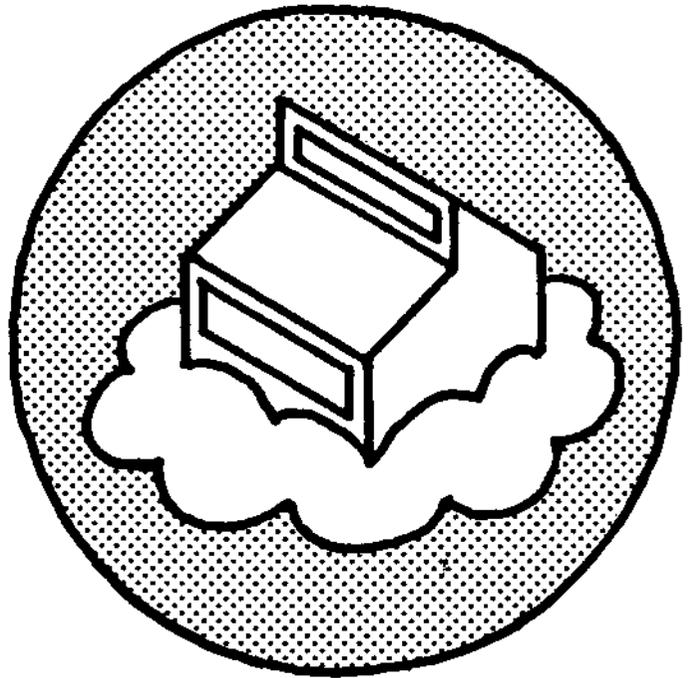


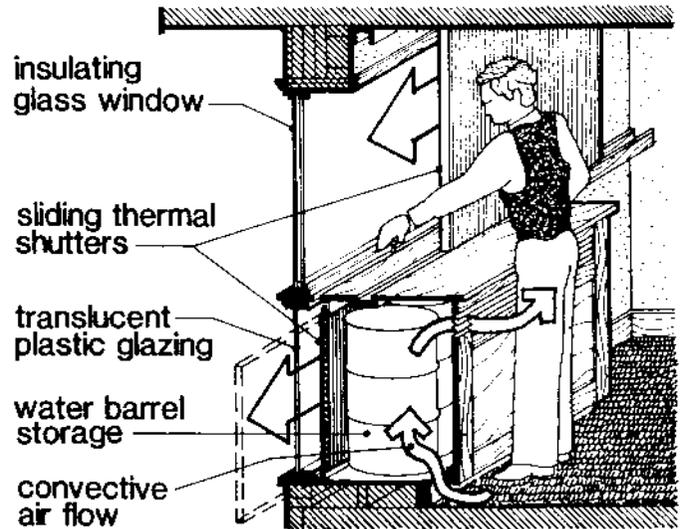
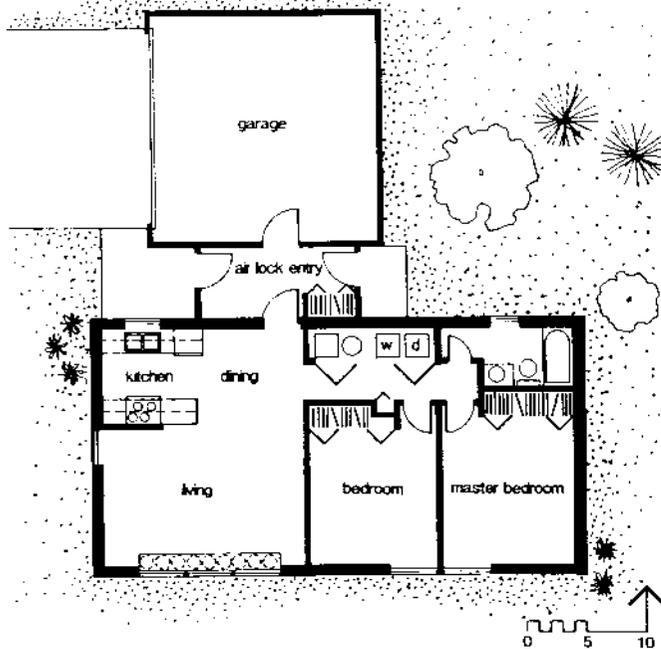
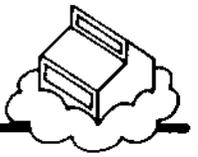
# CHAPTER 9

## EXAMPLE PROJECTS

A number of projects involving passive solar heating techniques are presented in this chapter as examples which have succeeded in achieving a certain measure of energy self sufficiency.



