CITY OF BERKELEY

Residential Energy Conservation Ordinance (RECO)

Berkeley Municipal Code Chapter 19.16

Resolution No. 62,181–N.S.

A COMPLIANCE GUIDE FOR

BERKELEY'S RESIDENTIAL PROPERTY OWNERS, BUYERS AND SELLERS

Published by

City of Berkeley
Planning Department,
Office of Energy &
Sustainable Development
2120 Milvia Street,
2nd Floor
Berkeley, CA 94704
Telephone: 510-981-7440
TDD: 510.981-6903
(510) 981-5400 (fax)

Energy@ci.berkeley.ca.us

July 2008

CITY OF BERKELEY

Residential Energy Conservation Ordinance (RECO)

Resolution No. 62,181–N.S.

A GUIDE TO COMPLIANCE

July 2008

Contents

What is RECO?

The *Residential Energy Conservation Ordinance* (RECO) was adopted to improve the energy and water efficiency of existing housing in the City of Berkeley.

RECO is meant to help insulate residents from energy price increases by reducing the amount of energy used for heat, hot water, lighting. The ordinance states that every home or apartment building **sold or transferred** in Berkeley or **undergoing renovations valued at $50,000 or more** must meet energy or water efficiency requirements for the following items:

Item	Requirement	Page No.
1. Toilets	1.6 gal./flush toilet, or flow reduction devices	**5**
2. Showerheads	3.0 gal./min. flow rate	**5**
3. Faucets	2.75 gal./min. flow rate for kitchen and bathrooms	**5**
4. Water Heaters	Insulation wrap of R-12 value	**5**
5. Hot & Cold Water Piping	Insulate first two feet from water heater to R-3 value	**6**
6. Hot Water Piping in Pumped, Recirculating Heating Systems	Insulate all piping to R-3 value	**7**
7. Exterior Door Weather-Stripping	Permanently affixed weather-stripping, and door sweeps or door shoes	**7**
8. Furnace Duct Work	Seal duct joints, add insulation wrap to R-3 value	**8**
9. Fireplace Chimneys	Dampers, doors, or closures	**10**
10. Ceiling Insulation	Insulate to R-30 value	**10**
11. Common Area Lighting (multi-unit buildings only)	Replace incandescent with compact fluorescent lamps (CFL) of at least 25 lumens per watt	**12**

All homes sold or substantially renovated must demonstrate compliance with these requirements by being inspected and filing "**Form A - Certificate of RECO Compliance**" with the City of Berkeley. All other RECO forms are available at www.cityofberkeley.info/reco

Live/Work v.s. Work/Live Determinations: Studios, lofts and live-in spaces that are 1,500 square feet or less are considered residential housing, and must also comply with RECO. Spaces larger than 1,500 square feet are exempt from RECO, but must comply with the **Commercial Energy Conservation Ordinance** (**CECO**). Call 510-981-7440 for information, or visit www.CityofBerkeley.info/ceco for compliance information.

Your RECO Responsibilities

If a home is being sold or substantially renovated and has **not** previously met all RECO requirements, it must be brought into compliance and inspected. Properties sold after 1991 may already be in compliance. To check whether your property has previously undergone a RECO inspection, contact the City of Berkeley Building and Safety Division **via email at: reco@cityofberkeley.info** The City maintains records for each residential property in Berkeley. If further assistance is required, call 510-981-7440 and listen for the RECO option. Please have the property address ready.

Staff will tell you what the RECO status is of your building, and what the appropriate forms are for you to use. Please provide the address, including unit number if any, and the last date of sale. Compliance requires that all measures specified in the ordinance must be installed, subject to the maximum expenditure limits (see below), and be verified by an inspector on a *RECO Form A – Certificate of Compliance*. Form A is **only** available from an Inspector or authorized RECO auditor.

TIP: Responsibility for RECO requirements can only be transferred to a buyer once on any property or unit. If you are unsure if your property has had the requirement transferred once already, contact the City's Building and Safety Department and ask for the RECO status of your property before listing your property to avoid delays in closing. Contact **Building and Safety via email at: reco@cityofberkeley.info** If further assistance is required, call 510-981-7440 and listen for the RECO option. Please have the property address ready.

Sale or Title Transfer of Property: In the case of a sale of property, the responsibility for RECO compliance may be assumed by either the seller or the buyer of the home. If the seller assumes responsibility, RECO requirements must be met before close of escrow. If the buyer assumes responsibility, a RECO "Form A" must be filed with the City, and RECO requirements must be completed within one year of the date of sale. **As noted above, the Seller cannot transfer compliance with RECO to the new buyer if the responsibility has already been transferred once to the seller from the previous sale.**

If RECO requirements are not met, the sale can be stopped or a $500 fine imposed on the buyer by the City.

Renovation: Any residential property that undergoes renovation with a total construction cost of $50,000 or more must comply with the requirements of the RECO ordinance. In the case of renovation, RECO compliance is the responsibility of the applicant for the building permit (generally the property owner). RECO inspection and documentation for renovation work is done through the normal building inspection process.

RECO Spending Limits

There is a limit to the amount of money that you are required to spend to meet RECO upgrades. You need not spend more than:

- 0.75% of the final property sales price when a single structure of two housing units or less is sold or transferred;
- 0.75% of the final property sales price for each structure when a property with more than one structure of two housing units or less is sold or transferred;
- $0.50 per square foot when any *one structure with three or more housing units is sold*; or
- 1% of renovation costs when a property is undergoing a renovation of $50,000 or more.

