Energy Star compliant and either whole house or humidistat controlled.

Environmental comfort:

- Whole house exhaust fans shall have insulated louvers or covers which close when the fan is off and have minimum insulation value of R-4.2.
- Heating and air condition system design with: Heat/loss calcs per ACCA Manual J, Duct systems sized per ACCA 29-D Manual D, and select heating and cooling equipment according to ACCA 36-S Manual S. Or have any of the above designed with other equivalent design software or methods.

Nonresidential Mandatory Measures: Chapter 5

Planning and Design:

- For newly constructed projects less than one acre, develop a SWPPP specific to site to conform to NPDES permit or local ordinance.
- Provide bicycle parking up to 5% of available vehicle parking spaces.
- Provide designated parking for fuel efficient and carpool vehicles with special striping required at spaces. Starts a 1 per 10-25 total spaces and goes up.
- Design interior and exterior lighting such that zero direct illumination leaves the site.
- Site planned to keep surface water from entering building.

Energy Efficiency:

- Per CEC Energy Efficiency Standards.

Water Efficiency:

- For buildings over 50,000 sq. ft., provide separate water meters depending upon occupancy and excess consumption.
- 20% reduction in indoor water use (effective July 1, 2011) This is verified through water use baseline tables, fixture flow rates, and standards for plumbing fixtures and fittings.
- Reduce wastewater by 20% via water conserving fixtures or utilizing non-potable systems such as greywater, rainwater, recycles, etc.
- Develop water budget for landscape that conforms to local ordinance or to the CAL Dept of Water Resources Model Water Efficient Landscape ordinance.
- Automatic irrigation system controllers utilizing weather or soil moisture based controllers and weather based controllers.

Material Conservation and Resource Efficiency:

- Joints and openings of building envelope sealed in compliance with Calif. Energy Code.
- Construction waste recycling of at least 50%. Requires documentation.
- Construction waste management plan that identifies materials diverted from disposal by recycling or salvage, materials sorted on site, diversion facility, construction methods employed to reduce waste, specifies amount of materials diverted by weight or volume. Requires documentation.

Building Maintenance and Operation

- Recycling: Provide readily accessible areas for depositing, storage, and collection of non-hazardous material recycling.
- Commissioning required for new buildings of 10,000 sq. ft. or larger. By definition: Commissioning is a systematic quality assurance process that spans the entire design and construction process, including verifying and documenting that building systems and components are planned, designed, installed, tested, operated, and maintained to meet the owner's project requirements.
 - This is required before the permit is issued.
 - The specifications are too lengthy to summarize. See page 42-44 of the draft 2010 Cal Green Bldg Standards Code.

Environment Quality:

- Gas fireplaces required to be direct vent seal combustion type. Woodstoves or pellet stove comply with US EPA Phase II emission limits or local ordinances.
- Cover duct openings and protect mechanical equipment during construction.
- Finish and material pollutant control for low VOC or formaldehyde: paints, coatings, carpets, carpet cushions, carpet adhesives resilient floor systems, composite wood products. All required to be verified with documentation to established standards/limits.
- Where outdoor areas are provided for smoking, prohibit smoking within 25 ft of building entries, outdoor air intakes and operable windows or as per local ordinance.

Interior Moisture Control:

- For indoor moisture control, buildings shall meet or exceed the CBC Sections 1203 (ventilation) and Chapter 14(exterior walls).

Indoor air quality:

- Outside air delivery shall meet or exceed minimum ventilation requirements of Cal Energy Code.
- For buildings equipped with demand control ventilation, CO2 (carbon dioxide) sensors required.

Environmental comfort:

- Acoustical control with STC per ASTM E90 and ASTM E413
 - Exterior noise: Wall and roof of building envelope of STC 50 within 1,000 ft of freeways, 5 miles of airports or where sound levels at property line regularly exceed 65 decibels.
 - Interior walls and floor assemblies separating tenant spaces and t.i.'s to public places of STC 40. Outdoor air quality: Installations of HVAC, refrigeration and fire suppression equipment may not have CFC's or Halons.

Residential Voluntary Measures, Tier I & Tier II: Appendix Chapter A4:

The CALGreen code includes appendices that are not required to be adopted but may be adopted by amendment. These are optional additional measures deemed as voluntary that can be made mandatory via the amendment process to the code adoption ordinance. The voluntary measures are also within the same categories as the mandatory measures. The number of voluntary measures is extensive.

There is a 15 page Residential Voluntary Checklist provided at the end of this chapter.

Tier I or ***Tier II*** compliance:

The voluntary measures are listed individually and as a package that is grouped into a ***Tier I*** or ***Tier II*** level of compliance. All of the Mandatory Measures must be complied with in addition to the voluntary measures noted below.