# EXAMPLE PROJECTS



# EXAMPLE PROJECTS

## GRANDVIEW AND ISLANDER

**ENERGY KEYWORDS:** DIRECT GAIN, WATERWALL MASS, SUPER INSULATION, UNIVERSAL SITING

**DESIGN PARAMETERS:** Develop plans that could be built for competitive prices and fit on a standard 60 x 100 city lot.

**ENERGY CONCEPTS:** Reduce energy consumption by 80% in comparison to the conventional tract home. This is achieved through the use of either of two variations: 1) a double 2x4 stud wall construction with a small amount of glass area or 2) greater glass area with a single 2x6 stud wall construction.

**DESIGN SPECIFICS:** The Islander is a single-story dwelling and the Grandview is a two-story dwelling. Both can be regarded as "typical" designs which on the surface are no different than any other standard tract home.

## GRANDVIEW

(on the previous page)

**FLOOR AREA:** 1100 sq ft

with garage and optional basement

**SOUTH GLAZING:** 108 sq ft

**R VALUES:** Walls R-38, Roof R-60

**OTHER COMMENTS:**

1. Optional master bath upstairs.
2. Optional domestic solar hot water heater.
3. Optional entry vestibule.
4. Optional vestibule on first floor.
5. Optional fireplace and vent openings for attic turbine.
6. Optional water storage beneath first floor windows with sliding insulating panel. Translucent lexan panels below windows to admit sunlight to heat storage.

## ISLANDER

(on opposite page)

**FLOOR AREA:**

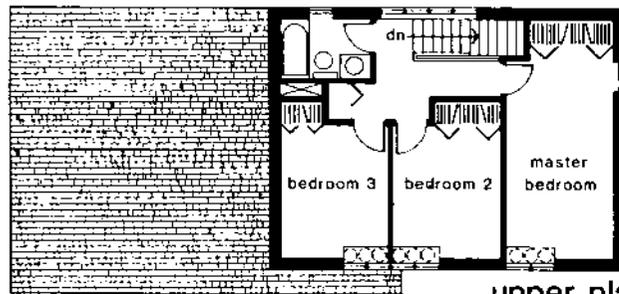
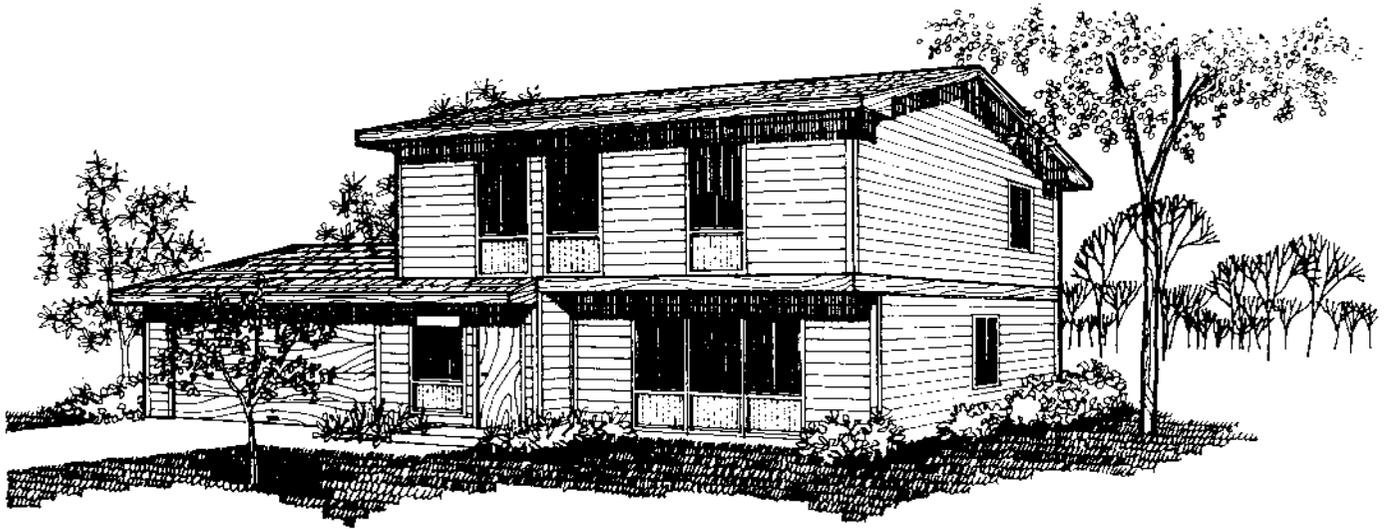
living 924 sq ft