If the expenditure limit is reached, and the property is sold again, the property must be brought into compliance by the next seller or buyer. The responsibility for RECO cannot be transferred more than once.

Scheduling a RECO Inspection

There are two different inspecting agencies for RECO, depending on whether you are transferring your building, or remodeling it.

1. For Sale or Transfer of Property:

Community Energy Services Corporation (CESC) a non-profit organization at (510) 981-9819. A RECO Auditor will be available weekdays from 8:30 AM to 11:00 AM to schedule an appointment for you. You may also call this number 24-hours a day to leave a message requesting the RECO audit. Please leave your name, telephone number, and property address. You may also schedule an appointment on the internet. Visit www.ebenergy.org for forms, requirements, and other information.

TIP: Be sure you have completed ALL RECO measures, or have met the Maximum Expenditure Allowance (0.75% of the FINAL sales price) before calling to save yourself the cost of a re-inspection. **Any "inspection" done by anyone other than CESC is not a valid RECO audit, and will not be allowed by the City. Be sure to contact CESC for your RECO audit.**

TIP: Call to set up an appointment **well in advance** of your deadline (whether it is close of escrow or your 1-year anniversary of sale date) to avoid costly delays.

2. For a Building Renovation:

City of Berkeley Building and Safety Division: **(510) 981-7440 weekdays 8:30 AM-5:00 PM.** City building inspectors will incorporate the RECO inspection into the comprehensive building permit inspection process.

Inspections are generally performed within 1 to 2 days of your call, and can be performed Monday through Friday. Please call to schedule an appointment. Once your property meets RECO minimum standards, the City Building Inspector will complete a Form A, and give you a copy of it for your records.

Inspection and Filing Costs

Renovations: The initial RECO inspection fee is *included* in the City's construction permit fees. There is no additional RECO fee or inspection required, outside of regular building inspection fees.

Property Sales or Transfers: Please make checks payable to CESC. Auditors will not accept cash payments.

Service Provided	Building Type	First Unit per Structure Cost	Each Additional Unit Cost per Structure
Initial Inspection	Single Family Dwelling	$100	NA
	Two or more units per structure	$100	$50

Re-Inspection	Single Family Dwelling	$50	NA
	Two or more units per structure	$50	$25

For either renovations or property sales, if your building does not receive approval on the first inspection, you will have to rectify the non-complying items and schedule a re-inspection.

When the building has passed the RECO inspection, you will receive a "Form A - Certificate of RECO Compliance," from the Building Inspector.

Form A for Sales and Transfers must be filed at the cost of an additional **$20** with the City of Berkeley at:

City of Berkeley
Building and Safety Division
2120 Milvia St.
Berkeley, CA 94704
Cashier Hours: 8:30 AM –3:30 PM Mon—Tues., Thurs—Fri.
9:30 AM-3:30 PM Wednesdays.
Please make checks payable to City of Berkeley.

TIP: You may mail the original **Form A** and a check for $20 per single family structure or unit, or $20 per structure for multi-unit properties, in lieu of filing in person. Be sure to keep your copy of **Form A** for your records.

RECO Form B: Buyer/Seller Warranty and Agent Notification

Filing Fee: $20

When to use Form B:

If a property has previously met RECO compliance (a Form A on record beginning Jan. 1, 1992), and still has all RECO measure in place (door weatherstripping, low-flow toilets, etc.) then the Seller may use Form B at the point of sale or transfer as a warranty that the building is currently RECO compliant. For any RECO measures that may have been removed, please note that these measures must be restored before the Buyer signs. There is no transfer of RECO measures once a property has met RECO compliance. All RECO measures must be maintained for all future sales.

Both buyers and Sellers should do their due diligence before signing, and ensure that all RECO measures are still in place.

TIP: To find out if in fact a building is in compliance with RECO, the Buyer or agent may contact the City's Building and Safety Department via email at: **reco@cityofberkeley.info** The City maintains records for each residential property in Berkeley. If further assistance is required, call 510-981-7440 listen for the RECO option, and give the Building and Safety staff the **address, including any unit number,** of the property to look up.

RECO Form C: Transferring Responsibility for RECO compliance to Buyer

Filing Fee: $20

If a property is not in RECO compliance, and the responsibility for compliance has not been transferred previously, then the Seller may chose to transfer RECO compliance to the Buyer. If the Buyer accepts responsibility, then Form C must be signed by both Seller and Buyer, and must be filed with the City of Berkeley. Form C can only be used once on a property. For all subsequent sales or transfers, a Form B should be used once Form A has been completed, and all RECO measures are in place.

RECO Form D: Escrow Accounts for RECO

Filing Fee: $20

When to use Form D: If a Seller is able to transfer RECO compliance to the Buyer, and RECO compliance has not already been transferred previously, then an Escrow account may be established with funds (0.75% of the final sale price) set aside for the Buyer to use toward RECO compliance, to be done within one year. If RECO funds are not depleted within one year, remaining funds revert to the Seller.

Form D may also be used in the case of hardship or involuntary transfer, such as when the property owner is deceased or the property has been foreclosed on. In either case, the same percentage of the final sale price is placed in escrow for the Buyer to use within one year to complete eligible RECO measures.

