

4 Meadowvale Solar Experiment, Ontario

Architects: Lee, Elken, Beckstead, Paulsen, Fair

The Meadowvale Solar Experiment was conceived for the purpose of demonstrating and evaluating energy conservation techniques in housing design and construction including the incorporation of a solar heating system. The solar heating system, calculated to provide 60-70 per cent of the heating requirements of the house, is a combination of a direct solar heating system and a solar assisted heat pump. Water is pumped through 690 sq. ft of flat plate, copper collector panels mounted on the south-facing roof where it is heated and returned to the concrete storage tanks in the basement. The collected energy is stored in 4000 gallons of heated water. In the direct heating mode, heated water from the storage tank is circulated through a heat exchange coil located in the ductwork. A fan blows the cool return air from the house across the coil, where it picks up heat from the water, and distributes the heated air through a standard forced air ducting system to the rooms in the house. When the water in the tanks is below a temperature which is sufficient for direct heat transfer (45°C), the water is circulated through the evaporator coil of a water-to-air heat pump where heat is extracted by the heat pump and amplified to a suitable temperature to heat the air. The condenser coil of the heat pump is located in the ducts where the air is circulated to pick up the heat. When the temperature of the water in the tanks is too low for efficient operation of the heat pump (14°C) an electric resistance coil is utilized to heat the house.

In addition to the operation of the active solar heating system, solar energy is also utilized in a passive sense as it shines through the large south-facing glazed areas at the first floor level. These windows were specifically designed to allow the low winter sun to penetrate deep into the living areas of the house and provide these areas with direct solar heat and light. Experience has shown that enough energy is provided through these windows to heat the entire house for a period of 6-8 hours during a sunny winter day even with an outside temperature as low as -20°C.

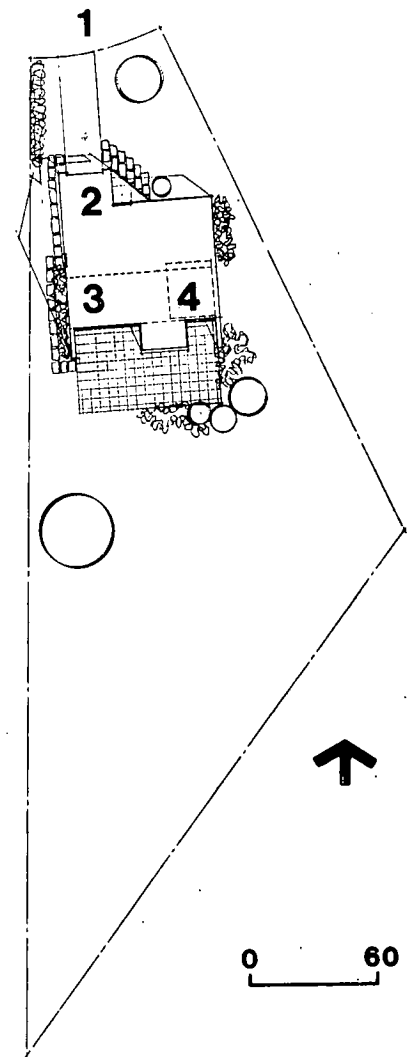
Energy conservation was a necessary parameter in the design

of this house and many features were incorporated to minimize the energy consumption. Increased insulation (walls R 18, roof R 26), minimum window area (except towards the south), use of double glass, fully weatherstripped wood frame windows, continuous vapour barrier-air seal around the total structure, and provision of an air-lock vestibule at the entrance are some of the methods employed to reduce heat loss. The masonry structure of the building also serves a purpose in the energy considerations. The massive concrete block walls are located within the insulated portion of the house (styrofoam insulation was applied to the exterior surface of the block walls) and, therefore, act as a thermal flywheel to help stabilize the interior temperature and store excess solar heat that enters through the windows.

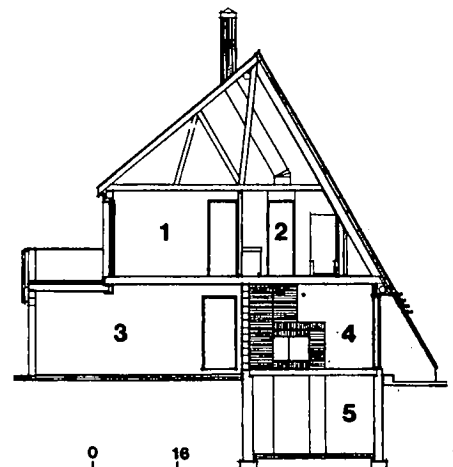
Energy conservation during the summer months was also an important consideration. The heavy insulation around the building helps reduce heat gain by conduction while shading of the south facing windows and locating openings to capture the breezes contributes to the natural cooling. If necessary, mechanical cooling can be achieved by reversing the cycle of the heat pump to take heat out of the air.

The house, located in the Meadowvale subdivision of Mississauga, has been occupied as a home for a year and an extensive monitoring program is in progress with the results to be reported to the National Research Council in Ottawa. Also being undertaken is a non-quantitative perceptual study of the implications of this approach to design in an urban and suburban context.

Douglas P. Lorrigan is responsible for the concept of the Meadowvale Solar Experiment. Architects are Lee, Elken, Beckstead, Paulsen, Fair; partner-in-charge Roger K. Paulsen. Mechanical and electrical consultants are Mechanical Consultants Western Ltd., George C. Bellamy and David Moon. O.T. Baggio and Associates Ltd. are structural consultants, and construction manager is M. Anthony Wallace and Associates.



SITE PLAN: 1 street. 2 house. 3 solar collectors. 4 storage tanks in basement.



SECTION: 1 master bedroom. 2 bathroom. 3 garage. 4 living room. 5 basement.