vestibule 84 sq ft

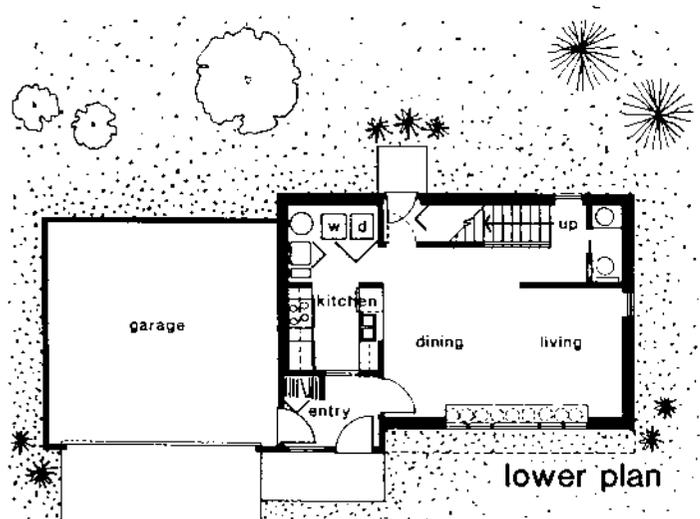
garage 400 sq ft

**SOUTH GLAZING:** 90 sq ft or 160 sq ft

**OTHER SPECIFICATIONS SIMILAR TO THE GRANDVIEW**

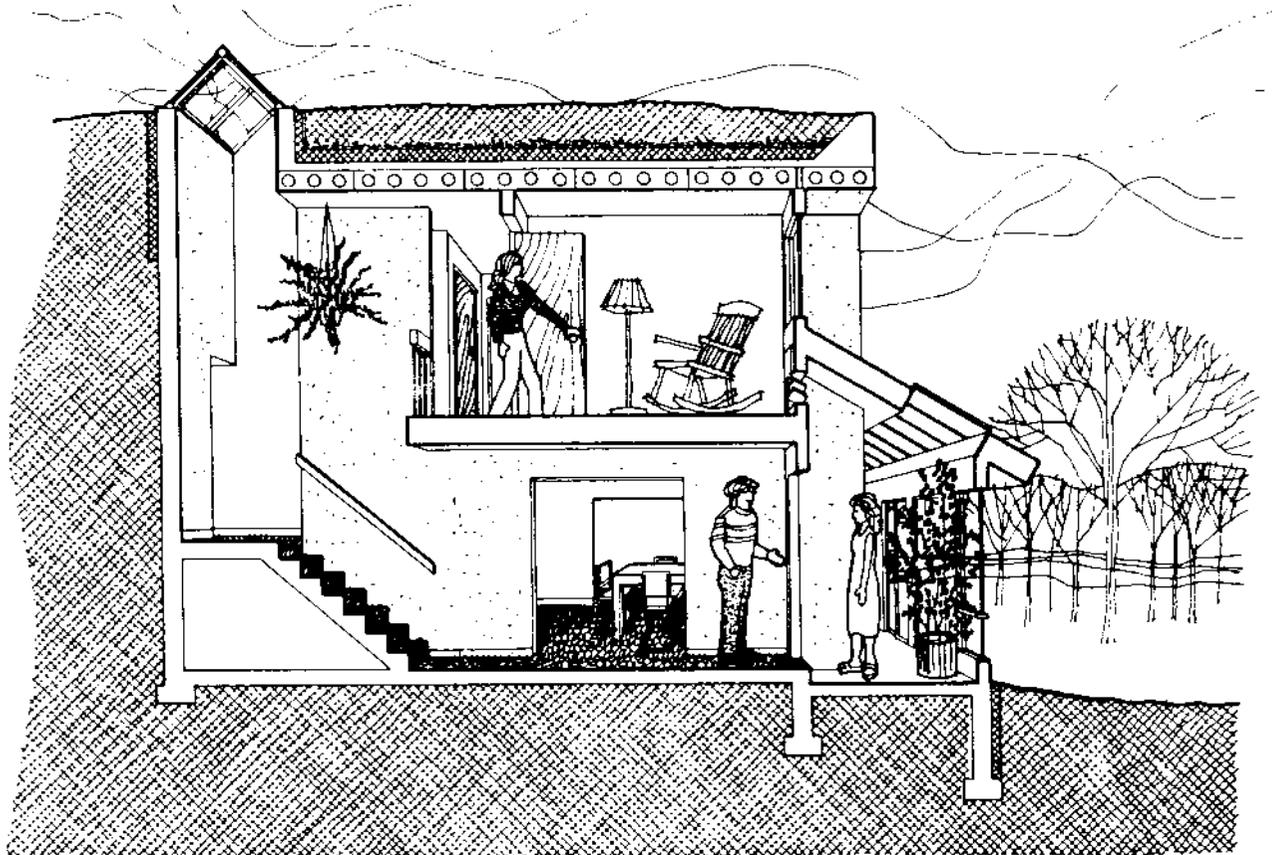


upper plan



lower plan

# EXAMPLE PROJECTS



## NELSON RESIDENCE KEARNEY, NEBRASKA

**ENERGY KEYWORDS:** DIRECT GAIN, THERMAL