Each of the 5 sections has specific requirements for ***Tier I*** or ***Tier II*** compliance. There are also electives required to meet each Tier level that must come from each section. These are noted in parenthesis adjacent to each section.

Planning and Design: Division A4.1

(***Tier I*** requires 2 electives from this section)

(***Tier II*** requires 4 electives from this section)

Site Selection: Intent is to avoid Greenfield sites (not previously developed)

- A site which complies with a least one of the following: Infill site, Greyfield site (previously developed with min. 50% impervious material), or EPA recognized Brownfield site (potential presence of hazardous/polluted/contaminated materials).

Site Preservation:

- Individuals with oversight authority with training in environmentally friend development to provide training to all parties associated with a project. A written guideline & instruction shall be provided to all.

Deconstruction and Reuse of Existing Materials:

- Existing buildings on site are deconstructed and salvaged for use. A list is provided.

Site Development:

- Orient buildings to optimize use of solar.
- Soils are analyzed by licensed professional and protected by natural drainage patterns and erosion control during construction and after occupancy. Site access minimizes cut/fill for roads/driveways. Underground trenches maximize trench content and minimize disturbed soil.

Topsoil protection: Topsoil protected or saved for reuse. This is the first delineation for specific requirements of Tier I and Tier II packages:

- ***Tier I:*** Displaced topsoil shall be stockpiled for reuse in designated area and covered or protected.

- **Tier II:** The construction area shall be identified and delineated by fencing/flagging to limit construction activity. Heavy equipment or vehicle traffic limited to areas planned to be paved.

Landscape Design: Post construction landscape shall accomplish one or more of the following:

- Areas disrupted during construction are restored consistent with native vegetation.
- Limit turf areas:
 - **Tier I:** Not more than 50% of total landscaped area.
 - **Tier II:** Not more than 25% of total landscaped area.
- Utilize at least 75% native California or drought tolerant species appropriate for climate zone
- Incorporate hydrozoning irrigation techniques.

Water permeable surfaces:

- Permeable paving is utilized for parking, walking or patio surfaces.
 - **Tier I:** Not less than 20% of the total surfaces shall be permeable.
 - **Tier II:** Not less than 30% of the total surfaces shall be permeable.

Cool roofs: There are 3 categories for cool roof specification for designation of Tier I or Tier II. These include solar reflectance and thermal emittance, or solar reflectance index alternative.

- Table A4 106.5(1) for **Tier I**
- Table A4 106.5(2) for **Tier II**

Energy Efficiency: Division A4.2

(**Tier I** requires 4 electives from this section)

(**Tier II** requires 6 electives from this section)

Performance approach: Using an Alternative Calculation Method

- **Tier I:** Exceed California Energy Code based on 2008 standards by 15%.
- **Tier II:** Exceed California Energy Code based on 2008 standards by 30%.

Building Envelope:

- Radiant barrier: Required in Climate Zone 2.
- Window shading: At least 18" in depth on south and west windows by either exterior moveable awnings/louvers, porch or patio covers, or overhangs.

Air Sealing Package:

- Infiltration is reduced and verified by 3rd party testing to requirements in California Energy Code.

HVAC design, equipment and installation:

- Radiant, hydronic, ground source and other innovative space heating and cooling systems are included.
- Commissioning plan developed to document specified building components meet project design and performance. This shall verify heating, ventilating, and cooling systems are inspected and certified by an independent 3rd party. Checklist of commissioning shall be included in Operation and Maintenance Manual.
- Gas fired equipment with minimum annual fuel utilization ratio (AFUE) of .90 or higher.
- Heat pumps with minimum heating seasonal performance factor (HSPF) of 8.0 or higher.
- Cooling equipment with seasonal energy efficiency ratio (SEER) higher than 13 and an energy efficiency ratio (EER) of at least 11.5.
- Install ductwork either within conditional envelope, in underfloor crawl space, with R-6 insulation or higher, or buried within ceiling insulation.
- Perform duct leakage to verify rate of less than 6% of the total fan flow.
- In climate zone 2 install whole house fan with insulated louvers or insulated cover.
- Energy Star ceiling fans are installed in all bedrooms and living areas.

Water heating design, equipment and installation:

- Tank type water heater efficiency with energy factor (EF) higher than .60.
- Tankless water heater energy factor (EF) .8 or higher.
- Distribution systems: Where water heater source is more than 10' from a fixture the distribution system shall be one of the following:
 - Central manifold system with parallel piping configuration (home-run system) with smaller diameter piping allowed by Cal Plumbing Code.
 - Demand controlled circulation pump.
 - Gravity based recirculation system.
 - Other system approved by enforcing agency.

Lighting:

- Building lighting consists of at least 90% ENERGY STAR qualified hard-wired fixtures.

Appliances:

- Each appliance provided by the builder meets Energy Star designation if applicable for that appliance.

