



COCONINO COUNTY – Department of Community Development

2500 North Fort Valley Road, Building 1, Flagstaff, AZ 86001 Phone (928) 679-8850 Fax: (928) 679-8851

ENERGY CODE – SCOPE OF WORK

1. Insulation requirements – Building Thermal Envelope: The boundary of the building exterior elements that separate and enclose the conditioned or heated space from the unconditioned space. This includes exterior walls, the roof, the floor, and any other building element adjacent to the unconditioned space. IECC 402.1.
 - a. R-38 in the ceilings including the gable ends. R-30 minimum may be used for 2 feet around the edges at the truss ends and over the top of the exterior wall or use raised heel trusses. Use insulation baffles for air circulation or raised heel trusses. R- 30 for vaulted ceilings. In vaulted ceilings, air circulation and venting shall be maintained above the insulation by deeper roof framing or insulation baffles running continuous up the roof structure.
 - b. R-19 for 2x6 wall framing. R-15 for 2x 4 wall framing. All corners and intersecting wall space at exterior locations shall be fully insulated by using approved framing methods. Installation **BEST PRACTICE** use R-22 (dense) insulation for 2x6 wall framing.
 - c. All knee walls shall be fully insulated and have an air barrier installed on both sides of the wall which includes the attic side.
 - d. R-30 for wood floor framing. Exception: Floor framing of 2x6 joists may have R-19 or R-22 (dense) insulation. Spaces of second floor framing that adjoin the exterior wall shall be insulated and the insulation held in place by approved methods.
 - e. Under slab shall be insulated with R-10 rigid insulation on the interior of the stem wall to 6 inches below outside grade and for 2 feet around the perimeter of the building or similarly R-5 for 4 feet around the perimeter of the building. There shall be installed R-5 rigid (1 inch) insulation between the top course of the stem wall and the slab as a thermal break. Option: R-10 rigid insulation on the exterior of the stem wall from the footing up to the top of the slab. The exposed insulation shall be covered with a protective metal Z flashing connected up on the wall framing and then covering the insulation down to 6 inches below grade or other approved methods.
 - f. Building floors that are of slab construction and are heated by in-floor hydronic heating shall have the entire under slab insulated by a minimum of R-5 rigid insulation or an R-5 listed thermal blanket. Installation **BEST PRACTICE** use R-10 rigid insulation under the entire slab.
 - g. Garages that are heated by an intermittent heating appliance (unit heater) will not require insulation under the slab floor. Walls and the ceiling in a heated garage shall be insulated as required according to the Energy Code and shall have an insulated garage door. Garages heated by in-floor hydronic heating shall have the entire under slab insulated by a minimum of R-5 rigid insulation or an R-5 listed thermal blanket.
 - h. As an installation **BEST PRACTICE** all plumbing water pipes and vent pipes shall be routed through interior walls so as to allow full insulation in exterior wall cavities. Unless structural or architectural design prohibits pipes to be installed in interior walls then they may be routed in exterior walls.