Note that Forms B, C and D are available on the City's website at
www.cityofberkeley.info/reco

RECO Requirements and Measures

The RECO energy and water efficiency measures were selected to conserve natural resources, improve equipment performance, and *save you money*. The measures will pay for themselves in a very short time by reducing your utility costs. Many items are simple "do-it-yourself" tasks, while others may require the assistance of contractors. Many local hardware stores, home improvement businesses, and contractors are familiar with RECO requirements; but it is the responsibility of the homeowner to ensure that specifications are met.

1. Toilets

All toilets in the home must be either "ultra-low-flow" toilets (ULFT) using 1.6 gallons of water per flush, or they must be modified to reduce the amount of water flow. Devices installed to reduce water flow must be designed specifically for that purpose. That means **no jars, bottles, or bricks** can be used. Any toilet replaced during renovation must be replaced with a low-flow 1.6 gallons per flush model.

Exemption for low-flow toilets may only be made if the City Building Inspector determines that the configuration of the building's drainage system requires a greater water volume to provide adequate flushing.

TIP: East Bay Municipal Utility District (EBMUD) may offer a rebate for Ultra Low Flush Toilet replacement for single-family and multi-family dwellings. Call EBMUD Water Conservation at (510) 287-1900 to request a rebate application, or visit http://www.ebmud.com and look under "Conservation" for all EBMUD residential rebates.

EBMUD also currently provides several toilet flow reduction devices to their customers at no cost during water conservation audits of your home. The recommended item is an early-closing device retrofit flapper valve that allows full water pressure to flush debris down the toilet, but closes early to reduce the amount of rinse water into the bowl. The device is an easy-to-install, permanent, adjustable, and very effective device that fits most toilet tank types. If this device does not work on your toilet, EBMUD can also provide specially-designed water volume reduction bags that displace about 2/3 of a gallon of water, and hang in the toilet tank without moving around or interfering with the toilet operation. Contact EBMUD Customer Service at (510) 287-0590 for more information. Most general hardware and plumbing supply stores also carry retrofit flapper valves and water displacement bags.

Each toilet flow device saves about 2,400 gallons of water per toilet a year on a typical water bill.

Do-it-yourself: Detailed installation instructions are printed on both the retrofit flapper valves and displacement bag packaging. Installation is very easy. First remove the toilet tank lid. Turn off the water supply (the valve handle is usually located just below the tank) and then flush the toilet to drain water from the tank. The flapper valve device requires no tools and just snaps on, in place of the existing flapper (some tools may be needed if existing hardware, such as a bracket on the overflow pipe, needs to be removed). The displacement bag should be completely filled with water, and hung inside the toilet tank against the tank wall, making sure to keep it away from moving parts.

2. and 3. Showerheads & Faucets

Showerheads and faucets must be installed or modified so that they meet the following flow requirements:

- Showerheads - 3.0 gallons per minute (GPM) or less,
- Kitchen and bathroom faucets - 2.75 GPM or less,
- All other faucets - 4.0 GPM or less.

Bathtub and outdoor faucets are exempt from these requirements, as are older faucets without threads for screwing on aerators.

TIP: East Bay Municipal Utility District (EBMUD) provides customers with free low-flow showerheads and faucet aerators that meet these requirements. Customers can pick up these devices at the EBMUD offices in Oakland, or call EBMUD Customer Service at (510) 287-0590, or visit http://www.ebmud.com and look under "Conservation" for additional rebates.

Rising Sun Energy Center also offers free installation of these devices through their summer program, California Youth Energy Services. Call 510-665-1501 for details and schedule.

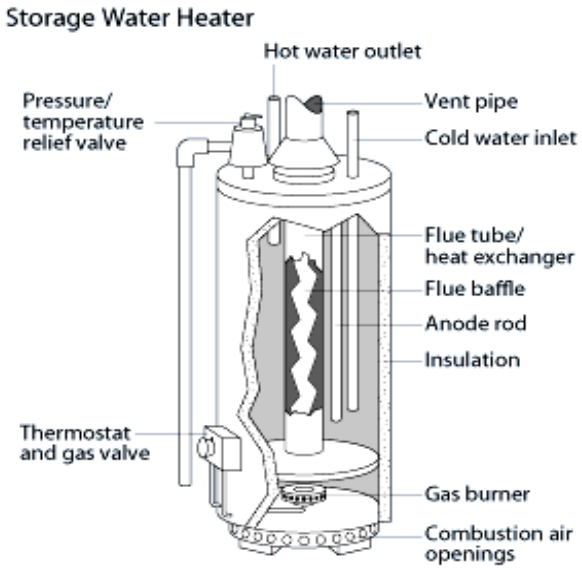
Installing one showerhead, one kitchen aerator and one bathroom aerator will save about 4,380 gallons of water per year, and $8 annually on your water bill. Additionally, if natural gas is used to heat your water, you will save about 33 therms and $30.00 on your utility bill every year. If you have an electric water heater you can expect to save about 450 kWh and $52.00 on your annual utility bill. Your hot water will also last for a longer period of time, since the reserves in the hot water tank are being drained more slowly.

Do-it-yourself: Replacing a showerhead or faucet aerator is one of the easiest plumbing jobs you can do. First unscrew the old showerhead: cover the base of the showerhead with a cloth to protect it from scratches, and use one pipe wrench to get a good grip around the arm of the water pipe to keep it from twisting, and a second to grip around the flat parts (or serration) of the showerhead base where it attaches to the water pipe. Slowly twist the head base counterclockwise, and remove the old device. Wrap one turn of Teflon pipe tape around the screw threads of the water pipe (or apply a light coating of pipe joint compound), and twist on the new showerhead. Tighten slightly with the pipe wrench. Run water to make sure there are no leaks, and tighten more if necessary. Do not over-tighten.

