The Energy Code for Existing Residential Buildings

Implementing provisions of the energy code for new construction is an easy task by incorporating them at the design. When the building is already constructed it becomes more difficult to obtain the amount of energy compliance found in new construction, but our existing building stock is where we can make a more significant effect for energy efficiency. The first thing to keep in mind when dealing with existing building is it isn't an all or nothing situation, but more of a if you touch it bring it up current adopted energy code, or as close as permitted by existing circumstances.

Historic Buildings R501.6

Historic building have a unique situation that on occasion there may be portions of the energy code that can not be adhered to by strict letter of the code due to the historic nature of the building. If the building meets one of the following conditions it is considered a historic building and is given some leeway.

1. Listed, or certified as eligible for listing, by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, in the National Register of Historic Places.
2. Designated as historic under an applicable state or local law.
3. Certified as a contributing resource within a National Register-listed, state-designated or locally designated historic district.

If a historic building has a component of the alteration, repair, or change of occupancy that could threaten, degrade, or destroy the historic form, fabric or function of the building that component would be exempt if a letter is presented to the code official and signed by an approved authority on the historic nature of the building.

What does this mean? It means that if a component of the building can not comply with the provisions of the energy code, because it would change the nature of the historic measure of the building. That one component would be exempt by this provision, but not the entire scope of work is exempt.

Historic Buildings R501.6 - Example

Situation	Energy Code Solution
Alteration to a 100 year old home has been submitted. The planning department states the home is in a historic district, and must comply with maintaining the exterior historic look of the building. The alteration is being done on the interior of the building, but the scope of work includes replacing the old windows, and exterior wall work.	The windows may not be able to be replaced with more efficient windows. There are other areas the project can improve the energy efficiency. • There may be a possibility for air sealing of any gaps between the framing and the window from the interior side of the walls. • If the walls are exposed to be cavity walls that do not contain 3 rows of brick you would have the opportunity to fill these cavities with insulation. • You may not get the full R-value required by the table, but you had nothing before and now have some R-value in the walls. • Perform some air sealing of the thermal envelope from the interior. • New mechanical equipment installed meets the provisions of R403.
The energy code is all about options to get you there	

Additions R502

Additions are probably the easiest type of construction for existing buildings to get energy compliance with. You are starting from scratch. The addition would need to comply with the energy code as it is new construction because this is an existing building there are a few details that have to be taken into consideration.

- The addition must comply without requiring the existing building or systems to comply with the energy code
- Can not make the building or the building systems unsafe or hazardous conditions, or overload the existing system.
- The addition is deemed to comply with the energy code when one of the following complies:
  - Addition alone
  - Existing building and addition- as a single building or where the building with the additions does not use more energy as existing building
- Any nonconditioned or low-energy space the becomes conditioned space will be required to comply with the code as if new construction (within the limitations of the structure)
- New Building envelope must comply with one of Tables or with REScheck, the specific insulation requirements, U-factor, sunroom provisions, air leakage
- New heating and cooling systems must comply with R403
- New service water heating must comply with the sections of R403
- New lighting will need to comply with R404

Additions R502 - Example

Situation	Energy Code Solution
An addition will be added to an existing house that will have a bedroom and a bathroom. The intent will be to utilize the existing mechanical equipment to heat and cool the addition. New ductwork will be installed and connected to the existing HVAC system ductwork.	The addition would comply with the following: • The new exterior walls will be required to be insulated to the values in the R-value Insulation table • The new attic area will be required to be insulated to the R-value insulation table • If a slab will be utilized that is 12” or less below grade slab edge insulation to the R-value insulation table • All new fenestration will be required to the U-factor and possibly the SHGC – dependent on the climate zone • The existing mechanical equipment would to demonstrate it can handle the additional loads of the addition, or a new or separate system must be installed for the addition. • The new duct work will be required to be sealed • New duct that is located outside fo the thermal envelope will be required to be insulated. • If a circulation system is installed it will be required to have the controls • Hot water piping would be required to be insulated to a minimum R-3 • Lighting will be required to comply with 404 for high efficiency of bulbs and controls, if

Alterations R503

Alterations to a building can not make the existing building any less conforming to the code than when it was constructed. Energy requirements for alterations apply to the work that is being performed, without requiring the unaltered portions of the existing building or building system to comply with the code. Basically if you touch it the energy code is required with a few exceptions if the energy use is not increased.