Renewable Energy:

- Install solar photovoltaic (PV) system in compliance with the California Energy Commission New Solar Homes Partnership (NSHP). Install energy efficiency measures meeting either:
 - **Tier I:** Exceed California Energy Code requirements based upon 2008 Energy Efficiency Standards by 15%.
 - **Tier II:** Exceed California Energy Code requirements based upon 2008 Energy Efficiency Standards by 30%.
- Install solar water heating system per Solar Rating and Certification Corporation (SRCC)
- Provide minimum 300 sq. ft. of unobstructed roof area facing within the 30 degrees of south for future solar collector or photovoltaic panels.
- Provide minimum 1" electrical conduit from electrical service equipment to accessible location in attic or other approved location for future solar system.

Water Efficiency and Conservation: Division A4.3

(Tier I requires 1 elective from this section)

(Tier II requires 2 electives from this section)

Indoor water use:

- Kitchen sinks and dishwashers:
 - **Tier I:** Maximum flow rate at kitchen sink shall not be greater than 1.5 gpm at 60 psi.
 - **Tier II:** Maximum flow rate at kitchen sink shall not be greater than 1.5 gpm at 60 psi and dishwashers shall be Energy Star qualified and not use more than 5.8 gallons of water per cycle.
- Non-water supplied urinals and waterless toilets (composting toilets) are installed.

Outdoor water use:

- Low water consumption irrigation system installed that minimizes spray type heads for turf areas only.
- Rainwater capture, storage and re-use system is designed and installed to use rainwater generated by at least 65% of the available roof area.
- When landscaping is provided by builder, a water budget shall be developed that conforms to local water efficient landscape ordinance or the California Department of Water Resources Model Water Efficient Landscape Ordinance where no local ordinance exists.

- When landscaping is provided by builder, a water efficient irrigation system shall be installed that reduces potable water use. The potable water use reduction shall be calculated beyond the initial requirements for plant installation and establishment using greywater or recycled water.
 - **Tier I:** Reduce use of potable water to a quantity that does not exceed 65% of ETo times the landscape area.
 - **Tier II:** Reduce use of potable water to a quantity that does not exceed 60% of ETo times the landscape area.
 - Calculation demonstrating compliance shall be provided.

Water reuse systems

- Greywater alternative plumbing piping is installed to permit discharge of clothes washer or other fixtures to be used for an irrigation system in compliance with Chapter 16A of the California Plumbing Code.
- Recycled water piping, based upon projected availability, dual water piping is installed for future use of recycled water.
- Recycled water is used for landscape irrigation.

Material Conservation and Resource Efficiency: Division A4.4

(**Tier I** requires 2 electives from this section)

(**Tier II** requires 4 electives from this section)

Foundation systems:

- Reduction in cement use: As allowed by the enforcing agency, cement used in foundation mix design shall be reduced as follows:
 - **Tier I:** Not less than 20% reduction in cement use.
 - **Tier II:** Not less than 25% reduction in cement use.

Efficient framing techniques:

- Beams and headers and trimmers are sized and installed as specified in CRC Table R502.5(1) and 502.5(2).
- Building dimensions and layouts are designed to minimize waste by one or more of the following:
 - Dimension in 2 foot increments are used.
 - Windows and doors are located are regular 16" or 24" stud positions.
 - Other methods acceptable by enforcing agency.
- Building systems use pre-manufactured systems to eliminate solid sawn lumber whenever possible by use of composite floor joists/roof rafters or manufactured floor/roof truss systems, panelized wall framing (SIPS or similar), or other methods approved by local agency.
- Material lists are included in the plans which specify the material quantity and provide direction for on-site material cuts of floor, wall, ceiling and roof framing members.

Material Sources:

- Utilize prefinished building materials for exterior trim, windows, or siding.
- Utilize concrete floors that do not require additional coverings.
- Use materials with post consumer or pre-consumer recycled content value (RCV)
 - **Tier I:** Not less than 10% recycled content value.
 - **Tier II:** Not less than 15% recycled content value.
- Use materials from renewable sources (products harvested within a 10 yr cycle).

Water Resistance and Moisture Management:

- Install foundation and landscape drains which discharge to a dry well, sump, bioswale or other approved on-site location.

- Install gutter and downspouts systems to route water at least 5' away from the foundation or connect to landscape drains with discharge to a dry well, sump, bioswale, rainwater capture system or other approved location.
- Provide flashing details on the building plans which comply with accepted industry standards or manufacturers instructions. Details shall be on the plans
- Protect building materials delivered to the construction site from rain and other sources of moisture.
- Provide cover area to protect exterior doors for 4 ft. with awnings, overhangs, or recess doors.
- Provide a permanent overhang or awning at least 2' in depth at all exterior walls.