WALLS, GREENHOUSE, LIGHT WELL, SOLAR CONTROL, EARTH SHELTERING, AIRLOCK ENTRY, NATURAL COOLING

**DESIGN PARAMETERS:** Design a 3 bedroom residence to be compatible with its surroundings.

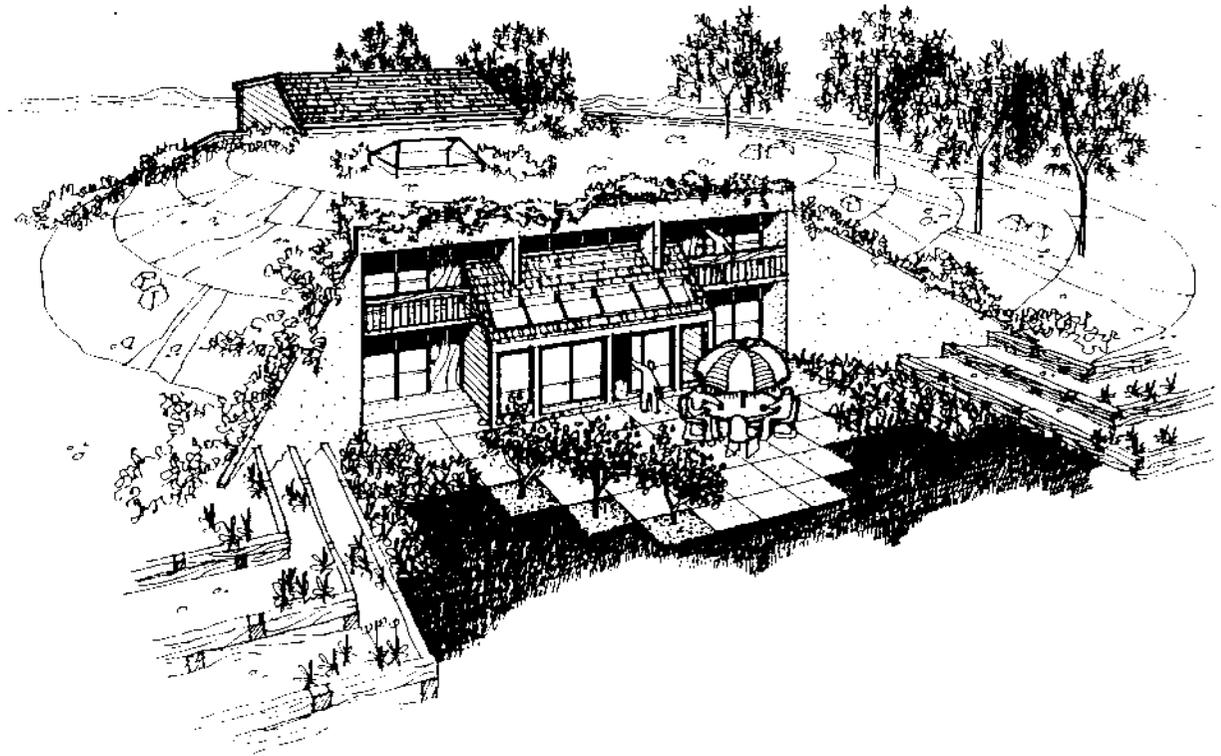
**ENERGY CONCEPT:** Earth sheltering, natural cooling, and passive solar design techniques were specified by the owner/builder team.

