Greenhouse-residence puts garden in every home

WASHINGTON, D.C. — Imagine a family home where lettuce, cabbage, spinach, swiss chard and cucumbers are grown indoors all year round.

Combining the best of both worlds, this greenhouse-residence designed in 1977 by Science and Education Administration researchers in Clemson, S.C., and built there in 1978, is one practical solution to today's rapidly rising energy and food costs.

Since 1975, the SEA Rural Housing Research Unit at Clemson has explored developing low-cost integrated solar energy systems. The present greenhouse-residence is the third they have designed.

The unique design of the structure combined with its utilization of solar energy conserves fossil fuel, while producing food.

Site location is critical for such a solar home. The collector, which is mounted at a 60 degree angle, requires the greatest amount of exposure to the sun. The south side of the home must be free of tree shading in the winter. Windows can be shaded by roof overhangs on the south in the summer. Trees are desirable on the east and west to prevent overheating of the home in the summer.

Solar energy entering the greenhouse is stored and used to help heat both the greenhouse and the residence. The greenhouse helps insulate the residence. In turn, heat escaping from the residence is used in heating the greenhouse.

The air in the home and the greenhouse is the same. Attached to the home, the greenhouse is an integral part of the system. It operates in conjunction with a 384-square-foot flatplate collector constructed of two layers of aluminum roofing with painted interior surfaces installed as an absorber plate.

In winter, solar-heated air is drawn through the flat-plate collector and then through rock thermal storage before returning to the greenhouse.

Heated air supplied to the house, either from thermal storage or from the auxiliary heating unit, returns through the greenhouse and then back through thermal storage.

In summer, the greenhouse and collector are manually separated from the house air. Dampers and vents are opened and closed to regulate the flow of air. Vents lead from the solar collector to the outside. At night, outside air - 6 degrees Fahrenheit lower than the storage temperature - is used to remove the heat from the 50-cubic-yard rock storage to the outdoors through these vents. During the day, air-conditioning supplements rock storge to cool the house.

The 248-square-foot greenhouse uses a low-iron double-strength tempered glass glazing and is lined on the inside with ultraviolet-ray-resistant film. The floor is gravel. The planting beds, located on the floor, are framed in redwood.

Energy efficient, the home is built of western red cedar siding. Two stories, with 1,472 square feet of living space, it has a living room, dining room, kitchen, 1-½ bathrooms, study, two bedrooms, and a carport.

Windows are double-glazed and wood doors are weather stripped. Doorways have air lock entrance ways. Walls have 6-inch/R19 batt insulation and the ceiling is insulated with 12-inch/R38 fiberglass. The crawl space is insulated with 2-inch thick polystyrene.

The home is all electric with an 84-gallon solar water heater supplemented by a 30-gallon auxiliary electric heater. The system is designed to accept a heat pump or oil or gas forced air heating.

These energy conserving features and the Clemson, S.C., location are responsible for low heating costs. In one January to April period, $164 was spent for auxiliary heating - a cost of only $41 per month.

The greenhouse may be used as a sun room by people who don't want to grow their own food. Since the greenhouse relies on returning house air for heating in the winter, cool-season vegetables are better suited for production.

Because the widespread use of insecticides in a closed environment that is part of a residence is undesirable, plants brought in should be free of insects such as aphids, white flies, and leaf miners.

Homeowners could grow half their annual vegetable needs in the greenhouse. Presently this amounts to approximately $250 worth of vegetables.

A successful design demands a high level of attention to planning and detail. A properly sealed tight-fitted collector and duct work are

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