

# A House Design For Energy Survival

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*Housing trends in recent years have featured the "family room," the "great room" and the "gathering room." We are proposing a new concept – the "survival zone." Planning principles needed for designing a survival space will be enumerated and a prototype built by the authors will be described. This idea is being suggested as a partial solution to two types of energy problems: Type 1. Temporary electrical "blackouts" or "brownouts" due to excessive consumer demand on available power. The survival zone is a space in which a family could live comfortably for a few days without electricity even in extremely cold weather; Type 2. The long-term need to conserve energy resources. For non-emergency daily living, the survival zone is designed to require a minimal amount of energy for heating and cooling. On a long-range basis this is an alternative to conservative thermostat settings.*

Despite concern about energy shortages, some families find it difficult to conserve energy by keeping the household thermostat set at 68°F (18.3°C) in winter and 78°F (25.5°C) in summer. Among these families are those with very young children, aging family members or persons with health problems such as poor circulation. Other families simply find this energy conserving measure uncomfortable. Consequently, it is often only those who are genuinely committed to saving energy who do so.

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The notion of the *survival zone* involves limiting the amount of space that is heated or cooled on a permanent basis. This is certainly not a new idea. Before central heating and air conditioning became part of the middle-class American life-style, it was not at all uncommon for the families to gather in the kitchen near the warmth of the cookstove for a variety of winter activities. In many homes, the parlor was used only on weekends or in warm weather. In these homes, spaces were typically designed so that many zones of the house could be closed off by simply closing doors. Bedrooms remained unheated and bricks were heated and put in the bed to warm cold feet. When central heat became the mode, homes were built with large open spaces to give a feeling of spaciousness. Despite

energy shortages in recent years, home builders continue to use plans with large open spaces which require extensive energy for heating and cooling. Such an arrangement makes energy conservation difficult and uncomfortable. The concept presented in this article is aimed at making energy conservation more attractive by applying certain planning principles.

### **Planning Principles for Energy Conservation**

A housing design for any family must be done with consideration of the particular family's space needs, activities to be performed, and the resources available. However, when planning for an energy survival space some special principles are applicable.

1. *Site selection and orientation is a prime factor in the planning phase.* The survival room should have a southern exposure with large windows in order to take advantage of the heat from the sun in the winter. Proper overhangs will assist in summer sun control. The north side of the house should be windowless and contain buffer zones (closets, laundry, garage) which can be off from the remainder of the house. In order to design a home with the proper orientation, careful selection of a site with southern exposure is an essential prerequisite.

2. *Provision for high-priority activities are included in the survival area.* Functions that could be performed in this space include cooking, eating, sleeping, bathing, studying, conversing, playing, reading and relaxing. This room could contain a battery operated radio and a telephone for the communication function in the event of power failure.

3. *Goals and values of family members are reflected in the design.* The kinds of activities enjoyed by family members will determine what additional items are included in the survival zone. Whereas some families enjoy television, others would prefer to have a game table or writing space located in this area. In the future, homemakers may wish to have the family computer and total residence energy controls located in this space.

4. *The area to be heated or cooled is minimized through zoning.* Only high-priority zones are heated or cooled on a daily basis. For example, a space heater, wood stove or room air conditioner might be

used in the survival zone while the remainder of the home is closed off in extremely cold or hot weather. By heating (or cooling) a fraction of the usual space, energy is conserved while the goal of comfort is met.

5. *The zoning of the house is based on daily, weekly and seasonal activity cycles.* The survival zone is in the center of the house. It is the most frequently used zone and is designed for basic functions (e.g. cooking, eating, dressing). Less frequently used zones partially surround this core room and provide a buffer from extreme outdoor temperatures. The secondary zone contains bedrooms and extra bathrooms which are ordinarily used on a daily basis, but which can remain unheated in emergencies. The tertiary zone includes the living and dining area, extra bedrooms and other spaces which might be used weekly for guests or sporadically for family use. The "buffer" zone serves as a type of insulation between the primary and secondary zones and the outdoors. The garage, storage and laundry rooms could constitute the buffer.