**DESIGN SPECIFICS:** The 2 story structure was designed to take advantage of a sloping site. The solar greenhouse integrates all six major living spaces. Bearing walls divide the house into three bays, defined by the ends of the solar greenhouse. The structure is poured concrete with precast horizontal roof slabs.

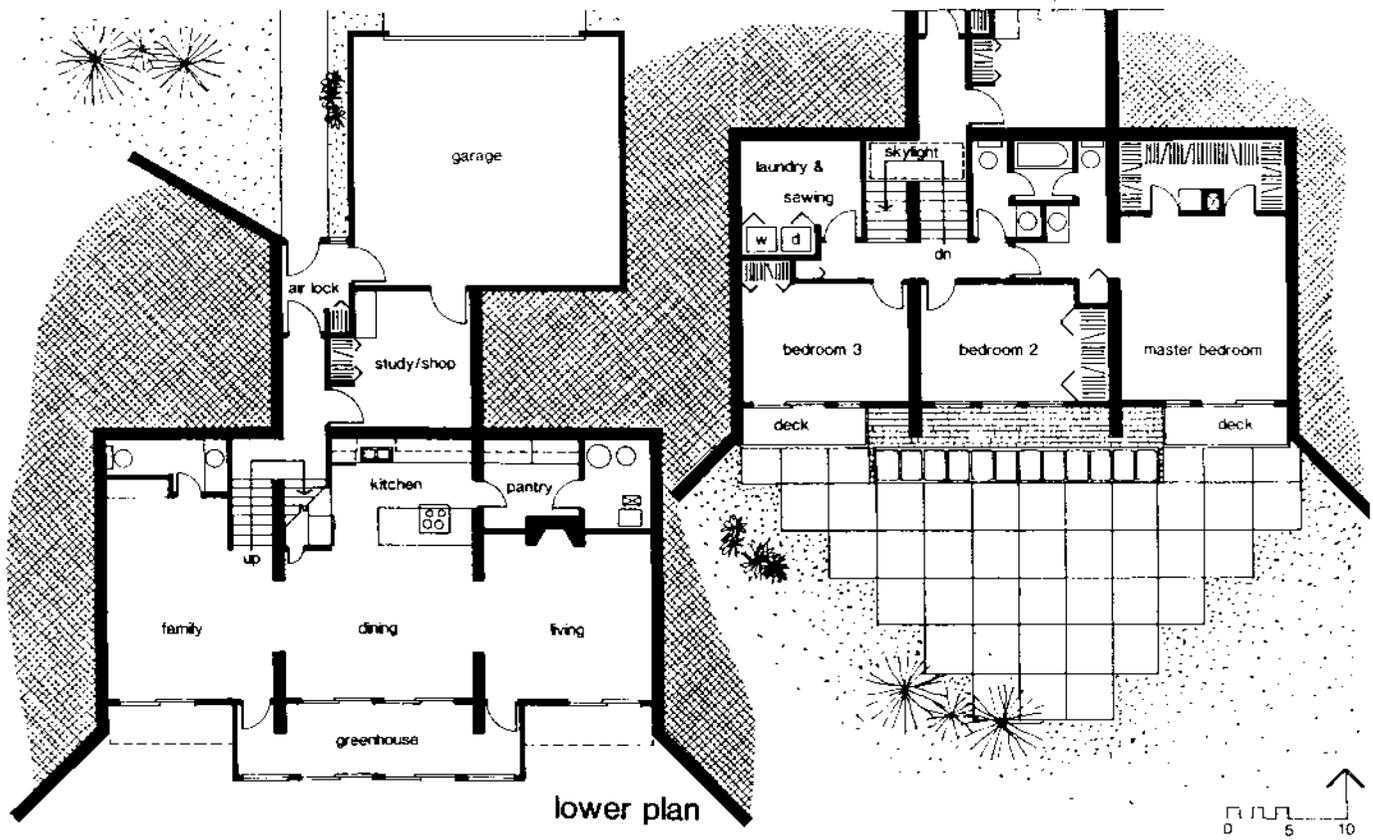
**FLOOR AREA:** 1st floor 1310 sq ft  
2nd floor 903 sq ft  
greenhouse 175 sq ft  
garage 433 sq ft

