CITY OF DOWNEY

COMMUNITY DEVELOPMENT, BUILDING AND SAFETY
11111 Brookshire Avenue
Downey, CA 90241
562.904.7142
(www.downeyca.org)

BUILDING ENERGY		
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2016 CALIFORNIA ENERGY EFFICIENCY CODE

The following residential guidelines are based on the 2016 California Energy Efficiency Code, specifically; the requirements for residential additions, alterations, renovations, and new construction located in Climate Zone 8 and Climate Zone 9, as they apply to the City of Downey, using the prescriptive approach (Package D).

The performance method is not addressed herein. A performance analysis is performed by an independent Energy Consultant and they provide a detailed energy analysis for the dwelling that is based on computer modeling.

When using the performance approach, all compliance and mandatory measures are included in energy computations and may differ from the prescriptive requirements detailed below.

Homeowners and contractors may complete their own energy documentation using the prescriptive method. Some assumptions of the prescriptive method may include energy requirements more restrictive than a computer modeling. In these cases, i.e., HERS rating, etc., the performance analysis may prove to be a better avenue for compliance. Any questions regarding energy analysis may be directed to your energy consultant.

FENESTRATIONS GUIDELINES

Additions 700 square feet or less

1. Fenestrations shall not have more than 50 square feet of fenestration area.
2. There is no credit for windows removed.
3. U-Factor of 0.32 maximum.
4. SHGC factor of 0.25 maximum.
5. CF-1R ALT form required.
6. All other Package D components apply
7. Additions that are 400 square feet or less the maximum allowed fenestration area is greater of 75 square feet or 30% of the condition floor area of the addition
8. For additions that are 700 square feet or less, but greater than 400 square feet the maximum allowed fenestration area limit is the greater of 120 square feet or 25% of the condition floor area up to 1000 square feet.

Additions 700 sq. ft. to 1000 sq. ft.

1. Limited to the total glazing area allowed in Package D plus the glazing area that was removed by the addition
2. U-Factor of 0.32 maximum.
3. SHGC factor of 0.25 maximum.
4. CF-1R ADD form required.
5. All other Package D components apply
6. The maximum allowed fenestration area shall be the greater of 175 square feet or 20% of the addition floor area and the maximum allowed on West – Facing fenestration area shall be the greater of 70 s quare feet or the requirements of CEEC Section 150.1 (C).

Additions of more than 1000 sq. ft.

1. Limited to the total glazing area allowed in Package D cannot consider glazing removed.
2. Performance approach must be used for additions greater than 1,000 Ft^2 in order to consider glazing removed..
3. Shall meet all the requirements of new construction
4. U-factor of 0.32 maximum.
5. SHGC factor of 0.25 maximum.
6. CF-1R or CF-1R ADD form required.
7. All other Package D components apply.
8. Alterations that are vertical fenestrations and skylight area shall meet the total fenestration area and West-Facing fenestration area, U-Factor and Solar Heat Gains Co-efficent requirements of 2016 CEEC Section 150.1 (C) and Table 150.1 (A).

*Minimum requirements for renovations not adding additional square footage**

1. Exempt from the fenestration area requirements.
2. New, retrofit and/or replacement windows require U-Factor of 0.40 maximum and SHGC of 0.35 maximum. **(CEEC Table 150.2-C)**
3. CF-1R ALT form required.

**This is the section that applies to window replacements on a "like for like" basis. The window plan shall include the U-factor and SHGC for the replacement windows. The CF-1R-ALT form is required. (Fenestration section only, page 1)*

SOLAR REFLECTANCE AND THERMAL EMMITTANCE

New construction shall meet the requirements of the Cool Roof standards. Additions shall meet the requirements of the Cool Roof standards. Re-roofs, when more than 50% of the exterior surface of the roof or more than 1,000 ft^2 of roof will be replaced, whichever is less, the altered exterior surface area of the existing roofs shall meet the following requirements:

- For alterations to steep-sloped roofs (rise to run greater than 2:12): Roofing products with a density of 5 pounds per square foot or more in Climate Zones 1 through 16 shall have a minimum 3-year aged solar reflectance of 0.15 and a minimum thermal emittance of 0.75, or a minimum SRI of 10.