Construction Waste Disposal Reduction, Disposal and Recycling

- Non-hazardous construction and demolition debris generated at the site is diverted to recycle or salvage. Documentation to demonstrate compliance shall be provided. (There are exceptions if no recycling facilities exist locally or the site is remote).
 - **Tier I:** At least 65% reduction.
 - **Tier II:** At least 75% reduction.

Environment Quality: Division A4.5

(Tier I requires 1 elective from this section)

(Tier II requires 1 elective from this section)

Pollutant Control:

- Documentation for early compliance with formaldehyde limits.
- Resilient flooring installed with low VOC:
 - **Tier I:** At least 80% of the total area of resilient flooring installed shall comply.
 - **Tier II:** At least 90% of the total area of resilient flooring installed shall comply.
- Thermal insulation installed shall meet the following requirements:
 - **Tier I:** Insulation to comply with low VOC standards.
 - **Tier II:** Insulation to comply with low VOC standards and have no added formaldehyde.

Indoor Air Quality and Exhaust

- Filters with a higher value than MERV 6 are installed on central air or ventilation systems.
- Direct-vent appliances and cooling equipment is utilized if the equipment will be located in the conditional space or install space heating and water heating equipment in an isolated mechanical room.

Nonresidential Voluntary Measures, Tier I & Tier II: Appendix Chapter A4:

(Note: This summary does not include requirements for OSHPD or DSA regulated buildings)

This section is similar to but not the same as the residential voluntary measures. The voluntary sections of CALGreen code are appendices that are not required to be adopted but may be adopted by amendment. These are optional additional measures deemed as voluntary that can be made mandatory via the amendment process to the code adoption ordinance. The nonresidential voluntary measures are also within the same categories as the mandatory measures. The number of voluntary nonresidential measures is also extensive.

Similar to the residential voluntary measures there is a checklist at the end of the Appendix A5 chapter that has a checklist for nonresidential projects that are covered by the Building Standards Commission (BSC) requirements. There is a 24 page Application Checklist for BSC that can be used for verification of compliance at plan check and/or building inspection.

Tier I or Tier II compliance:

The voluntary measures are listed individually and as a package that is grouped into a **Tier I** or **Tier II** level of compliance. All of the Mandatory Measures must be complied with in addition to the voluntary measures noted below.

Each of the 5 sections has specific requirements for **Tier I** or **Tier II** compliance. There are also electives required to meet each Tier level that must come from each section. These are noted in parenthesis adjacent to each section.

Planning and Design: Division A5.1

(**Tier I** requires 1 elective from this section)

(**Tier II** requires 3 electives from this section)

Site Selection: Intent is to avoid Greenfield sites (not previously developed)

- Community connectivity. Where feasible, locate project with ½ mile radius of at least 10 basic services, accessible to pedestrians. This includes a bank, place of worship, convenience grocery, day car, cleaners, fire station, barber shop, beauty shop, hardware store, laundry, library, medical clinic, dental clinic, senior care facility, park, pharmacy, post office, restaurant, school, supermarket, theater, community center, fitness center, museum, or farmers market or other services on case-by-case basis.
- If feasible, select for development a brownfield or greyfield or infill site as defined in section A5.102.

Site Preservation:

- Reduce development footprint and optimize open space.
 - Exceed the local zoning's open space requirement for vegetated open space by 25%.
 - Provide vegetated open space equal to building footprint if no zoning requirement in place or provide vegetated open space equal to 20% of total project site area.

Deconstruction and Reuse of Existing Materials:

- If feasible, disassemble existing buildings instead of demolishing to allow reuse or recycling of building materials.
 - Maintain min. 75% of existing structure and envelope based on surface area. (excepting windows & hazardous mtl).
 - Reuse existing interior non-structural elements in at least 50% of the area of the completed building.
 - Salvage additional items.

Site Development:

- Design storm water runoff:
 - With no net increase in rate & quantity from existing to developed site.
 - Use post construction best management practices (BMPs) to mitigate runoff quality.
- Low impact development (LID). Employ minimum of 2 of the listed methods to allow rainwater to soak into ground, evaporate, or use for irrigation or other use.
- Bicycle parking & changing rooms: Meet local ordinance requirements or U of Cal Policy on Sustainable Practices or the following, whichever is stricter:
 - If visitor traffic is anticipated, provide short term permanently anchored bicycle parking racks within 200 ft. of visitor entrance = 5% of visitor vehicle parking capacity (min 1 rack for 2 bikes).
 - For buildings with over 10 tenant-occupants, provide secure bicycle parking for 5% of vehicle parking capacity (min one space). For public schools/community colleges = 15%.
 - For buildings with over 10 tenant-occupants provide changing/shower facilities for tenant-occupants only per Table A5.106.4.3.

