COO-4513-1

MASTER

DESIGN METHODOLOGIES FOR ENERGY CONSERVATION AND PASSIVE HEATING OF BUILDINGS UTILIZING IMPROVED BUILDING COMPONENTS

Progress Report

for the period August 1, 1977-October 31, 1977

J. Habraken and Timothy E. Johnson
Massachusetts Institute of Technology
Cambridge, Massachusetts

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DISCLAIMER

ABSTRACT

Construction of the experimental building demonstrating light weight ceiling thermal storage tiles, transparent insulation assemblies, and specialized louvers is well underway. Difficulties in acquiring materials have put the building two weeks behind schedule. A superior heat mirror product is being used in place of the original proposed transparent insulation for the south windows. Negotiations are underway to acquire superior logging devices at no additional cost for monitoring the building.

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This contract is concerned with gaining data on performance and marketing of light weight ceiling thermal storage materials, transparent insulation assemblies, and specialized louvers to direct light to the ceiling. An 800 square foot building is under construction to acquire the data. As agreed upon in the contract, funds for building materials and construction labor are to be externally supplied. These funds have been provided by the MIT Godfrey Cabot Fund.

Most of the work performed in this reporting period has been related to the construction of the building. Working drawings were completed in mid-September. Construction started September 15. As of October 31, the following items have been completed:

Excavation and grading
Slab pouring
Slab perimeter insulation instalation
Steel structure wall fabrication
Foundation caulking and flashing

The custom glazing fabrication and ceiling tile pouch filling are underway. Because of delayed deliveries for the roof joists, steel decking and masonry siding material, we find ourselves two weeks behind schedule. These delays will move back the occupancy time until January 1, 1978, but data logging is expected to start as scheduled on January 1.

All the delivery schedules for the remaining materials have been established with respective suppliers, including the ceiling tile, louver, and transparent insulation fabrication schedules.

The original transparent insulation has been replaced with a superior heat mirror that is being produced by Suntek Corporation. The final south glazing configuration is (from the outside in): glass, 3/4 inch air gap, double sided heat mirror on a mylar substrate, 3/4 inch louvers, and glass. This assembly gives a thermal resistance four times that of double glazing with a 17% reduction in transparency. This gives about the same solar heat balance as the original scheme, but visual distortion is practically eliminated and cost is reduced. The heat mirror will also be added to the standard casement windows on the building's north side to demonstrate the energy conservation possibilities of the transparent insulation.

The final list of contributing material suppliers is:Wheeling Steel (building system), Rolscreen Co (specialized louvers), Suntek Inc. (heat mirrors), PPG (glass), Pella Windows (casement windows), Cabot Corporation (phase change material), and the Architectural Research COrporation (ceiling tiles). Each of these companies will participate in the market survey study that will begin in February.

Negotiations are underway to replace the multichannel strip chart recorder with a tape cassette system for data logging at no additional cost. Computer processing will be done at no cost on the department's in-house machine.

Two hundred copies of the final report for the previous work on light weight thermal storage,originally funded by NSF, but transferred to ERDA in early 1977, was received from the printer in August.

The enclosed figures show the finalized building form (Fig. 1), the current state of construction (Fig. 2) as of October 31, and building energy flows (Fig. 3).