Alternatives and Exception

- For steep-sloped roofs, the following shall be considered equivalent to (an alternative) the cool roof requirements (see Cool Roof Values):
  A. Insulation with a thermal resistance of at least 0.85 $hr \cdot ft^2 \cdot °F/Btu$ or at least a 3/4 inch air-space is added to the roof deck over an attic; or
  B. Existing ducts in the attic are insulated and sealed according to **Section 150.2(D)**, or
  C. Buildings with at least R-30 ceiling insulation; or
  D. Buildings with a radiant barrier in the attic meeting the requirements of **Section 150.1(D)2**; or
  E. Buildings that have no ducts in the attic.

For low-sloped roofs, buildings with no ducts in the attic are exempt from the cool roof requirements

HVAC ALTERATION**

Efficiencies of HVAC equipment:

When HVAC equipment will be added or replaced, the HVAC equipment efficiencies shall meet the minimum HVAC efficiency requirements in the **2015 Appliance Efficiency Regulations**:

• Single phase air conditioners and heat pumps with an output capacity below 65,000 Btu/hr shall have a minimum 13 Seasonal Energy Efficiency Ratio (SEER).

• Central furnaces with an output capacity below 225,000 Btu/hr shall have a minimum 78% Annual Fuel Utilization Efficiency (AFUE).

* ***Split system central air conditioners installed in the Southwestern Region must be a minimum 14 SEER and 12.2 EER beginning on January 1, 2015.***

Non-Central Gas Heaters:

Non-ducted, non-central gas fired heating equipment (wall furnace, space heater, etc.) shall meet the minimum efficiency requirements of the "2015 Appliance Efficiency Regulations".

Duct Insulation:

When ducting will be added or replaced, the duct insulation values shall meet the Prescriptive duct insulation requirements:

• 40 linear feet or less of ducts are added in unconditioned space: R-4.2 [Mandatory Measures §150.2(D)]. HERS Verification in climate zone 8 and zone 9 is required***

• More than 40 linear feet of ducts are added in unconditioned space: Duct insulation requirements of Package D apply. Duct sealed and HERS* Verification in climate zone 8 and zone 9 is required.

• Newly installed ducted HVAC systems shall meet the Prescriptive duct insulation requirements of Package D listed in Standards Table 151-C. Duct sealed and HERS* Verification in climate zone 8 and zone 9 is required.

Indoor Air Quality and Mechanical Ventilation (Mandatory Measures)

Additions that are greater than 1,000 ft2 shall meet the requirements of ANSI/ASHRAE Standard 62.2 for Indoor Air Quality and Mechanical Ventilation. This is a Mandatory Measure, so regardless of the compliance approach used (Prescriptive or Performance) the Standards mandate that these larger additions meet ASHRAE Standard 62.2.

NOTE: Additions that are 1,000 ft^2 or less are not required to meet the mechanical ventilation requirements of ASHRAE Standard 62.2.

** HERS testing, CF-6R-MECH-20-HERS Form is required.*

*** CF-1R-ALT Form required for modified systems. For "like for like" furnace replacements, without duct modifications or additional habitable space. Minimum 13 SEER and/or 78% AFUE shall show on the plan. No additional documentation is required.*

**** When other components of the compliance package (T24) require sealed ducting, a HERS test is required for verification regardless of the length exemptions.*

Local Exhaust Ventilation

Bathrooms

A bathroom is defined as any room containing a bathtub, a shower, a spa, or similar source of moisture. Each bathroom in the addition is required to have an exhaust fan ducted to the outside with a minimum ventilation rate of 50 cfm. The ducting for the exhaust fan shall be sized according to ASHRAE Standard 62.2 Table 7.1 Depending on the type of ducting and the cfm of the exhaust fan, Table 7.1 is used to size the diameter of the duct and determine the maximum length in feet of the duct. Using Table 7.1 is the Prescriptive Approach for duct sizing to ensure that the fan will provide the minimum ventilation rate required. These local exhaust fans may operate continuously or intermittently. Installing these local exhaust fans in each bathroom will allow the home occupant to regulate the indoor air quality when needed.

NOTE: Bathrooms in the existing home are not required to meet the Local Exhaust Ventilation requirements of ASHRAE Standard 62.2.

Kitchens

A kitchen is defined as any room containing cooking appliances. Each kitchen in the addition is required to have an exhaust fan ducted to the outside with a minimum ventilation rate of 100 cfm. The range hood over the stove may be used to meet this requirement, but the range hood must vent to the outside; re-circulating range hoods cannot be used. The ducting for the exhaust fan shall be sized according to ASHRAE Standard 62.2 Table 7.1. This local exhaust fan may operate continuously or intermittently. Installing this local exhaust fan in the kitchen will allow the home occupant to regulate the indoor air quality when needed.

