Designing Houses for Low-Energy Consumption
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Designing Houses for Low-Energy Consumption

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Approximately 60 percent of household energy is used in space heating. Present need to conserve fuel—because of high cost and limited reserves—is forcing a revision in the standards previously used in planning houses. Many expected luxuries and some everyday practices will have to be eliminated or changed to reduce the fuel consumed in houses.

In planning a new house the following are suggestions of ways to reduce fuel requirements for heating in Michigan.*

1. Reduce the size and number of rooms to those needed by the family. Bedrooms of 120 square feet are very adequate for sleeping. Large living rooms with 50 to 150 square feet of unused space in the center often are used only occasionally by families. Combine activities into a large family room where the whole family can be together. This room could include food preparation, dining area, children's play area, place for reading, sewing, office and other things, depending on the family.

2. Instead of wide open areas and high vaulted, exposed ceilings, use normal ceiling heights (7½-8 feet). Use doors to close off parts of the house when not in use.

3. Limit the size of windows to that needed to look outside. Do not locate windows on the north or west unless absolutely necessary. Use insulated glass windows with storm windows to reduce heat loss. Some windows can be installed permanently to reduce infiltration. However, designs for new moveable windows have good weatherstripping and are double glazed to reduce heat loss. According to the University of Illinois Small Homes Council, a small net heat gain can be made when windows on the south are *triple* glazed. Double-glazed windows will lose more heat during nights and cloudy days than is gained during hours of sunshine.

   In order to utilize the sun's heat in winter and keep it out in the summer, the size and location of windows is important. Figure 1 shows the vertical size and location of windows and the length of the eaves' overhang to use the sun's heat most effectively.

4. Use insulated doors with well-fitted weatherstripping. Install storm doors on all doors.

5. When framing the house, extend the ceiling joists or the bottom chords of trusses beyond the wall to the eaves line to allow for adequate insulation of the ceiling at the wall line. Do not form the overhang by extending the rafters. This leaves a space only the thickness of the rafter for insulating and for ventilating the attic. This is not enough. Figure 2 shows the construction of both types of overhang.

6. Walls should be made thicker than the normal 2 x 4 stud wall so that more insulation can be installed. Two methods for building thick walls are shown in Figure 3.

7. Fireplaces are very inefficient heaters. They must be viewed as a decorative item rather than a heating system. When a fireplace is planned, it should be in a room that can be completely shut off with doors from the rest of the house or it can actually withdraw more heat than it adds. One can be comfortable by sitting in a big overstuffed chair soaking up radiant heat. Eventually a fireplace will heat the room that is shut off from the rest of the house. In an emergency it can be used for survival but would do little to heat an entire house in the event of power failure or fuel shortage.

8. A vestibule or entrance hall for each outside door will prevent cold drafts from circulating throughout the entire house when the outside door is opened.

9. Plan the house so you can have different heating zones. For instance, be able to shut off bedrooms from the rest of the house. Be able to close off large living rooms, especially when there is a family room where the family spends most of its time.

10. Insulate hot air heating ducts and hot water heating pipes.

11. Plan for the following insulation:
    a. A minimum of 6 inches but preferably 10 to 12 inches insulation in the ceiling.
    b. Fill walls with insulation.
    c. A vapor barrier of 4- or 6-mil polyethylene is a *must* for Michigan. This is applied over the inside of the studs before the plaster board is applied.
    d. Use a sill sealer on top of the concrete foundation before the sill is applied.
    e. Insulate the top of the basement walls from the first floor down to about 24 inches below the outside ground line.
    f. Floors over crawl spaces or over unheated garages should be insulated with 6 inches of insulation. The ground sur-

*Some of these suggestions would require some radical changes in family life if adopted in their entirety.

face of the crawl space should be covered with polyethylene or with rolled asphalt roofing lapped 6 inches and weighted down. Be sure to leave openings in foundation walls to ventilate crawl spaces.

12. Management: When houses are made tight to save fuel, moisture begins to accumulate, and this can cause serious problems. The moisture comes from people's breath, cooking, drying clothes, bathing, plants and flowers. Some system must be used to remove this moisture or it will condense on windows, walls and doors, or will seep into the wall cavity and condense. The following suggestions will assist in removing moisture:
    a. Use a kitchen fan during all food preparation.
    b. Use a bathroom fan during bathing.
    c. Do not dry clothes by hanging them in the basement or bathroom.
    d. Periodically air out the house. Choose days when the temperature is not too cold. Set the thermostat to about 40° and open doors and windows for about 20 to 30 minutes.