Most faucet aerators can be removed with finger pressure, but a wrench or pliers may be needed Use a cloth to protect the chrome. Wrap one turn of Teflon pipe tape around the screw threads of the faucet spout, replace any required washers over this pipe, then screw on the new aerator to "finger tight." Run water to make sure it does not leak, and tighten some more if necessary.

4. Water Heater Insulation

All water heaters in the home must have an insulation value of R-12 or higher. Most newer water heaters have built-in insulation of R-12; this may be listed on a sticker or nameplate mounted conspicuously on the heater tank. Older water heaters generally have a thermal resistance of R-6, so thermal insulation blankets providing an additional R-6 or more must be attached. Place your hand on the tank wall; if you can feel heat coming through the tank wall, it obviously needs more insulation. If no sticker or nameplate clearly indicates a value of R-12, an insulating blanket MUST be attached.



TIP: City and State building and safety codes also requires that all water heaters have **P/T valves** (pressure and temperature safety release valves) and **earthquake bracing**. Contact the City of Berkeley Buildings and Safety Division at (510) 981-7440 if you have questions about these items. These items should be installed by a qualified contractor.

Exemptions for thermal insulation blankets may only be made if there is less than 2-inch clearance between the water heater and the wall or other permanent fixture, or if your water heater has internal insulation of R-12 or greater. Many new water heaters have a rating on the label or manual that comes with the heater.

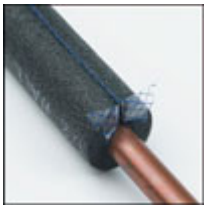
Insulation blankets come in a standard size (48"x75") that should cover any common water heater holding up to 60 gallons of water. The blankets come in two thicknesses - the 2" thickness has a rating of R-6.7, and the 3" thickness rates at R-10. Costs range from $10 to $17. It is not required, but highly recommended, that an R-10 blanket be used around water tanks heated by electricity, or for any water heater located in an unheated area, such as an outdoor closet. Note that most modern water heaters manufactured after 2005 have an internal insulation of R6 or greater.

Water heaters run constantly, keeping the water in the tank hot all the time. Adding a layer of insulation around a water heater reduces the energy it uses to keep this water hot. If natural gas is used to heat the water, a thermal blanket will save about 24 therms (about $20.00) on your utility bill every year. For an electric water heater, the savings will be about 540 kWh and $66.00 a year. The water in the tank will also stay consistently warmer due to slower temperature swings between heating cycles. In many homes it is possible to turn down the water heater thermostat setting to 120 F. degrees for even more immediate energy savings.

Do-it-yourself: Most water heater blankets have glass fibers in them, so wear protective gloves and a long-sleeved shirt. Read the packaging for detailed instructions. The package should include special tape. Be careful not to let the blanket touch the hot water outlet pipe and gas flue pipe, as they may be extremely hot. If the water heater is strapped down for earthquake safety, use

a screwdriver to remove these braces temporarily while you attach the blanket. With the vinyl side of the blanket on the outside, loosely wrap the blanket around the heater, keeping the blanket directly against the tank surface and under any nearby pipes, such as the overflow pipe. Use small pieces of the tape to attach the inside edge of the blanket to the tank, and to temporarily suspend it from the top surface of the water heater. Tighten the blanket around the tank and tape completely along the blanket's outer seam to seal it. Keep the blanket clear of the thermostat, gas valves, or gas conduit by cutting holes or slots in the blanket with scissors as you proceed. Replace the earthquake bracing, loosening it slightly so it doesn't compress the blanket padding. After a few days of experience, you may find your hot water temperature has increased so it may be desirable to turn down the water heater temperature.

5. Hot & Cold Water Piping Insulation



Both the cold and hot water pipes leaving the water heater must be insulated for a distance of at least two feet, or until they enter a wall. The insulation used must have a thermal rating of R-3 or higher.

Pipe insulation comes in two main types: self-adhesive insulating tape that can be wrapped around the pipe, and foam tubes that are pre-slit to slip over the pipe. Insulation tape and tubes will cost between $5 to $10.00 to cover 6 feet of pipe.

Insulating the first two feet of **both** the hot and cold water pipes reduces “recirculation losses” -- water cooling off in the pipes and sinking back into the tank to be reheated. Insulating a longer distance of the hot water pipe is not required but is recommended, especially if this pipe runs through an unheated space of the home. For a gas water heater, the minimum required pipe insulation will save as much as 14 therms (about $5.00) a year. For an electric water heater, savings will be about 340 kWh and $40.00 a year. The hot water delivered to faucets may also be hotter, which may allow you to turn down the water heater temperature for even more energy savings.

