



DATE: November 14, 2016

TO: Council Sustainability Committee

FROM: Development Services Director
Utilities & Environmental Services Director

SUBJECT: Update on 2016 CalGreen and the 2016 Energy Code

RECOMMENDATION

That the Council Sustainability Committee (CSC) receives this report and provides feedback.

SUMMARY

Every three years, the California Building Code undergoes a full update. The City is now at the end of the cycle for the 2013 codes. The 2016 codes will be in effect on January 1, 2017. In terms of green building and energy efficiency, the new codes represent a significant leap forward in order to reach California's target of Zero Net Energy (ZNE) for all new residential buildings in 2020 and all new commercial buildings in 2030.

BACKGROUND

The California Building Code is a comprehensive series of regulations that governs all aspects of construction. This set of laws is contained in Title 24 of the California Code of Regulations. State law requires that all communities enforce these building standards in their entirety. The Building Division of the Development Services Department is responsible for enforcing Title 24 in Hayward.

Title 24, commonly referred to as the California Building Code, covers five broad topics:

- LIFE SAFETY (earthquake and fire safety)
- CONSTRUCTION QUALITY and SANITATION (core system functioning – plumbing, mechanical and electrical)
- CIVIL RIGHTS (disabled access provisions)
- ENERGY CONSERVATION
- GREEN BUILDING

DISCUSSION

Since buildings are the second largest source of carbon emissions generated by the state (approximately 40% of total), improvements in building construction are critical to meeting California's emission reduction targets. The passage of The Global Warming Solutions Act of 2006 (AB 32) had the effect of pushing the Energy Code to new levels. The most notable change is the requirement that all new homes built in California must meet Zero Net Energy standards by 2020 followed by new commercial buildings in 2030. Zero Net Energy (ZNE) means that a building produces all of the energy it uses over the course of a year through onsite solar or other renewable methods. FAQs regarding ZNE homes can be found at: <http://www.californiaznehomes.com/faq>. The 2016 codes that will be adopted and effective on January 1, 2017 are designed by the California Energy Commission to function as the last phase of efficiency enhancements before launching the requirement to install onsite solar in 2020.

Building construction has many more negative impacts on the environment beyond fossil fuel-based energy consumption, including deforestation, overuse of water, use of harmful chemicals and urban sprawl. A building that meets ZNE standards alone is not necessarily considered a "green building". The term green building is used to describe sustainable design practices that cover building construction holistically. To fill in these gaps, the state developed and then adopted the California Green Building Standards Code in 2011. This set of regulations works in conjunction with the Energy Code to ensure that all buildings constructed in California are truly green in the full sense of the term.

New Features in the 2016 Energy Code for Homes

Given that in four years all new residential structures in California will need to perform at ZNE standards, the major changes in the code are focused on homes in this cycle. The Energy Code applies to new buildings and to remodels, repairs and additions to existing buildings.

Homes have four focal points for conservation in the Energy Code:

- Insulation (this includes walls, roofs, floors, attics and windows)
- Water Heating
- Heating and Cooling Systems (Furnaces and air conditioners)
- Lighting

The following items are highlights of changes in the 2016 Energy Code:

Wall Insulation - 24% Increase in Efficiency

For several code cycles, walls were required to have a minimum of R-13 insulation. This was based on standard insulation materials and the size of standard wall framing members. R-values for common fiberglass batt insulation yield about R-3.8 per inch. A standard 2 x 4 wall is exactly 3.5 inches deep. Doing the math, 3.5 inches times R-3.8 equals R-13. To increase the R-value beyond R-13 with standard insulation materials would mandate builders to use thicker and more expensive 2 x 6 walls.

The 2013 Energy code addressed this by requiring a 1-inch layer of rigid foam insulation on the exterior of walls in addition to the fiberglass insulation inside the wall. Rigid insulation has a much higher R-value per inch (approximately R-5 per inch). This change in the 2013 Code yielded a total R-value for a standard wall using 2 x 4 lumber of about R-18.

The 2016 standard is pushing wall insulation requirements to the end of the line in preparation for ZNE. It will require walls to be built out of 2 x 6 studs (which are 5.5 inches thick). This will yield an insulation level of R-19 with fiberglass batts inside the walls alone. The code will still require 1 inch of rigid foam insulation on the exterior of the building, for a total insulation level of R-24.

High Performance Attics – New Concept (This represents an increase in efficiency, but because of the various options and systems involved, a rough percentage of the energy efficiency change can only be evaluated on a specific building/design.)

