



COMMUNITY DEVELOPMENT DEPARTMENT

Council Meeting Date: May 24, 2011

Staff Report #: 11-080

Agenda Item #: F-1

REGULAR BUSINESS: Introduction of an Ordinance Adopting Local Amendments to the 2010 California Green Building Standards Code to Include Additional Sustainable Building Requirements

RECOMMENDATION

Staff recommends that the City Council introduce an ordinance adopting local amendments to the 2010 California Green Building Standards Code (Attachment A) to require:

- All residential and non-residential projects currently subject to the 2010 California Green Building Standards Code (Cal Green) to exceed the minimum energy efficiency standards established in the 2010 California Energy Code (Energy Code) by 15 percent;
- All residential and non-residential projects currently subject to Cal Green regulations to test heating and cooling ducts for leakage; and
- All residential projects currently subject to Cal Green regulations to install cool roofs.

BACKGROUND

The State has developed and adopted Part 11 of the Building Standards Code known as the 2010 Green Building Standards Code or Cal Green which was adopted by City Council on December 14, 2010 and became effective January 1, 2011. Cal Green establishes minimum green building standards for the construction of residential and non-residential structures to encourage sustainable construction practices in the following categories:

1. Planning and design;
2. Energy efficiency;
3. Water efficiency and conservation;
4. Material conservation and resource efficiency; and
5. Indoor air quality.

Cal Green applies to all newly constructed residential and non-residential buildings. For non-residential buildings constructed without tenant improvements, the provisions of Cal

Green apply to the shell of the building and to the initial tenant or occupancy of the building. Cal Green does not apply to additions, alterations such as subsequent tenant improvements, or repairs to existing buildings.

The specific mandatory measures established for both residential and non-residential construction include the following five (5) items:

- Site grading and drainage plans are required to demonstrate how the development will manage surface flow of water.
- Indoor water use is to be reduced by 20 percent when compared to an estimated water use baseline.
- Requirements for the reduction of indoor air contaminants include any installed fireplace to meet EPA Phase II emission limits, low volatile organic compounds adhesives, sealant, and finishes including carpet, and sealing air distribution components during construction.
- Automatic irrigation system controllers for landscape that are installed at the time of final inspection shall be either a weather or soil moisture based controller or have a rain sensor.
- Requirements for the diversion of construction waste from landfills are established, however, these requirements are less stringent than the current City Ordinance.

Additional specific mandatory measures established for residential construction include the following two (2) items:

- Projects that are less than one acre are mandated to manage storm water run off during construction to minimize negative effects on the site and adjacent areas.
- A building maintenance and operation manual is required to be supplied and must include all of the operation and maintenance instructions for the heating, ventilation, and air conditioning (HVAC) system, water heater, appliances, roof and yard drainage, landscape irrigation system including information about water conserving landscape; information on local recycling and waste recovery programs; public transportation/carpool options; information about state solar energy and incentive programs available.

Additional specific mandatory measures established for non-residential construction include the following six (6) items:

- For newly constructed projects less than one acre, a Storm Water Pollution Prevention Plan is required.
- Interior and exterior lighting shall be designed such that zero direct-beam illumination leaves the building site.
- Outdoor water use requirements including the development of a water budget for landscape irrigation use that conforms to the local water efficient landscape ordinance.

- Separate meters or sub-meters for indoor and outdoor potable water use are required for landscaped areas between 1,000 and 5,000 square feet in size. Chapter 12.44, Water Efficient Landscape, of the City of Menlo Park's Municipal Code applies above 5,000 square feet and also requires separate landscape meters.
- Bicycle and low-emitting, fuel efficient and carpool/van pool parking is required.
- New buildings 10,000 square feet and over are required to go through a building commissioning process which establishes and verifies a project's design for the building's systems and components. A complete report of the commissioning process activities undertaken through the design, construction, and reporting recommendations for post construction phases of the building project is required to be completed along with an operation and maintenance manual for each of the buildings systems.