- Provide designated parking for any combination of low-emitting, fuel-efficient, and carpool/van pool vehicles per Table A5.106.5.1.1 (approx 2+ per 25 parking spaces).
 - Paint “CLEAN AIR VEHICLE” for designated stall marking.
- Provide electric vehicle charging facilities per section 406.7.
 - For each space provide one 120V 20 amp and one 208-240V 40 amp outlets or panel.
- Design parking to meet but not exceed minimum local zoning requirements.
 - Use street or compact spaces for parking.
 - Encourage occupants to use carpool, ride share, or alternate transportation.
- Exterior wall shading. Meet CEC and select one of the following for wall shading:
 - Provide vegetative or man-made shading devices for east-west-south facing walls.
 - Use wall surfacing with minimum SRI 25 (aged) for 75% of opaque wall areas.
- Locate and orient building with long sides facing north and south.
- Reduce non-roof heated islands and roof heat islands by:
 - Hardscape alternatives: Provide shade or use light colored materials or use open-grid pavement system.
 - Cool roofs: There are 3 categories for cool roof specification for designation of Tier I or Tier II. These include solar reflectance and thermal emittance, or solar reflectance index alternative.
 - Table A5.106.11.2.1 for ***Tier I***.
 - Table A5.106.11.2.2 for ***Tier II***.

Cool roofs: There are 3 categories for cool roof specification for designation of Tier I or Tier II. These include solar reflectance and thermal emittance, or solar reflectance index alternative.

- Table A4 106.5(1) for ***Tier I***.
- Table A4 106.5(2) for ***Tier II***.

Energy Efficiency: Division A5.2

Performance approach: Using an Alternative Calculation Method

- ***Tier I***: Exceed California Energy Code based on 2008 standards by 15%.
- ***Tier II***: Exceed California Energy Code based on 2008 standards by 30%.

Prescriptive approach:

- All equipment and appliances required to be ENERGY STAR labeled if ENERGY STAR is applicable to that equipment.
- Energy monitoring to be provided by sub-metering or equivalent combinations of sensor measurements and thermodynamic calculations with data storage and data access available.
- HVAC systems with Direct Digital Control systems and centralized lighting systems shall include pre-programmed with automated demand response strategies.
- Locate and orient building with long sides facing north and south.

Renewable Energy:

- Use on-site renewable energy sources such as solar, wind, geothermal, low-impact hydro, biomass and bio-gas for at least 1% of the electric power calculated as the product of the building service voltage and the amperage specified by the service overcurrent protection rating. Documentation is verified as a percentage of estimated local utility rates for conventional fuel types.
- Using a calculation method approved by CEC calculate the renewable on-site energy system to meet the requirements of Section 511.1, expressed in KW/ Factor in net-metering on an annual basis.
- Install conduit from the building roof or eave to a location within the building identified as suitable for future installation of a regulator and inverter.

Energy Efficient Steel Framing:

- Design steel framing for maximum energy efficiency. 4 techniques are listed.

Water Efficiency and Conservation: Division A5.3

(**Tier I** requires 1 elective from this section)

(**Tier II** requires 3 electives from this section)

Indoor water use:

- For new water service not subject to Water Code Section 535, separate meters or submeters shall be installed for indoor and outdoor potable water use for landscaped area between 500 sq. ft. and 1,000 sq. ft.
- A schedule of plumbing fixtures and fixture fittings to reduce overall use of potable water within the building shall be provided. Reduction in water use shall be demonstrated by the 30% reduced flow rate specified in Table A5.303.2.2 or by calculation to water use baseline as established in Table A5.303.2.1.
 - **Tier I:** 30% savings.
 - **Tier II:** 35% Savings.
 - A schedule of plumbing fixtures and fixture fittings to reduce overall use of potable water by 40% within the building shall be provided (3rd option).
- Appliances: The following appliances shall have the following specification for water use.
 - Clothes washer maximum Water Factor that will reduce water use by 10% below CEC WF standards for commercial clothes washers.
 - Dishwashers: Residential 5.8 gals per cycle. Commercial per table A5.303.3
 - Ice makers shall be air cooled.
 - Food steamers shall be connection-less or boiler-less.
 - Limitation on use of water softeners by local agencies.
- New buildings and facilities shall be dual plumbed for potable and recycled water systems for toilet flushing when recycled water is available.

Outdoor water use:

- Provide water efficient irrigation system shall be installed that reduces potable water use. The potable water use reduction shall be calculated beyond the initial requirements for plant installation and establishment in accordance with Tier 1 or Tier II below.
 - **Tier I:** Reduce use of potable water to a quantity that does not exceed 60% of ETo times the landscape area.
 - **Tier II:** Reduce use of potable water to a quantity that does not exceed 55% of ETo times the landscape area.
 - Calculation demonstrating compliance shall be provided.
- Provide water efficient landscape irrigation design that eliminates the use of potable water beyond the initial requirements for plant installation and establishment. There is a list of 6 different methods that include plant coefficient, irrigation efficiency and distribution uniformity, use of captured rainwater, use of recycled water, use of graywater, etc.
- Restore all landscape areas disturbed during construction by planting with local adaptive and/or non-invasive vegetation.
- On previously developed or graded sites, restore or protect at least 50% of the site area with adaptive and/or non-invasive vegetation.
- Install a graywater collection system for onsite subsurface irrigation per Appendix G, 2007 California Plumbing Code.

