The following are recommended measures for an energy-efficient design. At a minimum, measures should comply with local building codes, which may address energy efficiency. The recommended measures are based on information available as of July 2012 and the age of these recommendations should be considered when comparing to new information that becomes available.

The information in Table 1 is referenced from the 2012 International Energy Conservation Code and will be explained throughout the recommendations. This information is not meant to be inclusive of all construction methods that may be used but a guideline for common residential practices. Missouri is divided into two zones by county and the proper zone should be considered based on the list below.

Table 1

<table>
<thead>
<tr>
<th>Windows</th>
<th>Insulation</th>
<th>Foundation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fenestration U-Factor</td>
<td>Skylight U-Factor</td>
<td>Glazed Fenestration SHGC</td>
</tr>
<tr>
<td>(Maximum)</td>
<td>(Maximum)</td>
<td>(Maximum)</td>
</tr>
<tr>
<td>Zone 5</td>
<td>0.32</td>
<td>0.55</td>
</tr>
<tr>
<td>Zone 4</td>
<td>0.35</td>
<td>0.55</td>
</tr>
</tbody>
</table>

I. Insulation

- Wood Frame Walls
  - 2 x 4  R-20*
  - 2 x 6  R-20*
  * The walls should have cavity insulation at the stated minimum, R-20, but the requirement can also be met with a cavity insulating R-Value at R-13 and a continuous layer of insulation at R-5 over the entire wall surface.

- Ceiling  R-49

- Floor:
  There are different recommendations depending on the county of the home and should be referenced from above.

- Mass Wall:
  The second number in Table 1 under mass walls applies if more than half of the insulation is on the interior of the wall. There are different recommendations depending on the county of the home and should be referenced from above.

- 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:
    There are different recommendations depending on the county of the home and should be referenced from above. Two values are listed for basement walls; the first value is for continuous insulation and the second value is for cavity insulation values.
  
  - Slab-on- Grade:
    Continuous R-10 at least 24" deep along the entire perimeter

  - Crawl Space Walls:
    Two values are listed for basement walls; the first value is for continuous insulation and the second value is for cavity insulation. There are different recommendations depending on the county of the home and should be referenced from above.

- Air Ducts:
  Ducts located in unconditioned attic space should have a minimum R-value of R-8 and ducts located in other unconditioned space should have a minimum R-value of R-6.

- Water Pipes:
  Insulate hot and cold water pipes in unconditioned space; and insulate hot water pipes in conditioned space where possible.
II. Windows / Doors
- Windows and doors with windows should meet the U-Factor and Solar Heat Gain Coefficient (SHGC) listed in Table 1. The U-Factor and SHGC are listed as maximum values and are provided by the manufacture. Each energy star rated window should be marked with this information.
  - Doors should also be solid core insulated
- Passive Solar Design Considerations for Doors and Windows:
  - 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 placed to allow the winter sun and block the summer sun
  - Avoid using windows on the east and west walls
  - Avoid excessive windows on the north wall

III. Mechanical
- Heating Systems (Use equipment that is Energy Star Qualified)
  - Gas
    - High-efficiency - Minimum 90% Annual Fuel Utilization Efficiency (AFUE) or, Consider a high-efficiency (condensing) heating system up to 96% AFUE
  - Electric Heat Pumps
    - Air source 9.25 HSPF minimum
    - Ground source 3.1 COP minimum
- Water Heater
  - Gas Minimum 62% Energy Factor (EF)
  - Electric Minimum 90% EF
  - Heat Pump Water Heater Energy Star Qualified
- Air Conditioner
  - Whole House Energy Star Qualified (Currently 14.5 SEER)
  - Window Energy Star Qualified
- Thermostat
  - Programmable thermostat with automatic setbacks
- Ductwork
  - Seal all duct joints (supply and return) with duct mastic or appropriate metallic 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.

IV. 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
- Consider the use of rain water collection systems for yard irrigation

V. Lighting
- Refer to Division of Energy fact sheet "Energy Efficient Lighting"
VI. Appliances  
- Consider purchasing ENERGY STAR labeled appliances.

VII. Passive Solar Heating Design  

The information contained herein should be considered as general recommendations for the construction/remodeling of low-rise residential buildings where energy-efficient design is being considered and should be allowed to be superseded by more stringent code and industry standards. Additional guidance can be found within the New Home Energy Star Program.

Works Cited  


For More Information  
For more information energy-efficient designs, contact:  
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E-mail: energy@ded.mo.gov  
Web site: www.ded.mo.gov/energy/index.html