Sustainable Building Program

Since the adoption of the Sustainable Building Program as one of the City Council's project priorities in fiscal year 2008-09, staff has implemented a phased approach to the program. Phase One was implemented in July 2008, making the submittal of the LEED checklist for all new non-residential projects over 10,000 square feet in size a voluntary measure. Phase Two expanded the scope of projects to include all mixed-use projects and new residential projects of more than five dwelling units in the voluntary program. Phase Three made the submittal of the checklists mandatory as of February 2009 for the types of projects noted above. In addition, the City prepared a Climate Action Plan (CAP), which the City Council approved in 2009. The CAP identifies a strategy to explore opportunities to exceed the minimum Cal Green requirements in order to further reduce greenhouse gas emissions.

ANALYSIS

The California Health and Safety Code enables local jurisdictions to modify the California Building Standards Code and adopt different or more restrictive requirements with the caveat that:

- The local modifications must be substantially equivalent to, or more stringent than, building standards published in the California Building Standards Code; and
- The local jurisdiction is required to make specific or express findings that such changes are reasonably necessary because of local geological, climatic, or topographic conditions.

The local amendments become effective 30 days after the formal adoption of an ordinance with the exception of amendments that affect the energy standards established in the California Energy Code (Energy Code). The California Energy Commission provided direction in November 2009 for jurisdictions seeking to adopt

local ordinances which establishes green building standards exceeding energy standards established in the Energy Code be required to apply for approval from the Energy Commission. The approval process requires local jurisdictions to provide documentation to support how the proposed standards would save more energy than the current statewide standards and the basis for how the standards are cost-effective.

The Energy Commission will not provide a review of proposed local ordinances until the ordinances have been adopted by the local municipality. After completion of their review, the Energy Commission may request a municipality amend the adopted ordinance. In this situation, the amended ordinance would then have to be re-adopted by the municipality before the Commission would again review the ordinance. The review process is required by statute to be completed within 90 days of the Energy Commission receiving a request for approval. This review process is required each time a new Energy Code is published and made effective by the State.

To meet the Energy Commission's requirement for demonstrating that the proposed ordinance will save more energy than the current statewide standards and be cost effective, staff intends to submit the *Cost Effectiveness Report in Climate Zone 3* commissioned by PG&E specifically for local jurisdictions to use for establishing energy savings and cost effectiveness. A copy of this report is included as Attachment B. The report presents the results of research and analysis of the cost-effectiveness of prototypical structures designed to exceed the 2008 energy efficiency standards in Climate Zone 3. The report references the 2008 standards, however, the 2008 energy efficiency standards which took effect on January 1, 2010, were re-adopted in July 2010 by the State to become the 2010 energy efficiency standards. Staff has confirmed with the Energy Commission that the report as written is still acceptable to the Commission.

Adoption of Proposed Local Amendments

There are several different approaches staff has reviewed for exceeding the mandatory measures in Cal Green. The most notable of these approaches are:

1. Requiring certification through the Leadership in Energy and Environmental Design (LEED);
2. Requiring certification through Build It Green (BIG); and
3. Making mandatory some or all of the voluntary measures included in the appendices of Cal Green.

In an April 5, 2011 Council informational item, staff identified a two-phase approach with the focus of the first phase on providing the greatest beneficial environmental impact while balancing ease of implementation by the development community and staff. In accordance with this focus, the first phase concentrates on measures that are currently in use by the design and construction community, are required by both LEED and BIG, are recommended additional measures in Cal Green, and are proven to reduce energy consumption and green house gases. Additionally, the recommended measures are

more restrictive versions of existing plan check elements, thereby not introducing new systems and processes that complicate and add time to the plan check process. These measures are intended to have minimal impact to the development community while achieving greater energy efficiency in new buildings.