NOTE: Kitchens in the existing home are not required to meet the Local Exhaust Ventilation requirements of ASHRAE Standard 62.2.

Whole-Building Ventilation

In addition to the local exhaust fans in the bathrooms and kitchens, an exhaust fan shall be sized to provide ventilation for the whole house. The minimum ventilation rate for the whole-building exhaust fan shall be calculated according to **ASHRAE Standard 62.2 Equation 4.1(a).** The conditioned floor area and the number of bedrooms in the home (the

existing house and t he addition) will determine the minimum ventilation rate. One of the local exhaust fans in the bathrooms or kitchens may be used to meet the whole-building ventilation, provided the exhaust fan meets the minimum ventilation rates for both the Local Exhaust and Whole-Building Ventilation requirements. The ducting for the whole-building exhaust fan shall be sized according to **ASHRAE Standard 62.2 Table 7.1** and this exhaust fan shall operate continuously.

NOTE: The whole-building exhaust fan may be installed in either the addition or the existing home.

Sound Rating

Majority of the local exhaust fans will operate intermittently, and are required to be rated for sound at a maximum of 3 sone, unless their maximum rated airflow exceeds 400 cfm (200 L/s).

Sound Rating and Continuous Operation

The whole-building ventilation exhaust fan will operate continuously, and is required to be rated for sound at a maximum of 1 sone. This exhaust fan can be controlled by a standard on/off switch, but the switch must be labeled to inform the occupant that the exhaust fan is the whole-building ventilation exhaust fan and is intended to operate continuously. No specific wording is mandated, but the wording needs to make clear what the control is for and the importance of operating the system. This may be as simple as "Ventilation Control" or might include wording such as: "Operate when the house is in use" or "Keep on except when gone over 7 days" or "Fan is to be left on to ensure indoor air quality."

INSULATION GUIDELINES

Envelope Alterations:*

When the exterior envelope will be altered, follow **2016 California Energy Code** requirements as follows:

Size of Addition

Component	700 ft² or less	More than 700 ft²	More than 1,000 ft²
Ceiling Insulation	R-30	R-30	R-30
Wall Insulation	R-13	R-13	R-13
Floor Insulation	R-19	R-19	R-19

Existing Attics:

When insulation is installed in an existing attic, the R-value of the total amount of insulation shall be R-30 (Climate zone 6). If the accessible space in the attic is not large enough to accommodate the required R-value, then the entire attic space shall be filled with insulation (provided such installation does not violate section 1203.2 of Title 24, Part 2.

* *CF-1R-ALT or CF-1R-ADD form is required*

LIGHTING ALTERATIONS

All new/replaced lighting shall be hi gh efficacy lighting (i.e. fluorescent, LED) or shall meet the required alternatives. Provide form CF-6R-LTG-01. To facilitate compliance, this form shall be completed at the time of plan review. The lighting indicated on the plan must match the form. After construction and prior to building final the certification portion of the form shall be completed by the responsible installer and presented to the inspector for final verification.

High Efficacy lighting:

1. Fluorescent lighting (pin base)
2. LED lighting systems and GU-24 lamp holders can now be installed under the following conditions:

   - LED lighting systems must be tested by the manufacturer and certified to the Energy Commission, and meet the lamp efficacy values listed in **Table 150-C.**
   - GU-24 lamp holders must be rated for use only with high efficacy lamps or high efficacy LED lighting that meet the lamp efficacy values listed in **Table 150-C.**
   - LED shall be hard wired – no screw base adapters are allowed.

NOTE: LED lighting which is not listed as high efficacy on the Energy Commission database shall be classified as low efficacy.

Mandatory measures:

All added or replaced lighting in a residential building shall be high efficacy (except kitchen lighting) or depending on the location of the lighting, be controlled by a dimmer switch or a manual-on vacancy (occupant) sensor. Form MF-1R details the mandatory measures and is no longer a check list.

Kitchens:

When lighting will added or replaced in the kitchen, all newly installed lights shall be high efficacy until a minimum of 50% of the total rated wattage of permanently installed lighting is high efficacy. Lighting in areas adjacent to the kitchen, such as in dining and nook areas, are considered kitchen lighting if they are not separately switched from the kitchen lighting, and shall be considered when calculating the installed wattage of the kitchen lighting. When lighting will be added or replaced inside cabinets for the purpose of illuminating only the inside of the cabinets, the total installed wattage of internal cabinet lighting shall not exceed 20 watts per linear foot of illuminated cabinets.