**SOUTH GLAZING:** 1st floor 64 sq ft  
2nd floor 86 sq ft  
greenhouse 130 sq ft

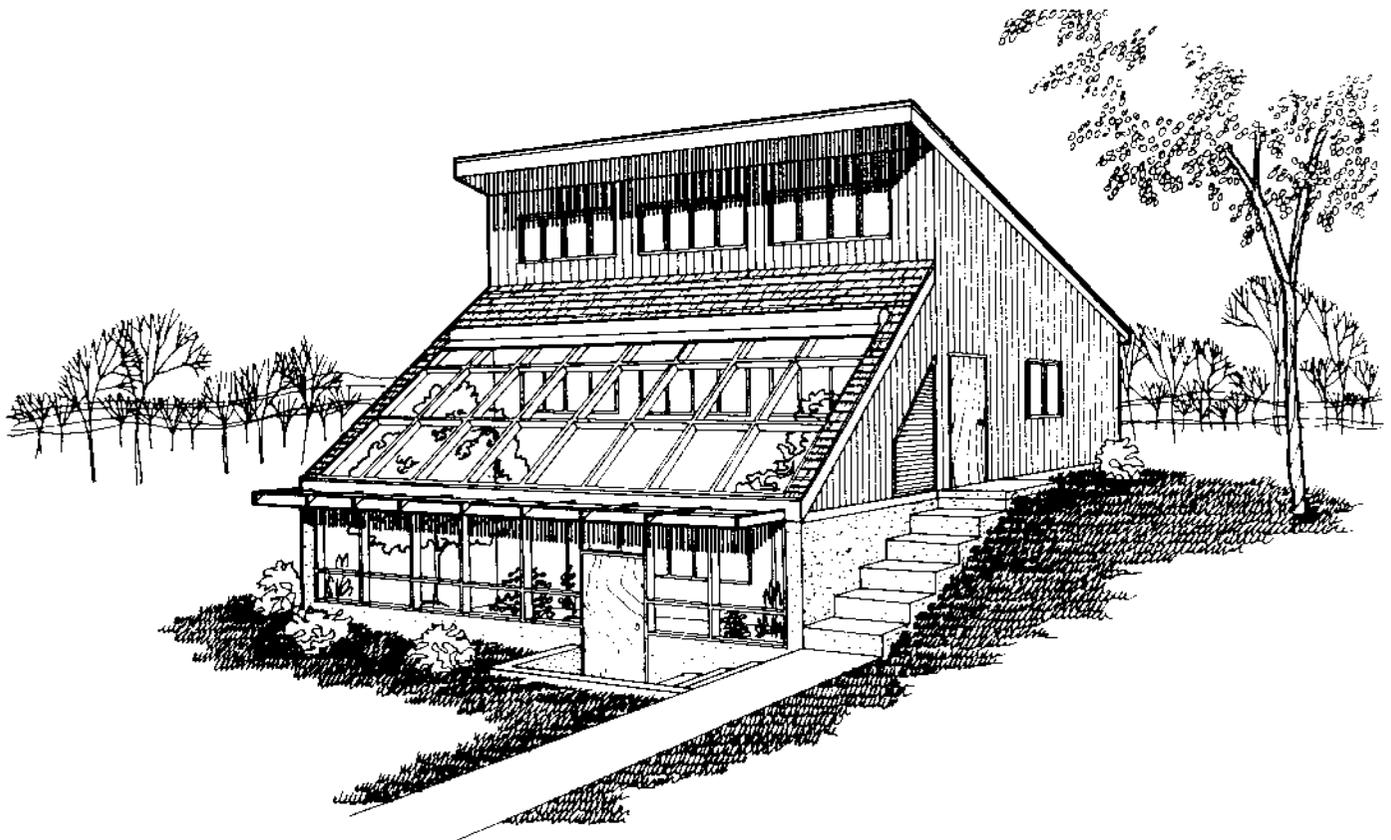
**INSULATION:** Roof R-36  
South wall R-27  
Other walls R-34 for 1st  
4 feet, R-2 for rest