Material Conservation and Resource Efficiency: Division A5.4

(**Tier I** requires 1 elective from this section)

(**Tier II** requires 3 electives from this section)

Foundation systems: (noted as “reserved” in draft)

Efficient framing techniques: Employ advanced wood framing techniques, or Optimal Value Engineering (OVE), as permitted by the enforcing agency. Advanced framing techniques include the following:

- Building design using 2 ft modules.
- Space wall studs up to 24" o.c.
- Space floor and roof framing members up to 24" o.c.
- Use 2 stud corners.
- Eliminate solid headers in non-load-bearing walls.
- Use in-line framing, aligning floor, wall and roof framing members vertically.
- Use single lumber headers and top plates where appropriate.

Material Sources:

- Select building materials or products for installation that have been harvested or manufactured in California within 500 miles of project site.
- Select bio-based building materials and products with at least 50% bio-based content.
 - Use materials made from plants harvested within a 10 year cycle for at least 2.5% of total materials value, based upon estimated costs.
- Use salvaged, refurbished, refinished, or reused materials for a minimum of 5% of the total value based upon estimated costs. Documentation required.
- Use materials with post consumer or pre-consumer recycled content value (RCV). Content to be determined by weight X total estimated cost of the material assembly.
 - **Tier I:** Not less than 10% recycled content value.
 - **Tier II:** Not less than 15% recycled content value.
- Use cement and concrete made with recycled products (exceptions made for high strength concrete)
 - Which comply with identified ASTM standards.
 - Use concrete manufactured with one or more of the following: fly ash, metakaolin, pozzolan, slag cement, silica fume, or other materials with comparable benefits.
 - Additional measures that may be employed.
 - For cement: Use of alternative fuels or alternative power or use of alternative ingredients.
 - For concrete: Use renewable or alternative energy, use recycled concrete, use recycled water.

Enhanced Durability and Reduced Maintenance: Select materials for longevity and minimal deterioration under conditions of use based upon reduced maintenance and recyclability.

Water Resistance and Moisture Management:

- Provide weather-resistant exterior wall and foundation envelope as required by CBC Sec 1403.2 and CEC Section 150.
- Moisture control Design and maintain landscape to prevent spray on structures. Design exterior entries and openings to prevent water intrusion.

Construction Waste Disposal Reduction, Disposal and Recycling

- Non-hazardous construction and demolition debris generated at the site is diverted to recycle or salvage. Documentation to demonstrate compliance shall be provided. (There are exceptions if no recycling facilities exist locally or the site is remote).
 - **Tier I:** At least 65% reduction.
 - **Tier II:** At least 80% reduction.

Life Cycle Assessment:

- Select materials assemblies based on life cycle assessment of their embodied energy and/or green house gas emission potentials.) There are web sites lists for calculating life cycle costs and more information.).

Building Maintenance and Operation: Commissioning appears to be required only for DSA regulated new structures over 10,000 sq. ft.

Environment Quality: Division A5.5

(*Tier I* requires 1 elective from this section).

(*Tier II* requires 3 elective from this section).

Pollutant Control:

- Indoor air quality (IAQ) maintained during construction:
- Provide temporary ventilation during construction per CEC Section 121 and by:
 - Openings in the building shell with fans at minimum 3 air changes per hour.
 - During dust-producing operations project HVAC opening.
 - Use HVAC system during construction only if necessary to condition with temperature range for material and equipment installation. Replace all filters prior to occupancy.
 - If building is occupied during demolition or construction, meet or exceed Control Measures of Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 1995 Ch 3.
- Additional IAQ measures:
 - Temporary generators to meet or exceed SMACNA IAQ guidelines (see above).
 - Remove and replace any materials with evidence of mold, mildew, or moisture infiltration.
 - Store odorous and high VOC-emitting materials off-site.
 - When possible, install odorous and high VOC-emitting materials prior to those that are porous or fibrous.
 - Clean oil and dust from ducts prior to use.
- IAQ Post-construction: After all interior finishes have been installed; flush out the building by supplying continuous ventilation with all air handling units at their maximum outdoor air rate and all supply fans at their maximum position rate for at least 14 days.
- IAQ testing. If building flush out is not feasible, testing alternative may be utilized using testing protocols recognized by the US EPA. Maximum levels of contaminants are listed with test protocols identified.
- Where complying composite wood product is readily available for non-residential occupancies, meet requirements before the compliance dates indicated in Table A5.504.8.5 (Tier I), or use composite wood products made with either CARB-approved no-added formaldehyde (NAF) resins or CARB-approved ultra-low emitting formaldehyde (ULEF) resins (Tier II).
- Resilient flooring installed with low VOC: Documentation is required.
 - **Tier I:** At least 80% of the total area of resilient flooring installed shall comply.
 - **Tier II:** At least 90% of the total area of resilient flooring installed shall comply.
- Thermal insulation installed shall meet the following requirements: Documentation is required.
 - **Tier I:** Insulation to comply with low VOC standards.
 - **Tier II:** Insulation to comply with low VOC standards and have no added formaldehyde.
- Acoustical ceilings and wall panels shall comply with CBC Ch 8 and with VOC-emission limits. Documentation is required.