The 2016 Energy Code will incorporate major changes to how attics are insulated. However, these new attic requirements are dependent on climate zone and will not be mandatory in our jurisdiction under this cycle. Hayward is fortunate to be located in California's premier climate zone from an energy conservation and human comfort standpoint. Of the 16 climate zones in the state, Climate Zone 3 is so mild that it is not uncommon for people to live comfortably in pre-war era homes built without insulation and without air conditioning. The craftsman style bungalows seen throughout the Bay Area frequently fall into this category. Inland climate zones usually require air conditioning systems for human comfort. While high performance attics will not be required by default in Hayward, this feature can be added to trade off other elements in particular cases. For example, if a building designer did not want to utilize a tankless water heater (see discussion below), he/she may be able to install a high performance attic instead and gain a credit in the overall energy budget for the home. The penalty they would take for a less efficient water heater would be offset by the efficiency gains in the attic. In a cooling climate zone outside the Bay area, this option would not be available.

Water Heating – 22% Increase in Efficiency

The 2013 Codes allowed for the installation of water heaters with 60% efficiency rating. This was easily accomplished by installing a standard storage tank water heater. The 2016 Energy Code will require water heaters with a minimum of 82% efficiency. To meet this standard, tankless water heaters will be required. Tankless water heaters, also called on-demand water heaters, do not store hot water which needs to be re-heated when not in use, but rather heats water with gas burners as it is being used.

Heating and Cooling - (No increase in unit efficiency; 33% increase in duct insulation)

The efficiency ratings for HVAC (heating, ventilation and air conditioning) units will remain unchanged during this code cycle, but the insulation levels for the ducts will be increased from R-6 to R-8. Based on the remaining efficiency opportunities left for homes, we anticipate that in the next Code cycle, heating and cooling equipment efficiency levels will be increased.

Lighting – Expanded Requirements

All lighting in new homes, remodels and additions must be high efficiency (fluorescent or LED). In the previous code cycle, exceptions were made based on different types of switches, such as dimmers and vacancy sensors. All exceptions are removed in the 2016 standards.

Other expanded requirements involved with the new Codes:

Home Energy Rating System (HERS) – Expanded Requirements

HERS rating is a program that was developed by the state to address the problem of limited inspection resources available to local jurisdictions. HERS raters are 3rd party professionals that are certified to inspect certain aspects of Energy Code compliance during construction. An example of a required HERS inspection is a duct leakage test. The 3rd party inspector will verify that joints in ducts that deliver heated or cooled air are properly sealed to avoid wasted energy. As the standards become more restrictive, there are more cases where HERS inspections are required by code. Additional HERS ratings will be required in this cycle.

Solar Ready—Expanded Requirements

Designers often attempt to modulate roofs with decorative elements such as dormers or oversized chimneys to break up massing. In some situations, these features are required by local planning departments to add character; however, in terms of adding rooftop solar, uneven surfaces, vents, and chimneys create a problem. The ideal roof design from a solar installation standpoint is a large, flat surface facing south that is free of obstacles and shadows. The Energy Code is addressing this situation through the Solar Ready provisions in the Code. These regulations require that for housing developments with 10 or more units (single family or multi-family), a “solar zone” must be established on the roof of each home. The solar zone must be at least 250 square feet for a single family home and must be free of obstructions, vents, chimneys or shadows. In addition to the clear roof area with sun exposure, the Code requires the installation of conduit pathways for the future installation of conductors.

New Requirements in the 2016 Energy Code for Non-Residential Buildings

The 2016 Energy Code for non-residential structures does not feature any major changes as part of this update. The fundamental changes occurred with the 2013 Energy Code and this cycle represents some refinements to those updates. In the same way that residential energy consumption is regulated, non-residential buildings are required to be insulated, implement lighting efficiency (indoor and outdoor), implement HVAC efficiency and provide efficient water heating.

Intelligent Lighting --Expanded Requirements

The major change for non-residential Energy Code standards is related to advancements in lighting technology. Prior to the 2013 standards, commercial interior lighting was typically achieved with fluorescent tube lights. Tube lights are limited in the sense that their efficiency has topped out with current technology and they can't be dimmed. The

lack of dimming is problematic when lighting is located adjacent to windows or skylights and the only choices for modulation are on or off.

In recent years, LED fixtures have come down in cost and are becoming the new standard. LED fixtures have two big advantages over fluorescent tube lights: They are more efficient and they are dimmable. The energy code now requires LED lights adjacent to windows or skylights to be connected to optical sensors which automatically dim or brighten the output in direct response to natural lighting conditions.

New Features in the 2016 California Green Building Standards Code (CalGreen)

As noted before, the California Green Building Standards Code was first adopted in 2011 and covers the non-energy aspects of green building. This standard applies to all new residential and commercial buildings along with residential additions. CalGreen also applies to commercial tenant improvements with a valuation of \$200,000 or more.