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# EXAMPLE PROJECTS



MORAN RESIDENCE AUBURN, NEBRASKA

ENERGY KEYWORDS: DIRECT GAIN,  
GREENHOUSE, CLERESTORY, EARTH BERM

DESIGN PARAMETERS: Develop a solar-conscious home on a budget under \$40,000.

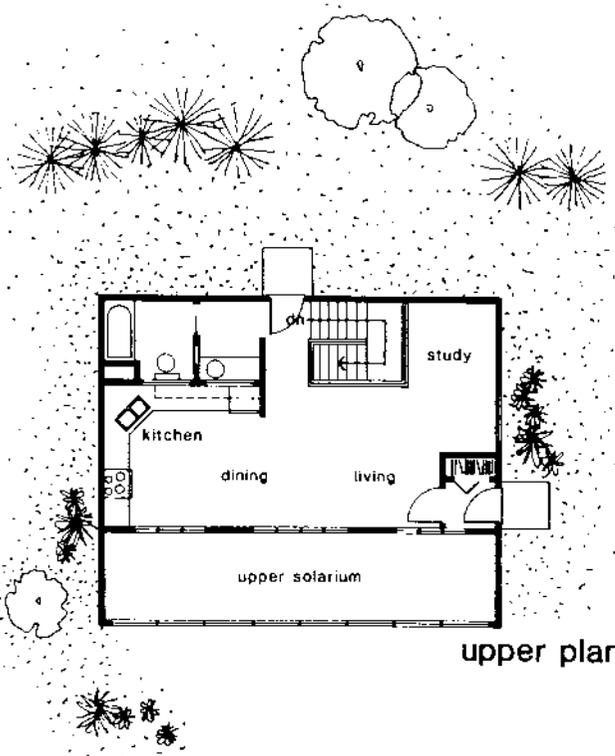
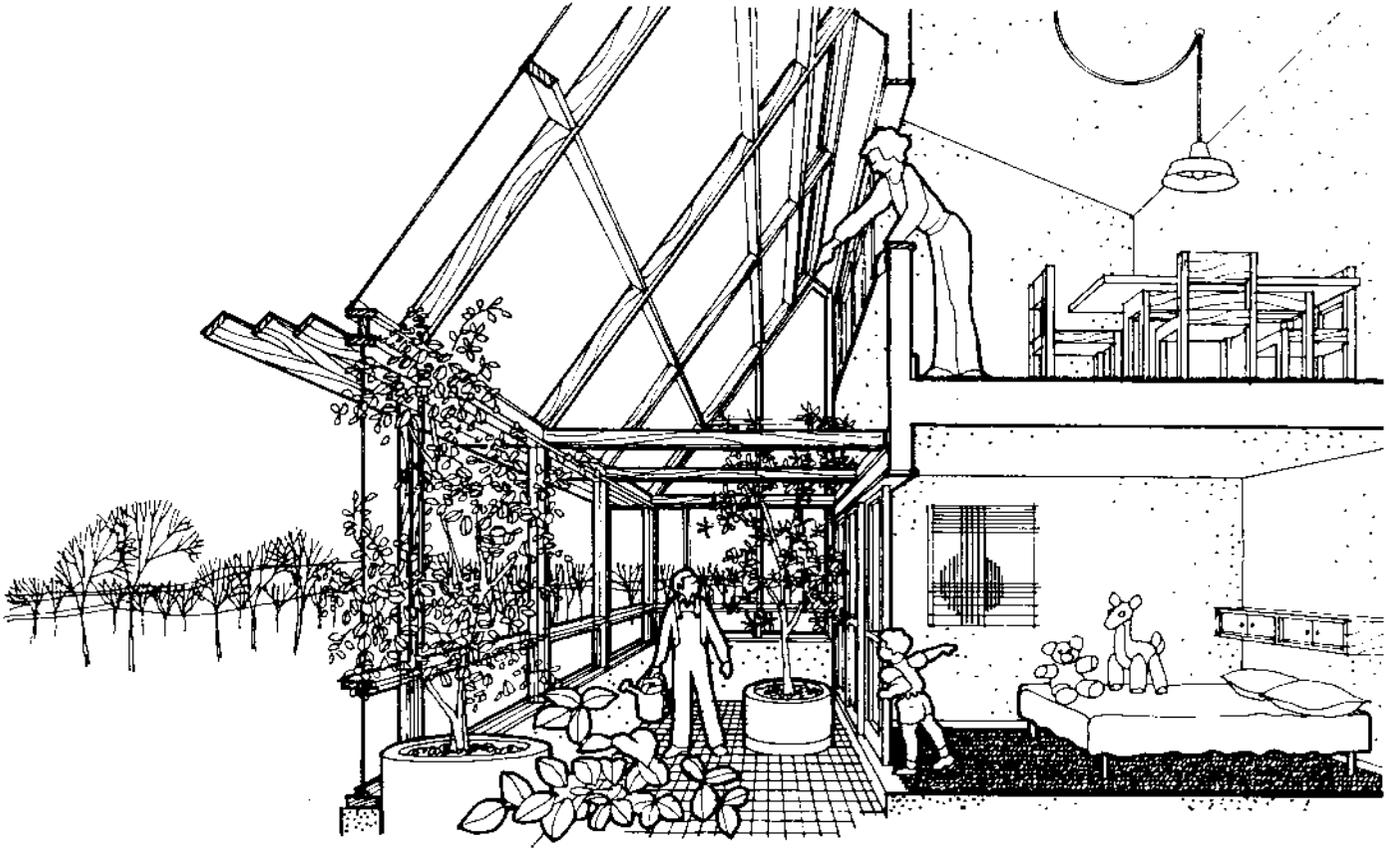
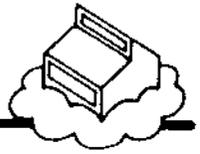
ENERGY CONCEPTS: A greenhouse (solarium) was incorporated as the major passive solar energy system. A clerestory provides some direct gain to the upper level living areas.