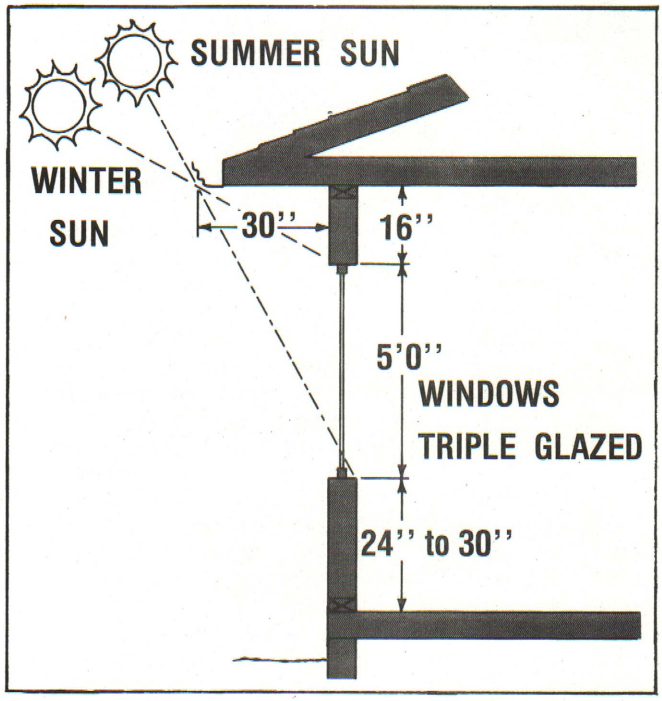


Figure 1—Window designed for best use of sun's heat.

Figure 2—Top drawing shows roof overhang designed for adequate insulation and ventilation.

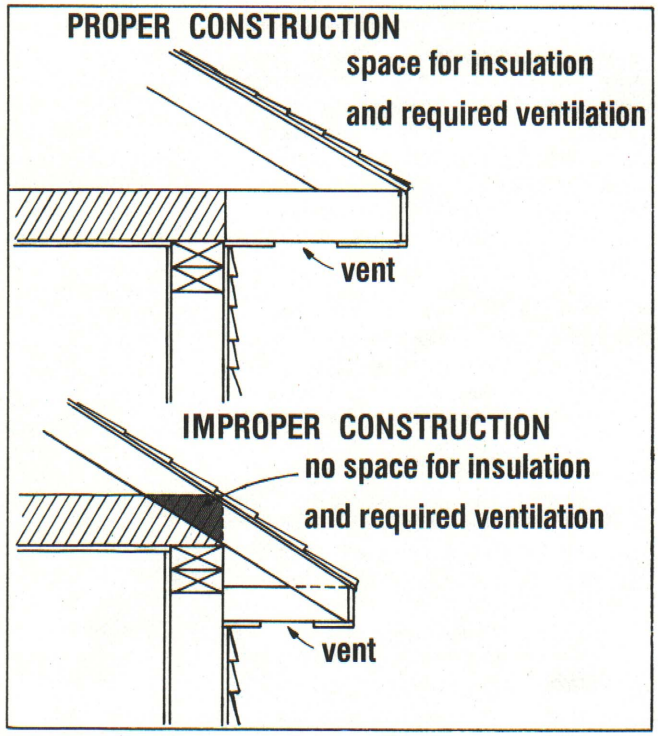
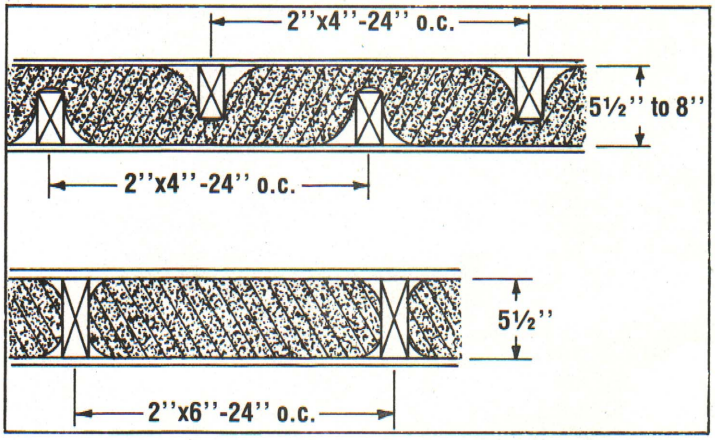


Figure 3—Two methods (2 x 4 and 2 x 6 studs) for building thick walls.



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