

CASE STUDY: "Equinox" Solar Office Building Raleigh, North Carolina

**ARCHITECT/OWNER: Innovative Design, Inc.
Raleigh, North Carolina**

This two-story 3,300 square foot all masonry solar office building was designed by the owner, Innovative Design, Inc., a Raleigh, North Carolina, architectural firm that specializes in solar architecture. The firm has designed and constructed more than 250 solar structures as architect, builder, or consultant. When designing their own building, the architects sought to make it a "state-of-the-art showcase" for the firm's expertise and to serve as a facility that would demonstrate commercial solar architecture. They named the building "Equinox" to show equal design concern for all seasons and its appearance is obviously solar.

Both solar heating and cooling systems were designed into the structure with the results expected to be 80% contribution for heat and about 30% cooling reduction.

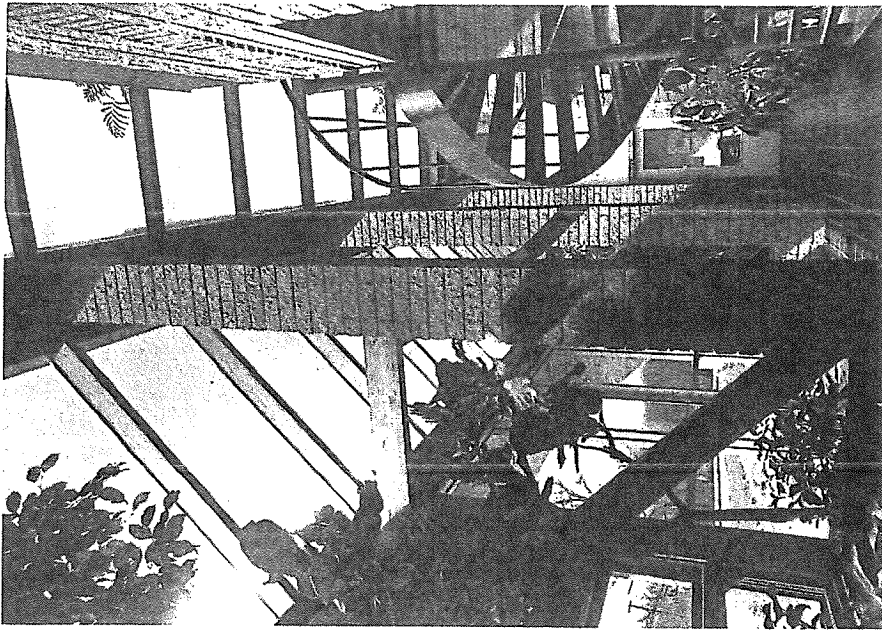
The high mass building envelope consists of 8" concrete block with 4" rigid insulation applied to the exterior and covered with cement-based stucco as the finish. In addition to serving as the building shell, the block walls act as thermal storage. The stucco was left with a rough textured surface and in its natural gray shade to illustrate the structure's use of natural resources and high-tech design. The building faces south, and earth berming has been used on north, east, and west elevations to provide further energy conservation.

A large central atrium is used for horizontal and vertical circulation as well as the main solar collection area. Sloped glazing is used over this area, and the 45 degree forms are designed for the building to shade itself, beyond simple overhangs. All offices open off the atrium providing natural light and indirect heat gain.