- Can not make the building or the building systems unsafe or hazardous conditions, or overload the existing system.
- Building Envelope the following items do not require to comply with full requirements as new construction.
    - Storm windows over existing windows
    - Existing ceiling, wall, or floor cavities if exposed in construction provided they are filled with insulation
    - Existing roof, wall or floor cavity is not exposed
    - Roof recover
    - Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing
    - Applied film on existing single pane windows to reduce SHGC when not being replaced
- Replacement fenestration if the sash and glazing are replaces must comply with Table R402.1.2 for both U-factor and SHGC—area weighted average may be used for multiple replacements
- New heating and cooling systems would comply with R403
- New Service water heating systems would comply with R403
- New lighting would comply with Section R404– lighting efficiency and controls, if applicable

Alterations R503

Energy Requirements	Example
Existing ceiling, wall, or floor cavities if exposed in construction provided they are filled with insulation	If the insulation exists in the cavity and the cavity is filled no further insulation required If the existing cavity does not have insulation or a reduced amount of insulation as long as the cavity is filled with insulation even if the amount of insulation does not meet the minimum R-value in the current code it is compliant
Existing roof, wall or floor cavity is not exposed	Any part of the building that is not part of the alteration is not required to comply with the energy code
Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing	When the roof is the location of the thermal envelope and not at the ceiling this exemption requires insulation be added above or below the roof sheathing
Replacement fenestration	If only the glass is being replaced it doesn't need to comply with the U-factor or SHGC requirements. If the entire window unit is being replaced then the U-factor and SHGC would apply. The option for an area weighted average for U-factor and SHGC is permitted.
New ductwork from extending from	>40 linear feet—no duct testing
New lighting	If replacing less than 50% of the luminaires in a space do not need to comply with R404

Maintenance and Repairs R501.3 & R504

Buildings should be maintained to perform as intended and under the code they were built to.

When there is damage to a building the repairs are not required to comply with the latest adopted energy code.

Examples listed in code as repairs

- Glass replacement in existing sash and frame
- Roof repairs
- Repairs to only the bulb, ballast, or both in a luminaire being replaced

Situation	Energy Code Requirements
Window breaks	No energy code requirement– fix the window and glass
Roof leaks	No energy code requirement– fix the leak
Light bulb breaks	No energy code requirement—replace bulb
The plumbing in the bathroom as a leak that damages, floor and walls	No energy code requirement—repair the leak and build the bathroom back to how it was If there was insulation in the wall or floor that was damaged by the leak then the insulation would need to be placed back into the floor and/or wall to the R-value it was prior to the leak
There is a fire in the garage	When building back you would build back to what was installed prior to the fire. All components of the thermal envelope would need to be returned to the original values.

Change of Occupancy or Use R505

Spaces that have a change of occupancy or use and increases the energy usage then the project will be required to be brought up to the full extend of the code as if it was new construction.

Any space that is converted to a dwelling unit from a different use or occupancy it will need to be constructed to the full extent of the energy code as if it was new construction.

There is an exception to this if you are using the simulated performance path you demonstrate it doesn't exceed 110% of the annual energy cost.

When having a project that will have a change of use such as converting a garage to a dwelling unit or a bedroom. One must keep in mind while there is a change of use you are not starting from scratch. You have an existing structure that technically must comply with the full extent of the code as new construction. That is trying to fit a square peg into a round hole. How does one approach this type of project for energy compliance? What are the components that can be complied with fully, and what items are you doing the best that one can with what is currently there?

Many times prescriptive compliance for projects that convert unconditioned space to conditioned space Is not possible. Using the simulated performance alternative or a REScheck provides opportunities for compliance with the energy code. Remember chances are that the space that is being converted is probably more energy efficient then the rest of the house. There will be projects where we are getting the intent and the best we can under the existing conditions, but may not be in strict compliance with the energy code

Change of Occupancy or Use R505

Wall insulation	Not all walls are 2x6 walls to be able to get an R-20 or R-30 in the cavities. Fill that existing cavity up with as much insulation as possible. This may require the use of closed cell foam.
Attic/roof insulation	The attic will be able to get a full R-value to it. Many roofs or ceiling may have been exposed ceiling to show framing designs i.e. beams. Insulate at the roof to the depth that can be obtained with the existing structure.
Slab edge insulation	This is one of the more difficult areas for compliance in existing garages. Trade offs are not allowed for slab on grade insulation. Many designers will install a framed floor above the slab on grade. This allows for the needed cavity insulation to be installed.
Glazing/window/door	If these are being replaced there is no reason they can not meet the U-factor and SHGC. In fact this is an area to do more than what is required by the code This will permit the project to “make up” energy efficiency that may not be able to be met due to existing conditions
Floor insulation	There are several options for the floor insulation. Typically for a garage conversion the floor is often insulated Place sleepers on the slab and insulate the floor with as much insulation the space will permit If the floor involves existing framing, fill the cavity with as much insulation as the cavity will permit