Upon completion of phase one, staff will begin working on phase two for the adoption of additional sustainable building measures. This process will include input by the Environmental Quality Commission and the public. The adoption of the first phase measures does not preclude the use of a point-based-system (i.e. LEED and/or BIG) in the second phase due to the fact that all of the measures recommended in the first phase are used in point-based systems.

Other local jurisdiction have used LEED and/or BIG as a basis for their green building ordinances however since the publication of Cal Green, some jurisdiction have moved away from adopting point-based systems and toward adopting ordinances making voluntary measures published in the appendices of Cal Green mandatory. This approach has made the amendment process more efficient because the appendices provide codified language that was developed with input from the Energy and Building Standards Commissions. The language is in the standardized format used throughout the Building Standards Code which design professionals and contractors are accustomed to using. The language is also used in the proposed ordinance (Attachment A). A list summarizing the approved ordinances from other surrounding local jurisdictions is included as Attachment C.

Staff is recommending the adoption of local amendments to Cal Green which establishes more restrictive standards for the following aspects of the design and construction of new buildings in Menlo Park.

1. All projects currently subject to Cal Green regulations will be required to exceed the minimum energy standards established in the Energy Code by 15 percent;
2. All projects currently subject to Cal Green regulations will be required to test the heating and cooling duct for leakage; and
3. All residential projects currently subject to Cal Green regulations will be required to install cool roofs. Cool roofs are currently required for non-residential projects.

A full analysis of the benefits and possible impacts is described in more detail below. All of the amendments are more stringent than the 2010 California Green Building Standards Code and are based on climatic conditions specific to the Bay Area, as required by the California Health and Safety Code. The specific findings related to these conditions are stated in Section 1 of the proposed ordinance (Attachment A).

Exceeding the Energy Code

The Energy Code establishes baseline requirements for energy efficiencies in buildings. Compliance with these requirements can be achieved through one of two methods, the prescriptive method or the performance method. The prescriptive method establishes minimum measures that must be incorporated into the design of the structure. The performance method uses a computer modeling program that establishes maximum energy consumption for the structure known as an energy budget. The program then estimates the proposed structure's energy use based on the structure's design of space heating and cooling loads, water heating load, lighting loads and the structure's envelope (i.e., exterior walls and roof). The estimate must be equal to or less than the energy budget.

Requiring a structure to use 15 percent less energy than the maximum allowed by the Energy Code will require the structure to be analyzed using the performance compliance method. The prescriptive method would no longer be allowed. With the performance method, the energy budget would be used to establish the 15 percent reduction in energy use. The 15 percent reduction would be consistent with the mandatory requirements of LEED and BIG.

The tables below are excerpted from the *Cost Effectiveness Report in Climate Zone 3* commissioned by PG&E (attachment B) and show the potential savings and payback time for exceeding the 2008 energy standards by 15 percent. The methodology used in the report is based on a design process for different prototypical building types in which various measures are adjusted to meet the minimum requirements of the 2008 standards and then exceed those standards by 15 percent. The options shown in the tables below represent combinations of different compliance measures. The energy savings shown on the tables for electricity are expressed in Kilowatt Hours (KWh) and for natural gas as therms.

Small Single Family

Building Description	Total Annual KWh Saving	Total Annual Therms Saving	Incremental First Cost (\$)	Annual Energy Cost Savings (\$)	Simple Payback (Years)
2,025 sf (Option 1)	78	85	\$1,659	\$112	14.8
2,025 sf (Option 2)	72	87	\$1,734	\$113	15.3
2,025 sf (Option 3)	85	81	\$1,592	\$108	14.7
Averages:	78	84	\$1,662	\$111	15.0

Large Single Family

Building Description	Total Annual KWh Saving	Total Annual Therms Saving	Incremental First Cost (\$)	Annual Energy Cost Savings (\$)	Simple Payback (Years)
4,500 sf (Option 1)	181	105	\$3,431	\$153	22.4
4,500 sf (Option 2)	88	117	\$4,136	\$150	27.5
4,500 sf (Option 3)	172	106	\$2,793	\$153	18.3
Averages:	147	109	\$3,453	\$152	22.7