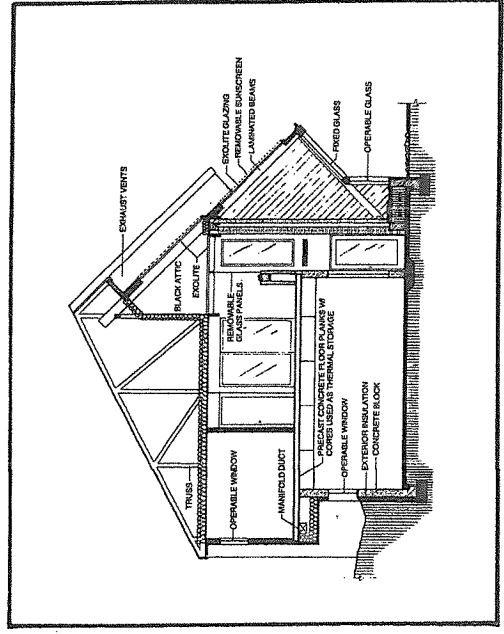
Two main passive solar systems are used in the building. A black attic-type system collects heat which is transferred to the thermal storage by blowing it through hollow concrete floor planks. The fan shuts off at night, and heat radiates from the storage. In summer, hot air is exhausted from the attic, and the floor planks can be flushed with cool night air with the fan system to help cool the interior during the day. Acting as an isolated gain system, the atrium collects heat and stores it in the mass walls and floor to be transferred to the offices later by radiation. Concrete split block is used in the atrium interior for walls, planters and support columns which, with the quarry tile floor, store the heat. A fan system circulates the heat throughout the building, and excess heat is vented out through the attic. Motorized thermal curtains, which are integrated into the structural block columns, are rolled down at night.

Offices receive indirect light from the atrium and from diffused north light. To promote natural ventilation, most windows are operable. A sunscreen over the atrium roof blocks about 80% of the sun's penetration in summer. In spring and fall, natural ventilation keeps the interior comfortable, but in the warmest summer months air conditioning is used to some extent.

The building cost (exclusive of site work) was \$180,000 but the architects expect a payback in five to seven years. The building houses Innovative Design's entire operation and contains space for two tenants, one of which is the North Carolina Solar Energy Association that wanted to be located in a "conspicuously solar building to promote its organization."

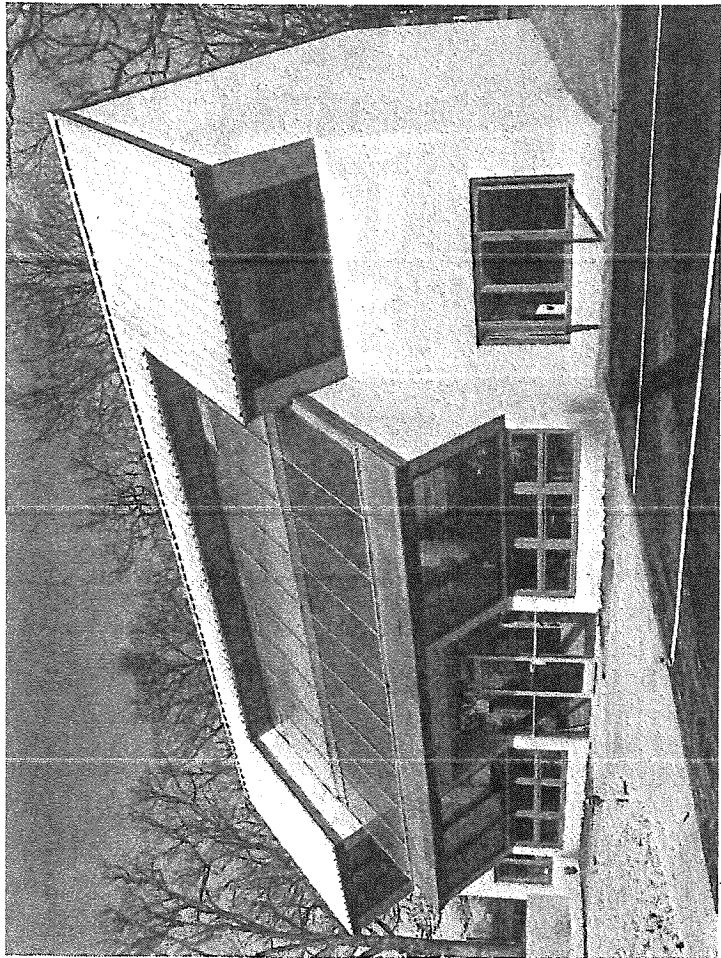


The atrium where concrete split block used for interior walls, planters, and structural columns provides thermal storage as well as a handsome finished appearance.





The building during construction shows the concrete block exterior walls.



South elevation of the Equinox Solar Office Building.