- i. Sprayed Foam Insulation: Roof and floor framing back side of sheathing. Open cell foam; R-4 per inch, use 7 inches minimum. Closed cell foam; R-6 per inch, use 5 ½ inches minimum and cover the back side of the framing members. Exterior wall stud cavity, fill the entire framing space. This conforms to the Energy Code prescriptive methods for R-30 insulation for a vaulted roof and a floor and R-19 for exterior walls.
2. Insulation installation – Alignment and contact of the insulation to the air barrier. County Ord. 07-12, Part V, # 1.E.
 - a. An air barrier is a solid and rigid material that separates indoor (conditioned) and outdoor (unconditioned) air and makes up the inside surfaces of the insulated cavity. These materials include the drywall, panel sheathing and framing of the wall cavity, the floor sheathing of the floor assembly, the drywall of the ceiling and the interior surfaces of knee walls, dropped ceilings (soffits) and enclosures of concealed construction.
 - b. Insulation shall be installed in full contact with the air barriers on all sides (6 sides) of the exterior wall cavity including knee walls. The insulation shall be installed so as not to create any voids around piping, wiring, blocking and any other obstruction within the wall cavity.
 - c. Insulation shall be installed in full contact with the air barrier at the unconditioned side of the floor sheathing in crawl spaces above and in attics the dry wall ceiling covering below. The insulation shall be installed so as not to create any voids around piping, wiring, blocking and any other obstruction within the floor or ceiling cavity.
 - d. When faced insulation is used the tabs of the insulation facing shall be lapped over the framing members.
 - e. **NOTE – There shall now be required an Insulation Inspection before the installation of drywall which is after the Rough Trades Inspection.**
 3. Air leakage – The building thermal envelope shall be durably sealed to limit air infiltration. The sealing methods between dissimilar materials shall include installation of air barriers, flashed, caulked, gasketed, or weather-stripped. IECC 402.4.
 - a. Air barriers shall be installed in the following locations: the attic sides of knee walls of intersecting floors and roofs, behind tubs and showers on exterior walls, dropped ceilings, chases and fireplace enclosures adjacent to the thermal envelope. All exterior sides of wall construction shall be fully sheathed or covered with exterior panel siding to meet the requirements for exterior air barriers.
 - b. Approved sill seal gasket material shall be installed under the bottom sill plate for slab on grade construction.
 - c. The exterior of all buildings shall be covered with approved Grade D permeable building wrap or building paper. Two layers of Grade D paper when stucco is the exterior finish over wood sheathing.
 - d. The openings of doors and windows shall be flashed by approved methods to prevent water and wind migration. Any voids between the door and window openings to the framing shall be insulated and caulked.
 - e. All penetrations of electrical wiring and plumbing through the top plate and bottom floor plates shall be caulked with a fire-resistive caulking material.

- f. Duct, flue and piping shafts opening into unconditioned space shall be capped and sealed with solid material, flashing or blocking and any remaining gaps are sealed with fire resistive caulk or foam.
 - g. Ceiling penetrations such as light fixtures adjacent to the building thermal envelope shall be caulked or gasketed.
 - h. Recessed lighting fixtures shall be IC-rated (thermally protected) fixtures, insulated and the penetration to the unconditioned space shall be sealed by caulking or gasketing. A recessed light fixture may be installed in an airtight box with proper clearances to combustible material and the box insulated as required. A recessed light fixture may be installed according to manufactures specifications when complying with Title 24 (California Rating) requirements to be air tight.
 - i. **NOTE – There shall now be required a Building Wrap, Window/Door Flashing and Air Barrier Inspection after the Roof Sheathing, Sheer Wall and Anchorage Inspection. Penetration sealing shall be inspected at the Rough Trades Inspection.**
4. Window type (fenestration) and skylights – The U-Factor (Thermal Transmittance). IECC 402.3.
- a. All windows shall be of the Low-E type and comply with the U-Factor of 0.45 minimum. **BEST PRACTICE** – Low-E windows with the U-Factor of 0.35. When metal or aluminum windows are used they shall be Low E with a thermal break and the U-Factor shall be 0.45 minimum. Window labeling for these specifications shall stay in place through the Final Inspection. **EXCEPTION** – Windows used for the installation of glazing for approved passive solar design.
 - b. Skylights shall have a U-Factor of 0.60 maximum.
5. Ducts – The R-value and installation of supply air and return air ducts. IECC 403.2.
- a. Supply air and return air ducts located in unconditioned spaces shall have an insulation value of R-8 minimum. Exceptions - In floor and attic trusses where the main trunk duct is run and an R-8 duct is too large to be properly installed, R-6 duct may be used. Ducts may be un-insulated when located completely inside the conditioned space.
 - b. All rooms in a building, heated by a forced-air heating system, shall have a return air path by the use of a return air duct to each room, a “Jump Duct” between a room and the main return air, transfer grilles or use louver doors. Exception – bathrooms, toilet rooms, laundry rooms and similar spaces. No heating ducts may be installed in a garage or storage room unless return air is compensated from the outside (the source not through the garage, storage room or attic) and the system is installed by approved methods and equipment. County Ord. 07-12, Part V, # 3.
 - c. Duct joints, connections to the duct register boot and plenums shall be sealed with water-based mastic at all joints to cause the duct system to be airtight. Duct tape will not be allowed as the sole method to seal the ducts at joints. Furnace equipment may be sealed with metallic duct tape.