- Hazardous particulates and chemical pollutants: Minimize and control pollutant entry into buildings and cross-contamination of regularly occupied areas.
 - Install permanent entryway systems (min. 6 ft. in direction of travel) to capture dirt and particulates at entryways.
 - In rooms where hazardous fumes or chemicals are produced, exhaust them and isolate them from adjacent rooms.

Comparison CALGreen to Build It Green and LEED point rated certification programs:

CALGreen includes regulations for all types of buildings regulated by the State building code. This includes schools, hospitals, medical clinics, industrial/office/retail nonresidential buildings, manufactured homes, residential and multifamily structures, etc. Other green point programs are specific to delegated occupancies such as residential for Build It Green or LEED for nonresidential structures. The mandatory regulations in CALGreen will be required for all occupancies. Including voluntary measures through a local amendment will provide a single source of regulations for all buildings that will not require other certification programs to be instituted along with the CALGreen mandatory measures. Adopting CALGreen with amendments for increased green building regulation will provide a common set of regulations for all occupancies. Typically the State regulations increase in compliance requirements every 3 years. This can be expected of CALGreen. It is anticipated that many of the voluntary measures in the 2010 CALGreen will become mandatory in the 2013 California Building Code. Thus there will be a built-in ramp up of regulations over time that all jurisdictions in the State will be obligated to enforce.

Direct comparison of CALGreen to Build It Green for residential projects:

CALGreen for residential compliance has 5 categories that identify mandatory measures and voluntary measures that can be made mandatory via the amendment process. This includes planning and design, energy efficiency, water efficiency and conservation, material conservation and resource efficiency, and environmental quality. The mandatory measures are minimum requirements. Within the Tier I or Tier II voluntary programs there are specified “electives” in each category that must be included. With the voluntary program added as an amendment to CALGreen, this becomes very similar to the Build It Green (BIG) certification program.

The categories for BIG include community, energy, water, resources, and indoor air quality/health. Each category has minimum point totals but allows options for added points to meet a minimum threshold as designated for the opted green building program. Typical compliance for certification in the BIG program includes energy compliance 15% above minimum California Energy Commission (CEC) Efficiency Standards. Tier I voluntary includes the same 15% above minimum CEC standard

An initial analysis of the mandatory requirements in CALGreen to BIG by Build It Green staff identifies numerous similar code measures. Some are currently within building code practices. This includes storm drain management, moisture control for the building, exhaust/ventilation, and water conservation through local landscape and irrigation ordinances. The mandatory measures alone in the CALGreen match BIG rated criteria in many instances. However, the mandatory measures fall short of a 50 point certification for BIG primarily due in energy efficiency and some levels of indoor air quality specifications. The CALGreen mandatory elements would have an insufficient number of points to achieve a green point rating (50 points) under BIG standards. Including voluntary measures such as Tier I would provide an equivalent green point program to a certification level with BIG for residential projects. Going to Tier II voluntary measures would exceed a 50 point certification level in many instances especially if the energy efficiency standard of higher than CEC minimum standard of 30% is included.

Direct comparison of CALGreen to LEED for nonresidential projects:

As with residential projects, CALGreen for nonresidential compliance has 5 categories that identify mandatory measures and voluntary measures that can be made mandatory via the amendment process. This includes planning and design, energy efficiency, water efficiency and conservation, material conservation and resource efficiency, and environmental quality. The mandatory measures are minimum requirements. Within the Tier I or Tier II voluntary programs there are specified “electives” in each category that must be included.

The categories for LEED certification are also similar. These include sustainable sites, energy and atmosphere, water efficiency, materials and resources, and indoor environmental quality. It has been noted by KEMA staff that CALGreen items do not always fulfill LEED requirements; however, LEED credits almost

always fulfill CALGreen requirements. This would indicate a slightly higher requirement for LEED credit in most categories. The one major difference between CALGreen is in building commissioning. CALGreen only requires commissioning for buildings over 10,000 sq. ft. whereas LEED is more restrictive and commissioning is required to be completed by an independent 3rd party. There is also no direct nexus for energy efficiency standards by the California Energy Commission to LEED certification whereas there is a direct correlation of CALGreen to the CEC standards.