Do-it-yourself: If the piping to be covered is easily accessible but has lots of bends, insulation tape (usually foil-covered) may be easier to apply. If the piping has long, straight runs then tubular insulation installs more quickly. Wipe the pipe clean of dust and grease before proceeding. **Tape** style insulation is easy to apply: simply wrap the tape around the pipe, slightly overlapping with each turn. Secure the ends in place all the way around the pipe diameter with a strip of duct tape. For **tubular** insulation over straight pipe runs, simply slot the insulation tube over the pipe. Elbows and bends in the pipe may be covered more easily by cutting short slits or V-notches in the tube at the bend locations. All tubes - straight or bent - must be sealed along their seams with a length of duct tape. Also tape around the ends of tubes all the way around the pipe diameter, and at the joints between tube sections. Self-sealing tubes don't need duct tape along their seams, but still need to be taped at the ends. If you decide to insulate more length of your hot water pipes, make sure you know which pipes are carrying hot water by feeling their temperature, after running the water for a while to heat up the pipes.

6. Hot Water Piping in Pumped, Recirculating Heating Systems

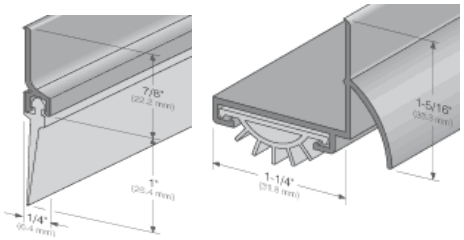
These systems are most commonly found in hotels, apartments, and other multi-unit buildings, but are also occasionally found in single-family homes as gravity water heating systems and solar heating systems, or pumped domestic hot water systems.

All of the hot water piping in pumped, recirculating water heating systems must have insulation of R-3 or higher. This applies to the entire hot water distribution system (not just the first two feet from the tank), except where piping is inaccessible (inside walls, etc.)

All the RECO requirements for water tank insulation, and hot and cold water piping insulation (first two feet from tank) described above also apply to these systems. This includes insulation of large commercial-scale tanks that provide hot water for residential heating.

Pipe Replacement: When the time comes to replace recirculating hot water pipes, there are a couple of lower-cost options than re-plumbing with copper pipes. New advanced plumbing designs can reduce the amount of water wasted through recirculating hot water, and provide hot water nearly instantaneously. These advanced plumbing methods cost less to install, and waste less water and energy by using small diameter flexible PEX (Polyethylene Cross Link) piping directly to fixtures through a short manifold located at the main water heater. Contact a knowledgeable plumber for details and estimates.

7. Exterior Door Weather-Stripping



Weather-stripping material must be permanently nailed or screwed in place around the sides of and top of exterior doorframes, and a door sweep, or shoe must be nailed or screwed in place along the bottom edge of each door. This includes doors to unheated garages, basements, crawl spaces, attics, and porches. Weather-stripping must be permanently affixed; self-adhesive strip insulation tape does NOT meet RECO requirements, unless it is also tacked in place every six inches.

Weatherstripping and door sweeps stop the air leaks and drafts around doors. There are many weatherstripping products and door bottoms available. Measure the total door perimeter length and doorframe width before selecting these materials, and look for other details of the doorframe and jamb that may limit your options. The longest-lasting and most effective types of weather-stripping have a metal frame holding a vinyl or rubber seal, with screw holes in the frame, and cost $15 - $20 for 17 feet of weather-stripping. Spring-tension copper V-strip is also acceptable. Again, products having adhesive backing must also be tacked in place. A three-foot wide door shoe will cost about $5 - $15, and a door sweep will cost $5 - $10. Both are available in a variety of colors and are comprised of an adjustable metal or wood plate with an attached rubber or felt sweep strip. Door shoes are more durable, and provide a better weather seal at the bottom of the door, and usually have an exterior cap to deflect rainfall away from the threshold.

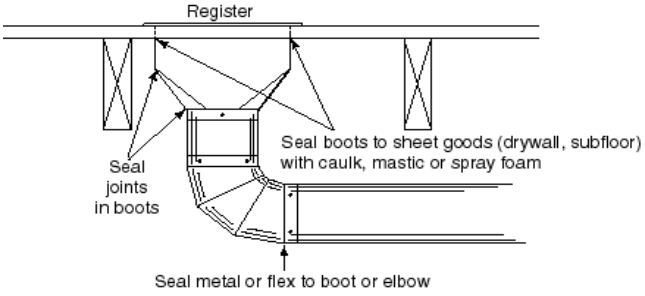
For a natural gas fired heating system, this measure will save about 15 therms a year in gas utility cost for *each* door that is weather-stripped. For electric heating systems you will save 390 kWh a

year per door. The home will also be less drafty and more comfortable, and you will hear less street noise.

Do-it-yourself: In all cases, follow installation instructions on the product package. Thoroughly clean the doorframe or jamb where the weather stripping will be attached. Weather-stripping is generally attached to the doorjamb just outside the door, with the vinyl touching the closed door panel to form a seal. In some cases "V-strip" may need to be applied to the doorframe itself; when the door is closed the "V" compresses, making the seal. Weather-stripping can be cut to size using a hacksaw or metal snips. Make straight cuts across the weather-stripping perpendicular to its length. Tack the correctly sized piece of weather-stripping on the jamb, then attach it permanently using screws or nails all along the metal frame.

The door threshold plate should be in good condition and higher than the floor for the full arc of the door's swing. Door shoes attach under the door and usually require door removal and size adjustment (using a plane and sander). This should only be performed by an individual with good carpentry skills. Door sweeps are easy to install, and come in two different widths to cover 1/2" to 3/4" gaps below the door. Measure this gap with a ruler instead of "eyeballing" it to make sure you purchase a wide enough sweep. Use a hacksaw or metal snips to cut the door sweep to the correct width. Hold the sweep against the door in its desired location, which should be low enough to just touch the threshold plate when the door is closed, but not so low as to cause scraping. Fasten the sweep to the door with screws. (Most door sweep plates have screw slots that allow minor adjustments to get the right fit.)