NOTE: Internal cabinet lighting is not considered kitchen lighting and will not be included when calculating the installed wattage of the kitchen lighting.

Lighting outlets that are intended for future use or specified by owner shall be calculated at 180 watts of low efficacy lighting per blank electrical box.

There will be three methods available to comply with the requirements:

A. All lighting is high efficacy, or

B. >= 50% wattage is high efficacy., or

C. Low efficacy lighting is controlled by vacancy sensor, dimmer, energy management control system (EMCS) or a multi-scene programmable control system ***and*** garage, laundry, closets > 70ft^2 and utility rooms are high efficacy ***and*** controlled by vacancy sensor.

This compliance is documented with the CF-6R-LTG-01 form.

Lighting in bathrooms, garages, laundry rooms, closets, and utility rooms:

Lighting that will be added or replaced in these areas must be high efficacy luminaries, but low efficacy luminaries are allowed if they are controlled by a manual-on vacancy (occupancy) sensor.

Lighting in other areas of the house including Hallways, living room, bedrooms, etc.:

Lighting that will be added or replaced in these areas must be high efficacy, but low efficacy luminaries are allowed if they are controlled by either a dimmer switch or a manual-on vacancy (occupant) sensor.

NOTE: Closets less than 70 square feet are not required to be controlled by a manual-on vacancy (occupant) sensor, a dimmer, or be high efficacy.

Switching

Lighting that will be added or replaced shall meet the new switching requirements of the **2016 California Energy Efficiency Code:**

- All permanently installed high efficacy luminaries shall be switched separately from low efficacy luminaries; ***and***
- Exhaust fans shall be switched separately from lighting system(s).

Outdoor Lighting

Permanently installed outdoor lighting (mounted/attached to the building) that will be added or replaced shall be high efficiency ***or*** are controlled by a manual on/off switch, plus a motion sensor not having an override or bypass switch that disables the motion sensor, plus one of the following three additional control methods:

a. A photo-control that does not have an override or bypass switch that disables the photo-control; ***or***

b. An astronomical time clock that does not have an override or bypass switch that disables the time clock; ***or***

c. An energy management control system (EMCS) not having an override or bypass switch that allows the luminaries to be always on.

NOTE: Permanently installed luminaries in or around swimming pools, water features, or other locations subject to Article 680 of the California Electric Code are exempt from the high efficacy requirements and can be low-efficacy luminaries.

WATER HEATING ALTERATIONS

Water Heater Efficiency:

When the existing water heating equipment is replaced and will serve both the existing home and the addition, the new water heater must be either gas, propane, or the existing fuel type. The Prescriptive Approach will allow an existing electric water heater to be replaced with an electric water heater, but does not allow switching from a gas water heater to an electric water heater. The Performance Approach shall be used if the replacement water heater will not be gas, propane, or the existing fuel type.

The water heater efficiency (Energy Factor) shall meet the minimum water heater efficiency requirements in the 2015 Appliance Efficiency Regulations. Storage water heaters shall have an Energy Factor equal to or greater than the minimum efficiency requirements (see 2015 *Appliance Efficiency Regulations).*

Tankless Water Heaters

Tankless water heaters are not direct replacements for tank type water heaters. In addition to the CF-6R-MECH-01 form, additional gas supply calculations are required. *See the Tankless Water heater Handout for additional information.*

Pipe Insulation Values (Mandatory Measures):

Any newly added or replaced piping shall meet the mandatory insulation requirements of §150(j). The Mandatory Measures require that the following piping shall be insulated to meet the insulation conductivity and minimum insulation thickness requirements listed in Standards Table 150-A and Table 150-B.

- First 5 feet of the hot and cold water lines from the storage tank (non-recirculating systems).
- Recirculating sections.
- Piping from the heating source to the storage tank (indirect-fired systems).

An installation certification, form CF-6R-MECH-01 for domestic water heaters is required. For projects that include a solar domestic water heating system, an additional certification, form CF-6R-MECH-02 is also required.

FLOW RATES

The maximum flow rate standards set by the California Energy Commission:

1. **Water Closets: 1.28 GPM**
2. **Showerheads: 2.0 GPM**
3. **Laundry Faucets: 2.2 GPM**
4. **Lavatory Sink Faucets: 1.2 GPM**
5. **Kitchen Faucets: 1.8 GPM**

For complete details contact your energy design professional or the California Energy Commission @ *(800) 772-3300*

Additional information is also available from the following sources:

www.energy.ca.gov/title24

www.energyvideos.com

www.coolroofs.org

www.downeyca.org

www.cabec.org