Low-Rise Office Building

Building Description	Total Annual KWh Saving	Total Annual Therms Saving	Incremental First Cost (\$)	Annual Energy Cost Savings (\$)	Simple Payback (Years)
52,900 sf (Option 1)	76452	-16	\$73,559	\$17,629	4.2
52,900 sf (Option 2)	74762	-3	\$83,099	\$16,457	5.0
52,900 sf (Option 3)	40583	4523	\$73,849	\$16,248	4.5
52,900 sf (Option 4)	55173	2217	\$50,921	\$34,725	1.5
52,900 sf (Option 5)	40996	4871	\$53,921	\$31,964	1.7
Averages:	57593	2318	\$67,070	\$23,405	3.4

The average cost per square foot for the construction of a new single-family residential home in Menlo Park is \$250 based on permit data for Fiscal Year 2010-11. The incremental costs per square foot to exceed the minimum energy efficiency standards represented in the report for the Small Single Family Residence is \$0.82 and \$0.76 for the Large Single-Family Residence. There is a very small data sample for the cost of a new low rise office building in Menlo Park; however, the most recent new office building's cost per square foot was \$235. The average incremental cost per square foot to exceed the minimum energy efficiency standards for a Low Rise Office Building represented in the report is \$1.26. Overall the incremental cost for the required additional energy efficiency represented in the report is a fraction of a percent when compared to the cost of construction while achieving long term energy savings resulting in a reduction of green house gases.

Duct Testing

The Energy Code establishes climate zones, which are 16 different geographic areas of California for which the Energy Commission has established typical weather data. From this data, the Commission has developed climate-zone-specific energy efficiency requirements for the building envelope and space-conditioning system. As discussed above, there are two methods for compliance to the requirements of the Energy Code, the prescriptive method and the performance method. Testing for air leakage in the heating and cooling ducts is required by the Energy Code in all climate zones under the prescriptive method. The performance method uses a computer modeling program that automatically assumes that the ducts have been tested to establish the energy budget

while the modeling program's analysis of the proposed design assumes a higher leakage rate. Duct testing becomes optional and if used as part of the proposed design, credit for a reduction in energy use is given.

Poorly installed ducts can result in air leakage into the unconditioned portions of a structure which reduces the amount of conditioned air actually reaching the living or work space. Additionally, if the supply duct system is leaking, the building can become depressurized, and air from outside may be drawn into the ducting and distributed into the building. If the return duct system is leaky, outside, stale, or polluted air, air from an attic, a crawl space, or combustion air from a gas furnace, clothes dryer, stove, or water heater can be drawn in and distributed into the structure.

Duct testing uses a calibrated fan that gently pressurizes the ducts and measures the airflow through the ducts to indicate total leakage. Testing of the ducts occurs prior to the installation of insulation and sheet rock so the ducts are readily accessible for repair. Qualified testers are readily available. Properly installed and tested ducts reduce the loss of heating or cooling air by 10 to 30 percent according to PG&E on its website. The cost associated with duct leakage testing varies due to the number of air handling equipment and vents in the structure but staff received estimates that range from \$300 to \$500.

Duct testing is used in the Cost Effectiveness Report (attachment B) to achieve the minimum energy efficiency standards for the single family prototypical residences so the incremental cost and the annual energy savings is not analyzed in the report. However, while working for the City of Morgan Hill, the City of Menlo Park's current Environmental Programs Manager performed energy audits on 34 homes with duct leakage tests being performed as part of those audits. The average leakage rate was 24 percent. The estimated annual loss in gas, electricity, and the cost associated with those losses are listed below.

Annual Wasted Therms (Heating) from 24% Leakage and Associated Cost	Annual Wasted KWh (Cooling) from 24% Leakage and Associated Cost	Total Annual Cost of Lost Heating and Cooling
105.52 therms	344.64 kWh	
\$94.97	\$48.25	\$143.22

Using the square footage of the two prototypical residences used in the Cost Effectiveness Report and assuming the test for air leakage is \$500, the cost per square foot for the 2025 square foot house is \$0.25 and \$0.11 for the 4500 square foot house.