8. Furnace Duct Work Insulation and Leaks



All joints in hot air ducts from furnaces must be sealed with acceptable pressure-sensitive tape or mastic. All ducts must also be insulated to R-3 or higher. Exemptions are made for ducts running through heated spaces, or ducts that are inaccessible because they are located in walls or under floors, or are coated with asbestos. These regulations do not apply to flex-tube ducting, (i.e., tubular, flexible ducting) which is pre-insulated at the factory. Plenums and return ducts must also be sealed, and insulated with duct board or similar insulating product of at least R-3 value.

Leaks in return ducts can pull carbon monoxide into the house from attached garages or faulty flue pipes, or cause back-drafting from gas water heaters, or harmful vapors from stored chemicals, or, in general, draw in foul air from some other place not intended by the system. By sealing and insulating the return ductwork, the system is closed up and cannot draw in any of these harmful toxins.

Mastic to seal metal ductwork needs to be applied around the duct joints. Duct insulation blankets rated at R-3 or R-4, or rigid duct board should be used to cover the surface area of all ductwork.

TIP: Duct tape is actually not acceptable under RECO for sealing leaking air ducts. It dries out over time, and contributes to air leaks and heat loss. Use a butyl-backed foil tape, or a clear tape **rated "UL-181-B" or "UL-181-FX 99DJ."** One such product is "Flexmate 285." Check the tape packaging to verify that the product meets this standard

Standard metal ductwork typically leaks at its joints (especially those near the furnace cabinet/air handler), and transfers heat to the surrounding air all along its length. Ductwork running through unheated spaces such as attics, basements, or crawlspaces will waste an average of 20% of the energy used to heat or cool the home. For a natural gas fueled furnace, sealing and insulating ductwork can save about 88 therms a year on your utility bill. The house will also warm up more quickly, and may feel more comfortable and less drafty while the furnace is on.

Do-it-yourself: See "TIP" about using the correct type of tape. Thoroughly clean metal duct surfaces around all the joints with a damp rag to remove all dust and dirt. Apply mastic (furnace cement) by smearing it on by hand (while wearing a face mask and disposable latex gloves), or with a brush, around all connections between the different pieces of ductwork. Mastic can be purchased online, or through a local furnace and plumbing supply company. Allow the mastic to dry for 24 hours before running your heating or cooling system, or insulating the ducts. To span gaps larger than 1/4", use fiberglass mesh. Apply a small amount of mastic to the ductwork, stick the mesh onto it, and then cover the mesh with more mastic. DO NOT consider the furnace filter slot or the combustion air inlets as "gaps."

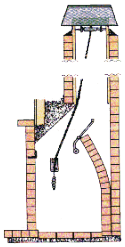
To install tape at joints, carefully wrap the tape around the entire circumference of the joint, and press firmly over the entire surface with your fingers or brush to ensure that it completely adheres. (Mastic is, by far, the preferred method.)

To approximate the amount of insulation needed, multiply the total length of the metal ducts by their diameter, and add another 20%. For example, if you have 150 feet of duct with a 20-inch outside perimeter, you'll need at least 250 square feet of insulation [(150 ft) x (20 / 12) ft = 250 sq. ft.], plus an extra 20% to account for the blanket overlap as the insulation is wrapped around the ducts [1.2 x 250 = 300 sq. ft.], for a total of 300 square feet.

Duct insulation is applied by wrapping it in a spiral pattern around the ducts. DO NOT USE DUCT TAPE for securing insulation. Use the foil tape or **UL-181-B** tape described above, or panduit straps, to secure the insulation at the starting end, then wrap the insulation around the length of the duct, overlapping about 1 inch, taking care to leave no gaps. Use the tape to secure the ends of the insulation, and when connecting two separate pieces of insulation.

If your ductwork already has insulation, look for dark spots on the existing insulation as an indication of leaks. Remove those sections of insulation, repair the leaks, and attach new insulation as above.

It is a good idea (though not required by RECO) to get a furnace tune-up and inspection every year, and change furnace filters monthly during the heating season.



9. Fireplace Chimneys and Dampers

Dampers, doors, or other devices must be installed to block airflow through the chimney when the fireplace is not in use. Combustible materials, such as cardboard or wood may NOT be used as dampers, doors, or closures.

A chimney damper is an operable flap inside the chimney box that can be opened or closed using a lever or chain pull. These devices typically cost from $175 to $275, installed. Alternatively, top-mounted flue dampers that close and open using a spring-loaded cable can be installed. Costs depend on size of chimney. The smallest basic unit is about $200 plus installation.

TIP: When considering a top-mounted chimney cap or damper to meet the RECO requirement for your fireplace, choose a model that will allow for easy chimney sweeping and maintenance. Note that top-mounted caps and dampers **CANNOT** be used with wood stoves or gas log fireplaces.

Fireplace doors mount to the opening of the fireplace, and are generally decorative as well as functional. These come in many styles, materials, and options, but most generally have a metal frame with glass doors and additional air vents that can be opened or closed to adjust fire draft level and heat entering the room. Fireplace doors start at $300 and run up to $2000 or more depending on choices of style, materials, and functions. Installation of the doors generally costs another $75 to $250.

