

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

October 1977

NOTICE  
This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Department of Energy, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

Prepared for the U.S. Energy Research and Development Administration  
under contract No. EG-77-S-02-4513.A000

EB  
DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

## **DISCLAIMER**

**This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.**

## **DISCLAIMER**

**Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.**

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.

Progress Report

for period August 1, 1977 to October 31, 1977

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 installation
- 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).

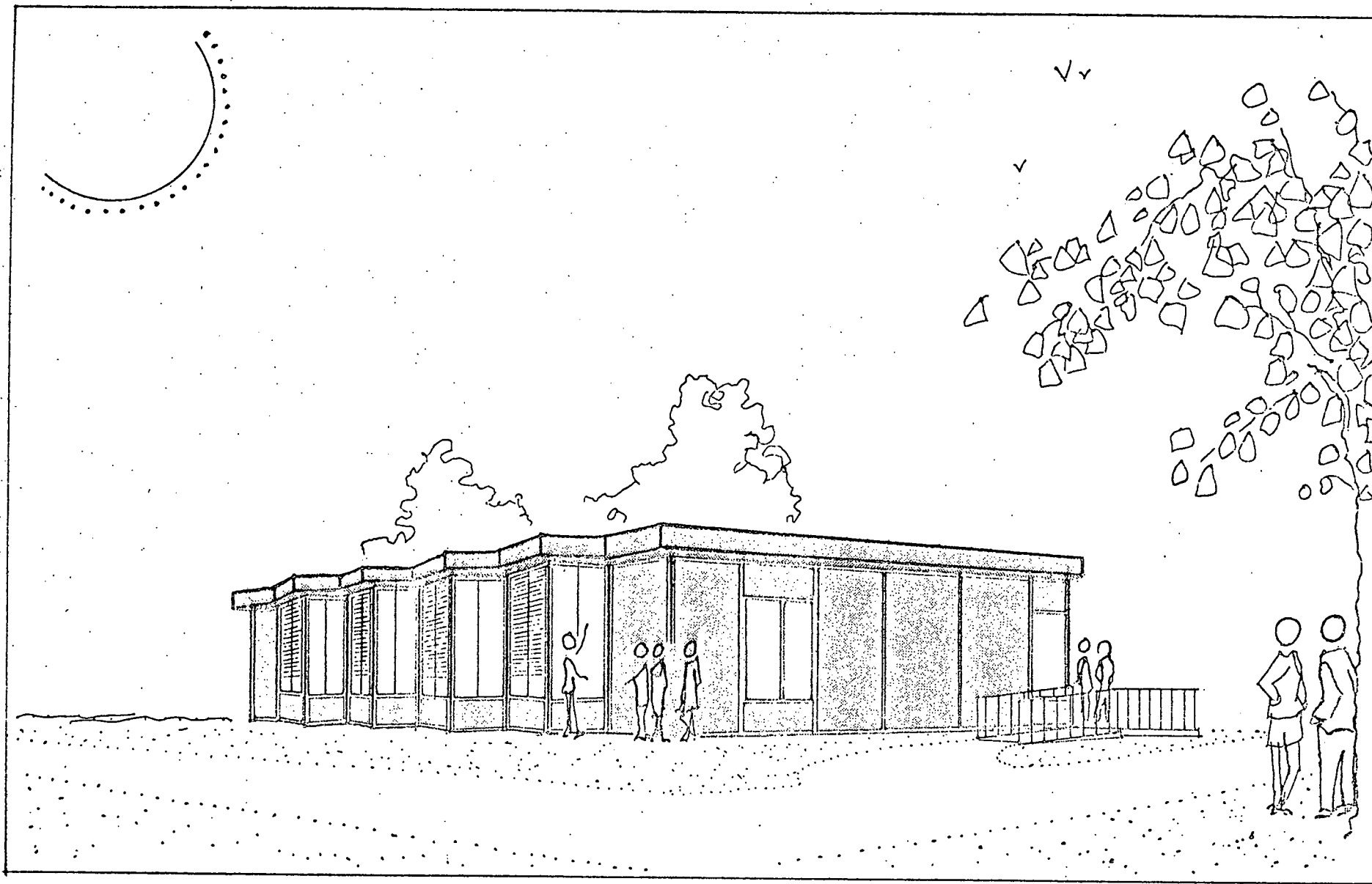
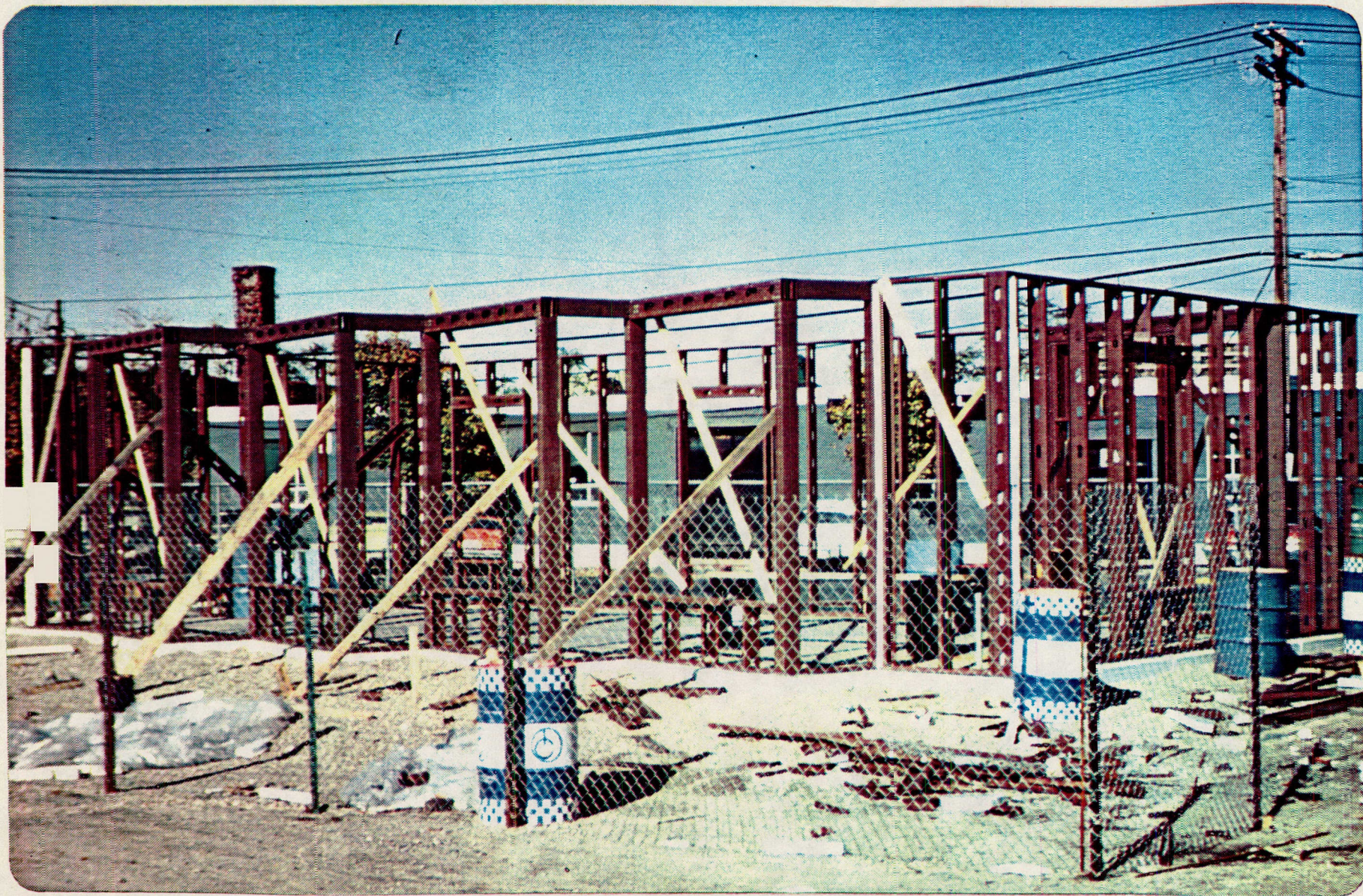