6. *Technology for energy conservation is incorporated in the building process.* This includes solar considerations, wall and ceiling insulation, insulated windows, insulated drapes, weather stripping and other energy principles.

7. *Principles of design are used to create an aesthetic environment.* In order to make the survival space a pleasant place to be, it must be attractive and well-arranged. It should be a space which invites families to spend winter hours within. If it is not a space that attracts people, it will not be used. This will result in the return of family members to larger zones and thus increase the energy demands.

### **A Prototype**

The authors of this article recently designed and built an energy-conserving house which features a survival room. The real test of this space concept came just two weeks after moving into the home. Following an unprecedented ice storm, power lines were down and electricity was off for nearly three days in freezing weather. The doors were



*South windows of the master bedroom (left) and survival zone. Solar hot water panels provide summer shade for large glass areas of basement level.*



*The activity area of the survival zone includes a sleeper sofa, a table, a wood stove, south windows and an entertainment center.*

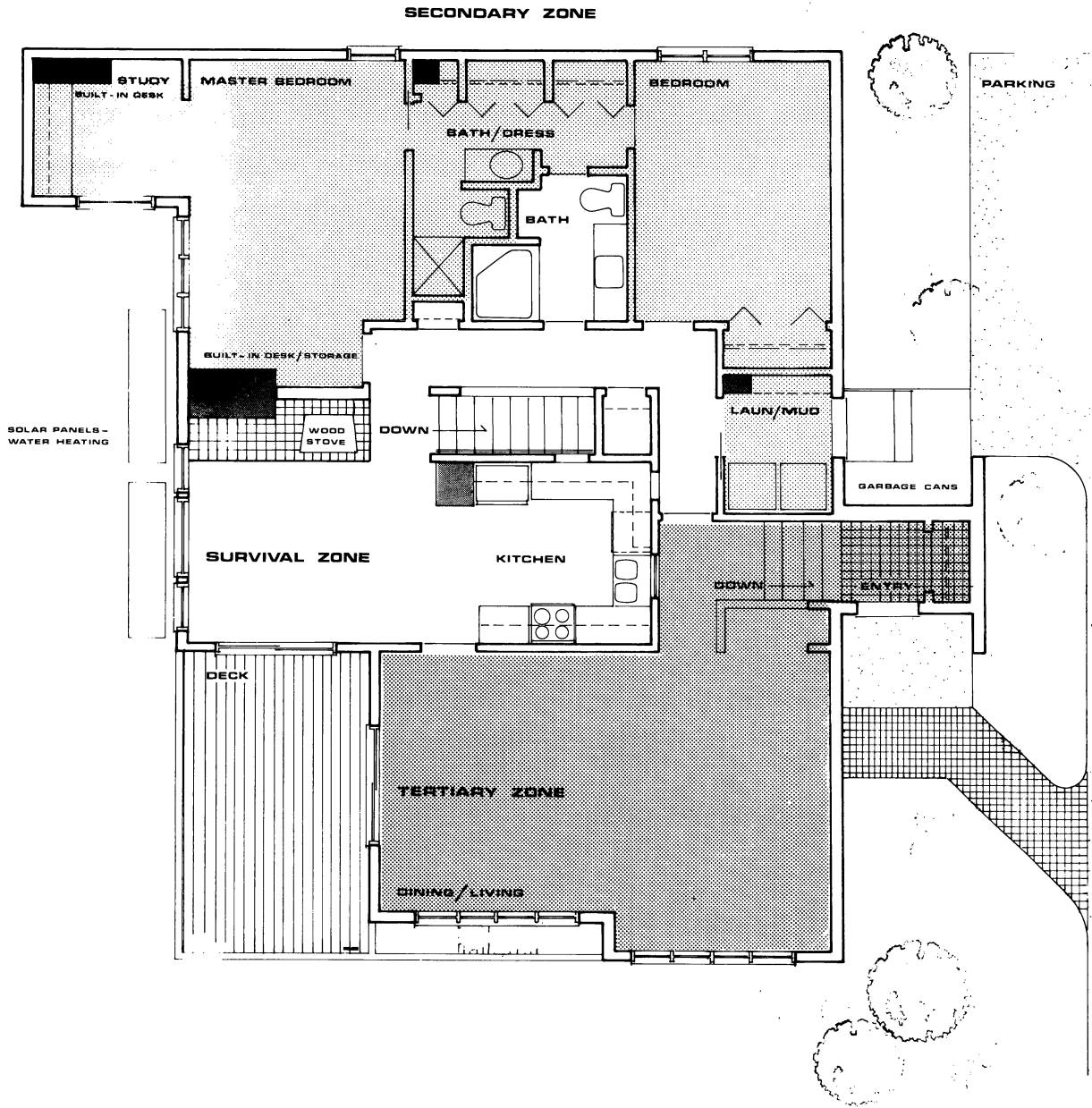
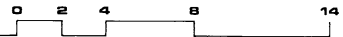