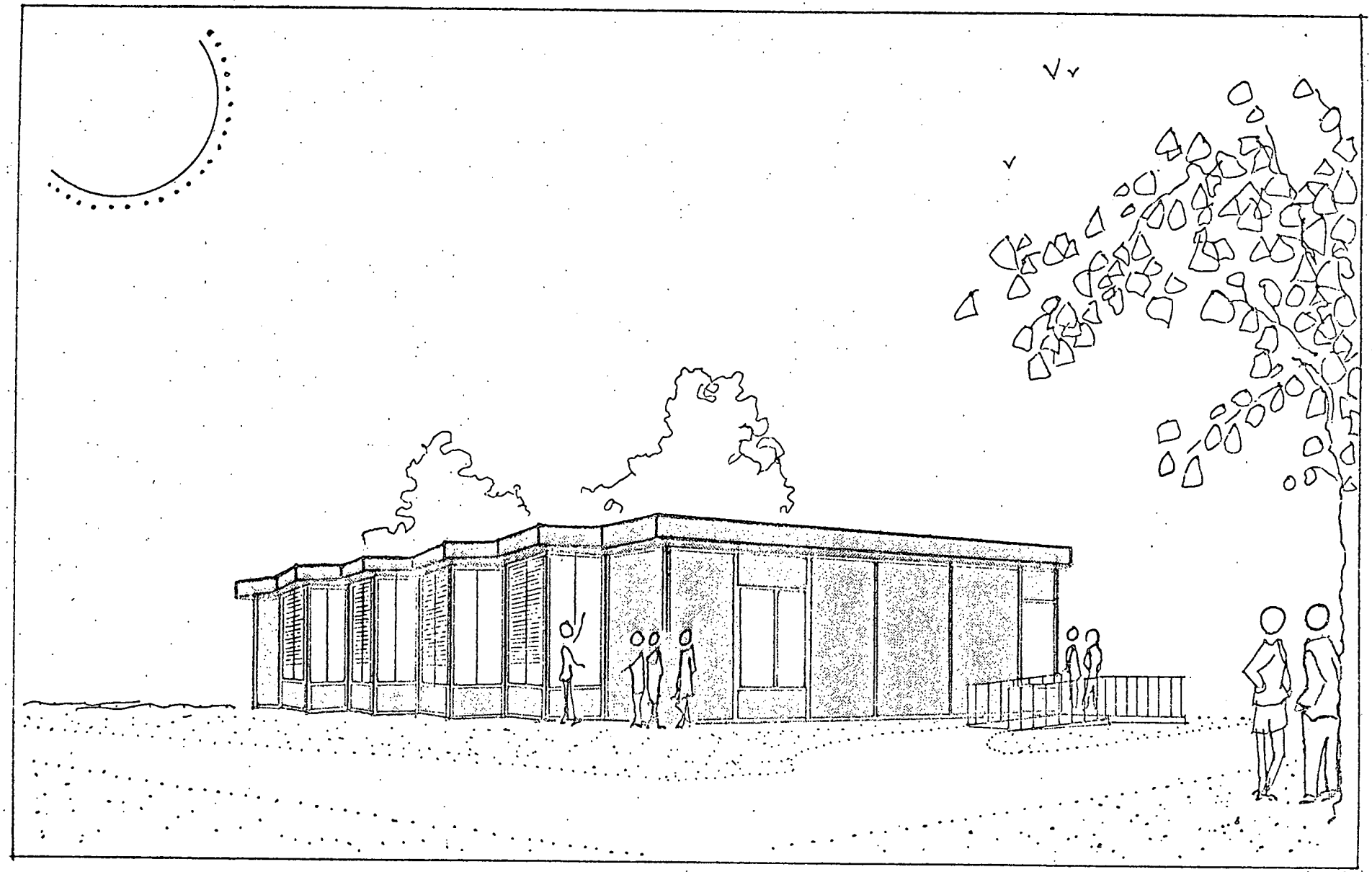
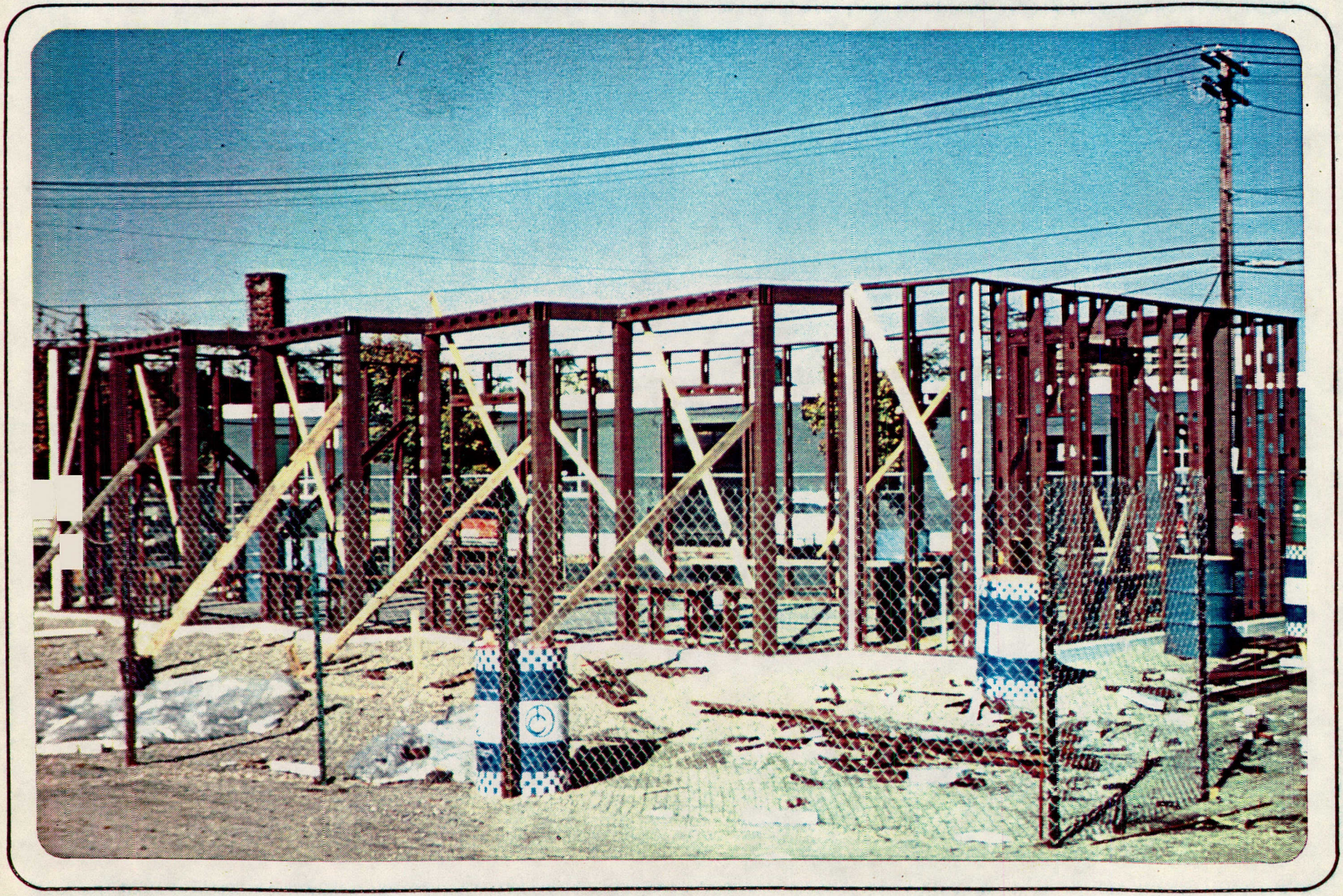