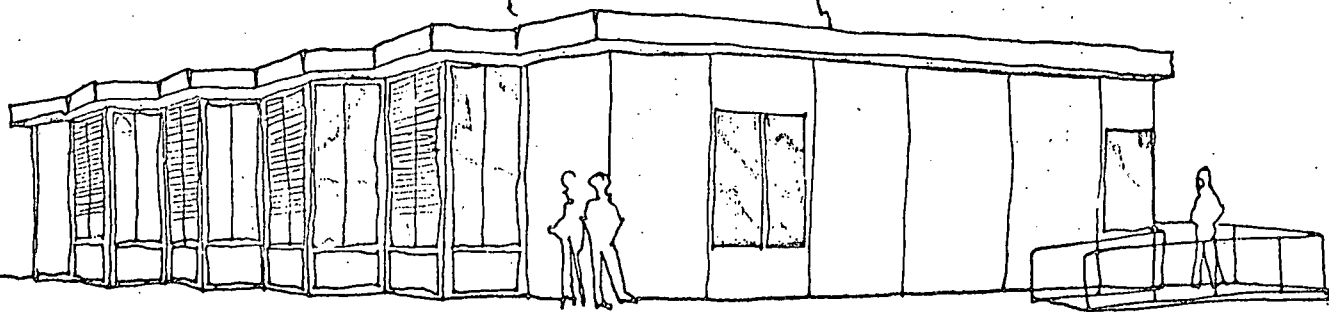
FIGURE 1.

# M.I.T. SOLAR BUILDING

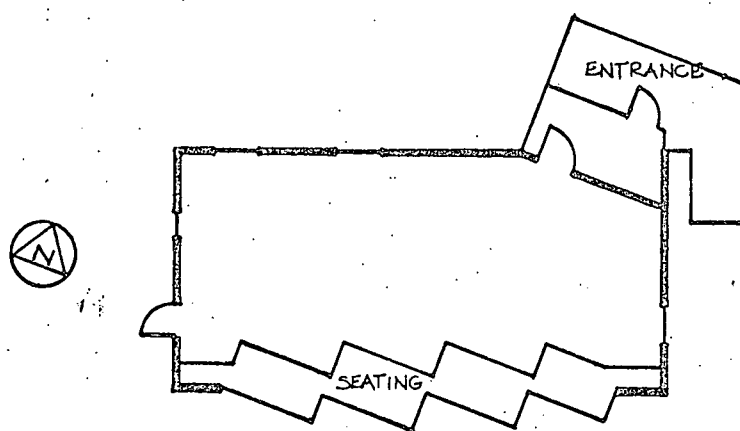




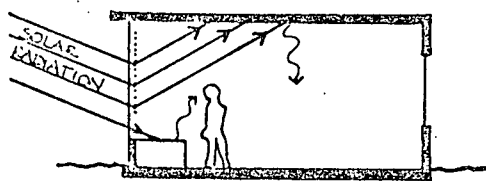




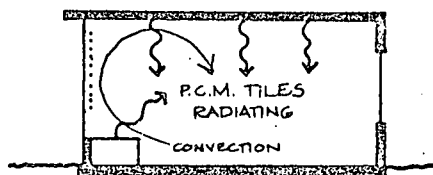
perspective



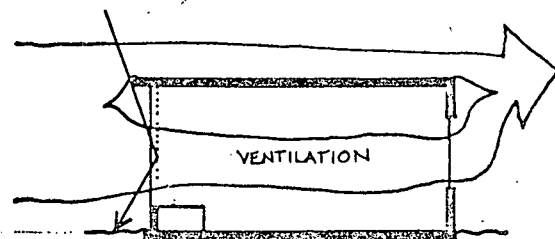
floor plan



WINTER DAY



WINTER NIGHT



SUMMER DAY

FIGURE 3. system schematics