6. Systems – For heat and water. IECC 403.
 - a. All fuel burning heating systems shall obtain all combustion air from the outside.
 - b. All hot water piping located in unconditioned spaces shall be insulated with R-2 insulation minimum. Hot water piping that is part of circulating system shall be insulated with R-2 insulation minimum.
 - c. Circulating hot water piping shall include an automatic or readily accessible manual switch to turn off the water circulation when the system is not in use.
 - d. Mechanical ventilation of outdoor air intakes and exhausts shall have an automatic or gravity damper that close when the ventilation system is not operating.
 - e. Equipment sizing for heating and cooling shall be in accordance with section M1401.3 of the International Residential Code, ACCA Manual J.

7. Moisture Control. IECC 402.5.
 - a. An approved building wrap shall be installed on the exterior side of the building sheathing or over the stud surface when exterior panel siding is used for heated buildings.
 - b. When a conditioned (un-vented and concealed) crawl space is approved, the normal foundation vents shall be installed so in the event a water spill was to take place in the crawl space the vents would allow circulation of air for drying purposes. The foundation vents may be blocked off and insulated over for the system of the conditioned crawl space. The conditioned crawl space shall have installed a continuously operated mechanical ventilation system according to IRC R 408.3 and meet all of the code requirements of IECC 402.2.8.

8. Indoor air quality and positive pressure air balance in buildings. IECC 403 and County Ord. 07-12, Part II, # 3.
 - a. Outside air is **RECOMMENDED** to be supplied into the return air system of heating equipment to insure fresh air will be circulated through the building, sized and installed by approved methods. Fresh circulated air throughout the house will provide clean indoor air and control moisture. Outside air will allow a positive pressure air make-up when any exhausting air equipment is utilized. Typical applications for this are an Energy Recovery Ventilator (ERV) or a Heat Recovery Ventilator (HRV).
 - b. Outside air intakes shall be located where the supply will not be contaminated by vehicle fumes or noxious odors.
 - c. In buildings heated by radiant systems where air is not circulated throughout, it is **RECOMMENDED** that an approved fresh air system be installed.
 - d. All structures that are built according to the Energy Code shall be considered Unusually Tight Construction. All fuel burning heating appliances within habitable portions of the building shall be installed in a sealed compartment with outside combustion air or be of the Direct-Vent type.
 - e. Building framing cavities shall not be used as supply ducts.
 - f. In non-heating seasons and when air conditioning is not used or not installed it is presumed that some windows would be open to provide fresh circulated air through the house.

9. Certificate – A permanent certificate shall be provided to the owner and a copy kept in the files of the permit with the County. A blank certificate is provided to the builder when the permit is issued. IECC 401.3.
 - a. The certificate shall be completed by the builder or the design professional.
 - b. The certificate shall list the R-Value of insulation installed in the ceiling or roof, in the walls, in the floor of the crawl space, under the slab, on the stem or foundation wall and of the ducts.
 - c. The certificate shall list the U-Factors for windows and skylights.
 - d. The certificate shall list the type and efficiency of the heating and cooling system of the building.
 - e. The certificate is to stay with the building as a permanent record.

10. Performance Alternative Method – Alternative to the prescriptive requirements of the Energy Code. IECC 404.
 - a. The residential building shall be modeled for energy use through the process of an approved code compliant computer software tool. This shall be done by a certified third party Home Energy Rating Specialist (HERS) Provider.
 - b. A compliance report shall be generated by the computer software tool to show that the proposed design is in compliance with the minimum requirements of the Energy Code and submitted with the building plans for review and approval.
 - c. The residential building when completed, it is a **RECOMMENDED BEST PRACTICE** to have diagnostic testing conducted showing that the building performance is in accordance with the compliance report. The testing shall be conducted by a certified third party HERS Provider. A certificate of compliance shall be submitted by the builder to the owner and to the Building Inspector at the time of Final Inspection. Note – For Energy Star Certification and rebate incentives from Federal and State Governments diagnostic testing is required.

Energy Code Compliance for Climate Zone 4 – Grenehaven and Marble Canyon Only!

NOTE: Wood Frame Wall, R-13; Wood Frame Floor, R-19; everything else the same as Zone 5.

**2500 N. FORT VALLEY ROAD, BUILDING 1 • FLAGSTAFF, ARIZONA 86001-9331
(928) 226-2700 • FAX (928) 226-2701**