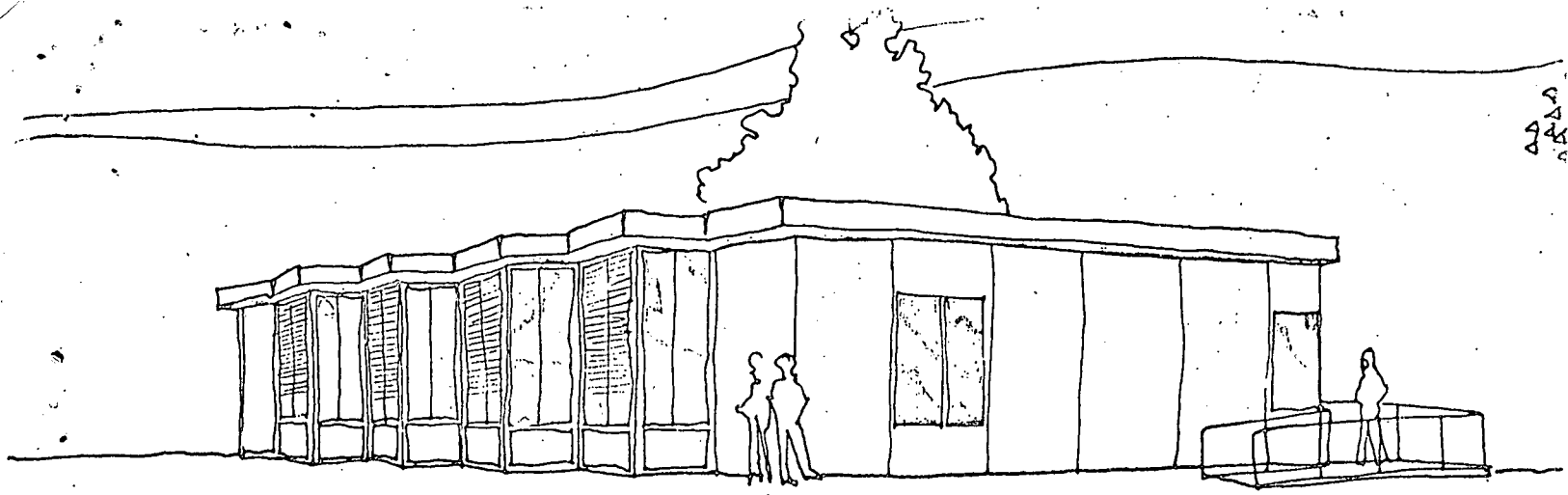
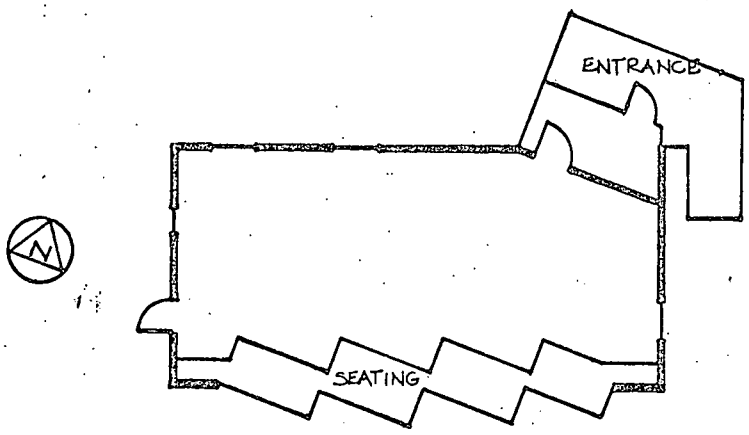