Cool Roof

A cool roof is one that has been designed to reflect more sunlight and absorb less heat than a standard roof. This solar-reflective quality helps maintain lower roof temperatures. Standard or dark colored roofs can reach temperatures of 150°F or more in the summer sun. A cool roof under the same conditions could stay more than 50°F

cooler. Cool roofs can be made of a reflective type of paint, tiles, or shingles. Both the Arrillaga Family Gymnasium and the Arrillaga Family Recreational Center have tile roofs that meet the cool roof standards.

In addition to keeping a roof cooler, a cool roof can benefit a building and its occupants in several ways:

- Reduce energy bills by decreasing air conditioning needs; and
- Improve indoor comfort for spaces that are not air conditioned; and
- Decrease roof operating temperature, which may extend roof service life.

Beyond the building itself, cool roofs can also benefit the environment especially when many buildings in a community have them. Cool roofs can:

- Reduce local air temperatures (sometimes referred to as the urban heat island effect); and
- Lower peak electricity demand, which can help prevent power outages; and
- Reduce power plant emissions, including carbon dioxide, sulfur dioxide, nitrous oxides, and mercury, by reducing cooling energy use in buildings.

Cool roofs can be achieved through a variety of construction methods and materials. A typical application will achieve air conditioning energy savings of approximately 10 percent to 20 percent according to PG&E. According to a 2006 Energy Commission sponsored study by Lawrence Berkeley National Laboratory and Oak Ridge National Laboratory, the average annual kilowatt hour (KWh) savings for a house with a cool roof installed and R-19 insulation in climate zone 3 is 52 KWh.

Examples of different types of roofing materials and typical costs for non-cool roof and the corresponding typical cost for cool roof are listed below.

Type of Roofing Material	Cost for Non-Cool Roof Material per 100 sq. ft.	Cost for Cool Roof Material per 100 sq. ft.	Incremental Cost per 100 sq. ft.
Composition Shingle	\$105 for 50 year shingle	\$175 for 50 year shingle	\$70
Tile Roof	\$200	\$200	No additional cost due to the fact the weight of a regular tile roof meets the definition of a cool roof
Painted coating applied over a non-cool roof material	Cost of the selected roofing material	\$105 plus the cost of the selected roofing material	\$105
Rolled Roofing	\$25.50	\$70.00	\$44.50

The average incremental cost is \$0.73 per square foot of cool roof material. There is no additional labor cost for the installation of the different types of roofing as the installation

of a non-cool roof is the same as a cool roof for each material type. The material cost as a percentage of the entire roofing installation cost is typically 20 to 25 percent.

IMPACT ON CITY RESOURCES

The proposed phase one local amendments to Cal Green will not result in any significant costs to the City other than staff resources to process the ordinance amendment.

POLICY ISSUES

The adoption of the current State codes and proposed local amendments do not represent a change in City policy and is consistent with the greenhouse gas reduction strategy in the Climate Action Plan.

ENVIRONMENTAL REVIEW

The adoption of the proposed ordinance is not a project that has the potential for causing a significant adverse effect on the environment and therefore is not subject to review under the California Environmental Quality Act (CEQA).

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PUBLIC NOTIFICATION

Public notification was achieved by posting the agenda, with this agenda item being listed, at least 72 hours prior to the meeting.

ATTACHMENTS

- A. [Ordinance No. _____ amending Title 12 \(Buildings and Construction\) of the Menlo Park Municipal Code adopting amendments to The 2010 California Building Standards Code Part 11.](#)
- B. [Climate Zone 3 Energy Cost-Effectiveness Study prepared for PG&E, dated July 19, 2010](#)
- C. [Green Building Ordinances for Surrounding Cities](#)