FIG. 1

**FLOOR PLAN**



closed to all other rooms except the one bath which is part of the survival zone. The wood-burning stove was fired up for a pot of water for hot tea, general cooking purposes and even sponge baths. There was sunshine on those days and a daytime temperature of 72°F in the 430 square-foot space was maintained.

The planning principles described above were applied. After purchasing a building site with good solar orientation, activity cycles, goals and values were assessed. Since both authors are professionally employed, the daily schedule involves only basic functions being performed at home, with entertaining only on weekends and mostly in the summer. Both need a desk area for studying and writing, and an infant daughter needs to be warm and needs a play space. A good view of the lovely mountains in Virginia was also important.

Incorporating as much energy-saving technology as economically feasible, and taking the above concerns into account resulted in an energy-conserving home which is comfortable, attractive and which meets the space needs of the occupants without being unnecessarily extravagant.

#### *Description of the Home*

The floor plan (Figure 1) of the home shows how the space was arranged. The survival zone contains the kitchen, eating area, a sleeper sofa, wood stove, various storage areas and built-ins for family activity items and one bath (see photographs). In addition to the large south windows, there is a sliding glass door on a portion of the east side which opens onto a deck to take advantage of a good view of the mountains. Double-pane insulated windows and insulated drapes were used.

Since the kitchen is in the center of the house, a pass-through was built opening into the back hall to

facilitate air circulation and passage of groceries, garbage and laundry.

The secondary zone includes both bedrooms, a bath/dress area for the master bedroom and the laundry/mud room. The master bedroom, which contains two study areas and a south orientation, is large enough to be utilized by the entire family in combination with the survival zone, if so desired.

The survival and secondary zones constitute the everyday living space of approximately 1140 square feet.

The tertiary zone includes the "luxury" spaces of the residence — a dining and living room combination and guest entry. The living room has south-facing celerestory windows for winter passive solar heat and summer ventilation. Large view windows to the east, a sliding glass door and the celerestory windows enable strictly passive solar heat on sunny winter days. The total square footage for all three zones is 1500 square feet.

The primary mechanical system (heat pump) is designed so that the tertiary zone can remain completely unheated or cooled when desired, through use of a damper in the main air duct. The air can be shifted from the tertiary zone either into the survival zone or a basement central room to be finished at a later date. This basement room also contains large south-facing glass door and window units for passive solar heating. Panels for the solar hot water system provide summer sun shading (see photograph).

#### **Summary**

By planning carefully and applying energy technology, an energy-conserving home was built which is comfortable, attractive and which meets the space needs of the occupants. We are continuing to develop the survival zone concept and how it may be applied to various types of residential designs.