A third option is to permanently seal off the fireplace. This must be done using sheet metal, NOT a flammable material like wood or cardboard. The sheet metal must be sealed with caulking and attached to the fireplace opening with masonry screws. The installed cost is typically about $75.

Having a fireplace with an unrestricted chimney opening is like leaving a window open in the house all year, except a chimney is even more effective at sucking heated air up and out of the house. This wastes energy and money, and makes the home drafty and uncomfortable. Dampers or doors can also stop smoky odors from blowing into your house on windy days. For a house with a gas furnace, dampers or doors can save about 320 therms and $165.00 a year on utility bills.

Do-it-yourself: Installation of *dampers* should be performed only by professional chimney masons. Installation of doors, dampers or seals will require moderate skill with tools, a power drill and masonry drill bits (unless the kit includes clamps and screw tighteners), fire-safe caulking materials, correctly sized devices (or the ability and tools to modify them to correct size), and the appropriate mounting hardware. For doors, follow the instructions with your specific model.

10. Ceiling/Attic Insulation

RECO requires ceiling insulation of at least R-30 rating. This is about 9 inches of blown-in cellulose insulation, which should cover a 2"x6"rafter by at least three inches at all points in the attic. Most Berkeley houses have ceiling insulation levels less than R-11, or about a 4-inch thickness of insulation. R-30 is a cumulative rating, so if you already have R-11, more will be needed to bring it up to R30. (RECO has a "grandfather clause" that approves existing ceiling insulation of **R-12** (6 inches deep) or better to pass inspection. If the existing insulation value is R-11 or lower, it must be brought up to R-30 value).

Exemptions may be allowed if the building has no attic, or the attic space is less than 24 inches high (measured from the bottom of the rafter to the top of the joist). Buildings with attics but no access doors or panels into the attic are NOT exempt. An access door must be constructed, and insulation installed in the space above the ceiling. Any "knob-and-tube" electrical wiring is present in the attic must be inspected by a licensed electrician.

SAFETY NOTE: "Knob and Tube" wiring in older homes: if your home has "knob and tube" wiring in the attic, you ***must*** have a licensed electrician inspect the wiring prior to installing any attic insulation, and certify that the wiring is safe to insulate around. This written certification must be submitted with your **RECO Form A** and $20 payment to the **City Building and Safety Division.** Existing insulation that meets the current RECO code is exempt. However, if additional insulation is needed to bring the current level of insulation into compliance, an inspection and written certification is required.

Wiring that fails a safety inspection should **never** be insulated. Doing so could cause a catastrophic fire, threatening the lives of those in the home. Upgrade poor wiring, including junction boxes and splices that may overheat if surrounded with insulation.

Never use foil-faced batts or metal supports if knob and tube wiring is present; to do so could cause arcing, short-circuiting, and/or fire.

Ceiling insulation reduces the heat loss from your home. Installation labor cost will vary widely depending on attic accessibility and complexity.

TIP: Air sealing done inside your attic at the top of interior and exterior walls BEFORE insulating will greatly reduce the amount of heat leakage from your home in winter, and can reduce the heat buildup from the attic into your home in the summer. A Home Performance Contractor skilled in this can provide estimates, and can even perform diagnostic tests to check air infiltration rates before and after their work is completed.

Rising Sun Energy Center offers a low-cost subsidized attic insulation program that will meet RECO requirements. Savings are 40-60% off typical retail cost of materials and insulation. Contact them at 510-665-1501 for program details and scheduling.

A 1,500 square foot, single-story home heated by natural gas can save ~430 therms per year on its heating bill by increasing the ceiling insulation level from zero to R-30 or greater. Ceiling insulation retains the heat in the rooms below to keep occupants feeling warmer, and dampens outside noise to keep your home quieter.

Do-it-yourself: If the house has a low-slope roofline, many interior attic angles or eaves, or difficult access, it is recommended that an insulation contractor be hired to install blown-in insulation. Insulation blowers can be rented, but experience is needed to equally distribute the insulation both for its protection value and to avoid excess weight on any portion of the ceiling.

If the attic area presents no major accessibility problems, loose fill insulation or batts are relatively easy to install by hand. This can be a hot, dirty, and arduous task. Protective clothing, goggles, gloves, and breathing masks should be used. Portable lighting will also be needed.

Before adding insulation, inspect the attic for electrical wiring, light fixtures, chimneys, exhaust flues, or any other heat-producing fixture, to reduce fire hazards. Insulation must be kept away from wiring and heat sources. If there is knob-and-tube wiring in the attic, have an electrician inspect it before proceeding. Keep insulation from settling around the heat-producing fixtures by erecting baffles around them. Leave plenty of space for airflow around the fixtures so the baffles themselves do not become a fire hazard.

Loose fill cellulose can be blown in between the ceiling rafters; it is okay if the insulation is packed down a bit, as this will increase its effectiveness. Dense-filled cellulose can achieve an R-value of 4.0 per inch of thickness (Dense-pack cellulose R-value provided by US Housing and Urban Development (HUD) ToolBase Services) You can continue to add more to increase the effectiveness.

Fiberglass batts of R-30 (or greater for more savings) should be carefully aligned with rafters to eliminate gaps that can reduce the effectiveness of the insulation; excess material at the eaves should be trimmed away using scissors or a razor knife, rather than packed down, since packed fiberglass actually conducts heat out of the house.