FIGURE 1. M.I.T. SOLAR BUILDING

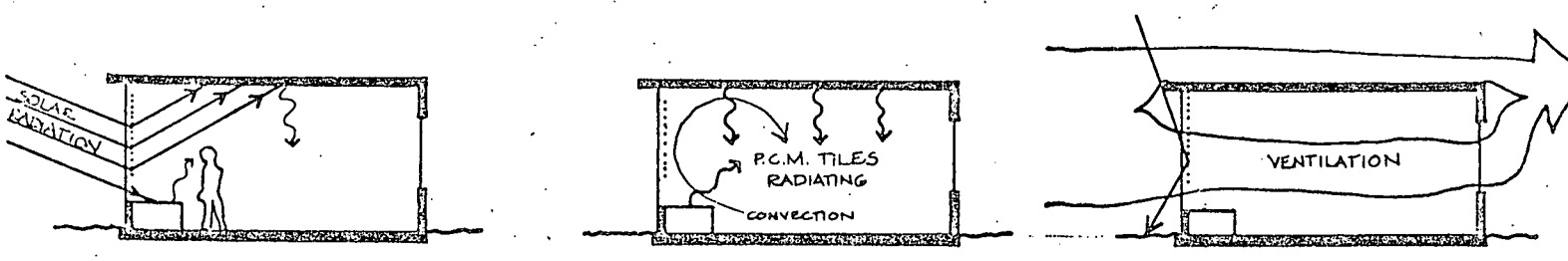




perspective



floor plan



WINTER DAY WINTER NIGHT SUMMER DAY

FIGURE 3. system schematics