CalGreen covers four broad topics related to sustainable construction:

- Planning and Design: bicycle parking, EV parking spaces, EV charging locations (*chargers are not required, but placement of conduit and reserved spaces are*), storm water pollution prevention.
- Water Efficiency and Conservation: Fixture flow rate regulations, requirements for water efficient landscaping and sub-metering.
- Material Conservation and Resource Efficiency: Construction waste guidelines, building commissioning, building operation and maintenance, moisture and mold control.
- Environmental Quality: Off gassing controls on chemical content of building products such as paints, adhesives and finishes, controls on refrigerant leaks and noise control.

The following items are notable changes in the 2016 California Green Building Standards Code:

Residential Mandatory Measures

Residential Lavatory Faucets: revised the maximum flow rate of residential lavatory faucets to 1.2 gallons per minute (gpm) at 60 psi (previously 1.5 gpm) §4.303.1.4.1

Construction Waste Management: Revised the minimum construction and demolition waste to be recycled and/or salvaged for reuse to 65% (previously 50%) §4.408.1

Operation and Maintenance Manual: Added photovoltaic systems and electric vehicle chargers to the list of items requiring operation and maintenance instructions §4.410.1

Recycling by Occupants: Added section which applies to building sites with five or more multifamily dwelling units; provides readily accessible area(s) that serve all buildings on the site and is identified for the depositing, storage, and collection of non-hazardous materials for recycling, including (at a minimum) paper, corrugated cardboard, glass, plastics, organic waste, and metals, or meet a lawfully enacted local recycling ordinance, if more restrictive §4.410.2

Woodstoves and Pellet Stoves: Revised reference standard to U.S. EPA New Source Performance Standards (previously U.S. EPA Phase II); requires appliances to have a permanent label indicating it is certified to meet the emission limits §4.503.1

Nonresidential Mandatory Measures

Revised the maximum effective flush volume of wall-mounted urinals to 0.125 gallons per flush (previously 0.5 gpf) §5.303.3.2.1

EV Charging Spaces: Increased the number of required EV charging spaces:

- 10-25 spaces = 1EV
 - 26-50 spaces = 2EV
 - 51-75 spaces = 4EV
 - 76-100 spaces = 5EV
 - 101-150 spaces = 7EV
 - 151-200 spaces = 10EV
 - 201 and over = 6% of total spaces for EV
- Table 5.106.5.3.3*

Commercial Kitchen Equipment: New section which adds requirements for food waste disposers: Disposers shall either modulate the use of water to no more than 1 gpm when the disposer is not in use or shall automatically shut off after no more than 10 minutes of inactivity; Disposers shall use no more than 8 gpm of water §5.303.4

Recycling by Occupants: Revised to include organic waste in the list of required recycling materials §5.410.1

ECONOMIC IMPACT

According to the California Energy Commission, the new energy efficiency standards will increase the cost of constructing a new home by \$2,700 on average. Cost data is not yet available for non-residential structures or for the impacts of CalGreen.

FISCAL IMPACT

With the increase in efficiency moving towards ZNE, enforcement of the new codes will have an impact on staff. Additional training is required and projects will take longer to complete during the plan review and inspection stages. Staff does not foresee an immediate fiscal impact from adopting the new codes this year, but over the course of the code cycle, staffing may need to be adjusted (either internally or through consulting services) to maintain our present review timelines. There is also a potential for an impact to our training budget for classes related to these new standards.

SUSTAINABILITY FEATURES

Energy – The 2016 CalGreen and 2016 Energy Codes will require that new buildings and major retrofits of existing buildings be significantly more energy efficient compared to what is required under the current codes. For new single-family homes, the next step in the three-year code cycle will be to require zero net energy.

Water – The 2016 CalGreen Code will increase water conservation. For example, in residential construction, faucets will be required to have a maximum flow of 1.2 gpm where the current code requires 1.5 gpm.

Air – CalGreen should result in fewer greenhouse gas emissions as new development will be required to provide more electric vehicle charging stations.

Solid Waste – CalGreen will require more construction and demolition debris to be recycled. The current code requires a minimum of 50% materials recycled and the new code will require at least 65%, unless superseded by a more stringent local ordinance.

PUBLIC OUTREACH

Staff has directly contacted all developers with active projects that are nearing submittal to ensure they are aware of the cutoff date for the 2013 codes. In addition, staff will provide information on the City's website indicating the start of the new code cycle. Staff will also provide useful links for developers, architects and contractors to learn more about the new statewide codes. Finally, a notice will be published to announce the December City Council public hearing when the 2016 codes may be adopted.

NEXT STEPS

The City Council is scheduled to formally adopt both the 2016 Energy Code and the 2016 Green Building Standards Code in December of this year. The new codes will be in effect on January 1, 2017.

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Approved by:

A handwritten signature in black ink, appearing to read 'K. McAdoo', written in a cursive style.

Kelly McAdoo, City Manager