TIP: Attics have vents along the exterior walls, top ridge or in the roof gables to allow for air expansion as the temperature changes. This ventilation is important for removing moisture and carbon monoxide and dioxide that may contribute to mold and other problems, so make sure you use baffles over vents, and above the wall openings before installing the insulation (available at building supply stores; or use a short length of fiberglass batting or rigid foam insulation). This will keep the vents open and allow the house to "breathe." Insulation should not rest against the roof deck/underside of the roof.

11. Common Area Lighting (in multi-unit buildings only)

Apartment buildings or buildings with three or more units are required to use energy efficient lighting of at least 25 lumens per watt in all common areas, porches or walkways and hallways.

In most cases, this simply involves replacing the old incandescent light bulbs with new screw-in compact fluorescent lamps (CFL's). These are available in a variety of shapes and sizes to accommodate most standard applications. If the fixture is located outdoors, make sure to use a bulb that is specifically rated for outdoor conditions. Outdoor-rated CFLs come in common floodlight dimensions and cost only $3-$15.
Compact Fluorescent lamps (CFLs) last much longer than incandescent bulbs -- ~10,000 hours for CFL's versus 750 hours for incandescent bulbs. For 12 hours a day, this is 28 months of operation for a CFL versus 2 months for an incandescent). One CFL will last as long as 14 incandescent bulbs, so the life cycle replacement costs are about the same, but maintenance time is significantly reduced.

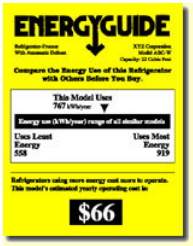
CFLs use 1/4 of the electricity of an incandescent. A 20-watt CFL replacement produces as much light (lumens) as a 75-watt incandescent. CFLs can save about 50% of the lighting portion of your electricity bills each year. Product packages generally provide information about the equivalence of light output of CFL's to incandescents (for example, a 27W CFL replaces a 100W incandescent), as well as product life and energy savings estimates.

If a compact fluorescent lamp won't fit into an existing fixture as required by RECO, the fixture must be replaced with one designed to work with CFLs. Depending on the style and features you choose, these new fixtures cost from $10 to $50, with the CFL included. Most CFL's are now "instant-on" with electronic ballasts, and will not flicker. Check product packaging for recommendations and restrictions.

TIP: Look for in-store rebates on compact fluorescent lamps and light fixtures. Note that all fluorescent lighting is regulated by the State of California as a Universal Waste, and must be disposed of at a recycling facility. Place old CFLs into a zippered locking plastic bag for protection against breakage, and bring it to the Berkeley Community Conservation Center at Second St. and Gilman, next to the Berkeley Transfer Station. Call 510-524-0113 for hours.

Do-it-yourself: In most cases, installing a fluorescent lamp in an existing incandescent fluorescent fixture is "as easy as screwing in a light bulb." However, higher wattage CFL's may be too large to fit into some fixtures, but using a shorter, lower wattage CFL is sometimes acceptable for general indoor lighting. Just make sure the CFL you use has at least 25 lumens per Watt. For example, a 15-W CFL must produce at least [15-W x 25 lumens/W] = 375 lumens. The typical 15-W CFL produces around 800 lumens, well above the RECO requirements.

If it is not possible to fit a screw-in CFL into an existing light fixture, replace the existing fixture with one designed to hold a ballast & lamp CFL. An electrician can do this, or do it yourself if you are knowledgeable about working with electricity. These fixtures install just like any regular light fixture. Turn off the electricity to the fixture at the circuit breaker before starting work. Connect the positive and negative wires to the appropriate house wiring using twist connectors and electrical tape as needed, and attach a ground wire. Attach the fixture to the support bracket. Flip the circuit breaker back on, and test the lamp.



TIP: When replacing any appliance, look for energy-saving models. Review the yellow and black "*Energy Guide*" for specific information on energy use, and compare models for efficiency.

Finding Suppliers and Contractors

Search for RECO compliance building supplies and contractors for various tasks in the phone book *Yellow Pages* listings, or an internet search under:

Home Performance Contractors .... energyupgrade@cbpca.org; www.CBPCA.org
..... Energy Conservation Products & Services
..... Home Repair & Maintenance
..... Furnace Repair/Duct Testing

General Building Materials ..... Home Repair & Maintenance
..... Hardware – Retail
..... Builders Hardware
..... Building Materials

Water Conservation ..... Plumbing Contractors
..... Plumbing Fixtures, Parts, & Supplies - Retail
..... East Bay Municipal Utility District (white pages)

Water Heater & Pipe Insulation .... Insulation Contractors - Home & Building
..... Insulation Materials
..... Hardware – Retail

Ceiling, Pipe, & Duct Insulation .... Insulation Contractors - Home & Building
..... Insulation Materials
..... Heating and Ventilating Contractors
..... Heating Specialties

Weatherization Materials ..... Hardware – Retail
..... Builders Hardware
..... Building Materials

Fireplaces & Chimneys ..... Chimney Builders
..... Masonry Contractors
..... Chimney and Fireplace Cleaning and Repair
Fireplace Equipment
Fireplaces

Lighting and Electrical ..... Electric Contractors (knob & tube wiring safety checks)
..... Lighting Fixtures - Retail
..... Hardware – Retail
..... Some Big-Box Retailers, such as Costco or Orchard Supply

Don't forget free products, rebates and services from PG&E and EBMUD programs.