Compliance options and the impact on local jurisdiction staffing:

City of Santa Rosa existing green building program:

The City of Santa Rosa's present Green Building Program requires certification of new residential projects with the Build It Green (50 points) certification program and a 20 point checklist for new nonresidential projects (or large additions) to the LEED program. Since these programs went into effect both Build It Green and LEED have updated versions of their respective green building programs. The CEC Energy Efficiency Standards have also been recently updated. The Building Division successfully implemented a procedure for integrating the green building program into the building permit process. This includes an integration process wherein: (1) The point checklists are required to be on the plans; (2) a residential certified rater or a nonresidential accredited LEED professional is responsible for reviewing plans to verify approved plans to not have discrepancies with proposed points to meet required point levels; (3) residential raters are required to be City of Santa Rosa Approved Special Inspectors and nonresidential raters must be accredited LEED professionals, (4) all inspections for green building verification are scheduled directly with the approved special inspector or accredited LEED professional; (5) raters are required to verify green building certification compliance prior to occupancy with a formal certification provided prior to final signoff of the building permit. Certified BIG raters or accredited LEED professionals basically verify all compliance. The raters, however, have no control over the status of the building permit. There is no fee charged by the City for green building compliance.

The City also has a Landscape and Irrigation Ordinance that is redundant in regulations pertaining to water efficiency with the CALGreen and point rated certification programs. Our City program can be integrated with CALGreen easily.

Transition to a new green building program:

Including green building within the California Building Code has been suggested to be verified through the typical building inspection process by local building inspectors to verify compliance. This has been a target for comment by many organizations that feel verification of compliance of CALGreen will be complicated and less effective through the normal building inspection program established in the California Building Code. Present point rated certification programs may have a higher degree of compliance verification. In order for local departments to fully enforce the CALGreen code extensive training of building division staff will be required during a time of limited budget resources. The building codes, however, do include options for compliance verification by special inspectors if the level of expertise is greater than a typical building inspector is able to provide. CALGreen does have information pertaining to the use of special inspectors for compliance verification. Due to cost of verification by local jurisdiction staff many jurisdictions are considering imposing a fee to offset training and staff time. The City of Santa Rosa present program uses approved special inspectors for verification. To reduce costs to the City and to improve the level of compliance, it is recommended that the City continue to have special inspectors verify compliance with green building standards whether this is a point rated system or the basic mandatory plus additional voluntary measures identified in CALGreen. Criteria to qualify special inspectors for CALGreen compliance, however, would have to be established. Additional staffing for plan check or inspection purposes or increased fees for the green building verification is not recommended.

City Council direction to ramp up existing program:

The City of Santa Rosa City Council recommended our existing green building program be ramped up to an equivalent 100 points on the previous versions of Build It Green after the adoption of the 2008 CEC Standard and new version of BIG residential rating system. It is estimated by energy consultant Marc Richmond that the former CEC energy efficiency standards and BIG rating system initially required by the City of Santa Rosa would require approximately 65 points under the new CEC and new BIG rating system to be equivalent to 100 points under the previous standards. This is mainly due to the increase in energy efficiency required under the new 2008 CEC standards.

Council also expressed a recommendation that nonresidential projects be required to be certified to a minimum LEED level of 26 points on previous versions of LEED for nonresidential buildings. This was a minimum point level for certification. The latest version of LEED, 3.0, has a 40 point level for certification. Amy Rider is providing consultation on the impact of this increase. Her initial analysis is that CALGreen under the Tier II voluntary measures would be equivalent to 40 points under the most version of LEED for nonresidential buildings. Unfortunately, this involves a significantly higher standard for energy efficiency in Tier II voluntary of 30% higher than minimum standards. Further study is in progress by the USGBC Northern California Chapter that may shed more light on a direct comparison of CALGreen to LEED certification of nonresidential buildings.

Recommended direction by local building officials:

Local building officials who are represented by the Redwood Empire Association of Code Officials (REACO) are presently in discussion on recommending a common direction for green building regulations. The intent is to have a common set of green building regulations that do not differ from jurisdiction to jurisdiction. Presently each jurisdiction in Sonoma County has unique green building regulations. This makes the process for compliance tedious and complicated for the building owner, designer, and contractor that typically may work in numerous different jurisdictions. The recommendation that is under consideration at this time by REACO will be based upon CALGreen regulations with additional voluntary measures meant to satisfy green house gas reduction goals and yet improve construction activity. It will not be a recommendation to have green building regulations based upon nonprofit point rated certification programs. These programs are costly and as they are ramped up they become more costly to the home builder and the home buyer.