



# Recommendations for Energy-Efficient Design for Low-Rise Residential Construction

Energy Center fact sheet

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The following are recommended as **cost-effective** measures for energy-efficient design. At a minimum, measures should comply with local building codes, which may address energy efficiency.

## I. Insulation

- Sidewalls      2 x 4      R-13\*  
                         2 x 6      R-19

\* An additional R-3 or more of exterior insulated sheathing will provide improved comfort and will be cost effective in some applications.

- Attic              R-38

Provide a vapor barrier toward the conditioned side on all walls (optional for ceilings) between conditioned and unconditioned space, including interior finished basement walls.

- Foundations: Around Missouri, administrators are reviewing codes involving Exterior slab insulation, crawl space foundation insulation (interior and exterior), and exterior basement wall insulation because of potential hidden termite pathways. Insulation installed on the exterior foundation (and on the interior for crawl spaces) should include a break below the sill plate to expose the masonry wall allowing a visual inspection for the termite pathways.

Basement      R-10 exterior **or** interior (consider the alternative of placing insulation on the interior walls of a finished basement)

Slab-on-Grade      R-10 24" deep along perimeter (exterior)

Crawl Space      R-10 on interior side of foundation wall and 24" below exterior grade - this is the preferred method when plumbing or heating ductwork is located in crawl space; **or** R-19 underside of floor

A vapor retarder is required over bare soil in crawl spaces and under basement concrete floors.

- Air Ducts      R-7 on supply and return air ducts in unconditioned spaces
- Water Pipes      Insulate hot and cold water pipes in unconditioned space; insulate hot water pipes in conditioned space where possible

### III. Windows / Doors

- Double glazed windows with low-E coating
- Solid core insulated doors
- Caulk, weatherstrip or otherwise seal around window and door frames
- Total glass area should be limited to 14% of the total wall area
- Concentrate most of the glass area on the south wall, with overhangs (28") to prevent summer overheating
- Avoid using windows on the east and west walls
- Avoid excessive windows on the north wall

### IV. Mechanical

- Heating System
  - Gas Mid-efficiency - minimum 78% Annual Fuel Utilization Efficiency (AFUE)  
Consider high-efficiency (condensing) up to 96% AFUE
  - Electric Heat Minimum coefficient of performance (COP)  
Pumps
    - Air source 47°F DB/43°F WB 3.0 minimum COP
    - Air source 17°F DB/15°F WB 2.0 minimum COP
    - Water source 70°F Entering 3.8 minimum COP
    - Ground source 70°F Entering 3.4 minimum COP
    - 50°F Entering 3.0 minimum COP
- Water Heater
  - Gas Minimum 62% Energy Factor (EF)
  - Electric Minimum 90% EF
- Air Conditioner Minimum Seasonal Energy Efficiency Ratio (SEER) of 12
- Thermostat Use automatic setback thermostat unless the manufacturer of the mechanical equipment does not recommend it.
- Ventilation
  - Minimum 50 CFM exhaust fans in all bathrooms
  - Minimum 100 CFM exhaust fan in kitchen
  - Maximum sone rating of 2 for all exhaust fans
  - All exhaust fans ducted to vent to the outside
  - Soffit and ridge ventilation for attic
- Ductwork Seal all duct joints (supply and return) with duct mastic or appropriate tape

Use the Model Energy Code for other types of mechanical equipment.

Contact your local utility representative and heating contractors for additional information on mechanical systems.

### V. Water Conservation

- Use water-saving devices (2.5 gallons per minute) on shower heads and aerators on faucets
- Gravity tank toilets shall use no more than 1.6 gallons per flush

### VI. Lighting

- Refer to Energy Center fact sheet "Save Lighting Energy"

## **VII. Appliances**

- Consider purchasing ENERGY STAR labeled appliances.

## **VIII. Passive Solar Heating Design**

- Passive solar strategies must be incorporated early in the design stage. "Passive Solar Design Strategies: Guidelines for Homebuilders," available from the Sustainable Buildings Industries Council, is an excellent resource for solar planning ideas.

## **For More Information**

For more information energy-efficient designs, contact:

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