DESIGN SPECIFICS: There are three bedrooms located on the lower level. A full bath would have been desirable but was not adopted for the lower level. The floor plan exudes economy of space and has an airlock entry.

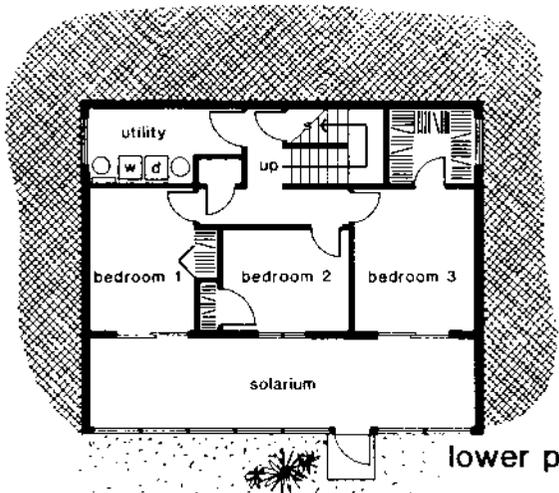
FLOOR AREA: Upper Living 572 sq ft  
Lower Bedroom 537 sq ft  
Greenhouse 239 sq ft

SOUTH GLAZING: Clerestory 45 sq ft  
Sloped area 320 sq ft  
with double filon  
Bedroom 111 sq ft

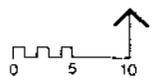
INSULATION: WALLS R-19  
ROOF R-32



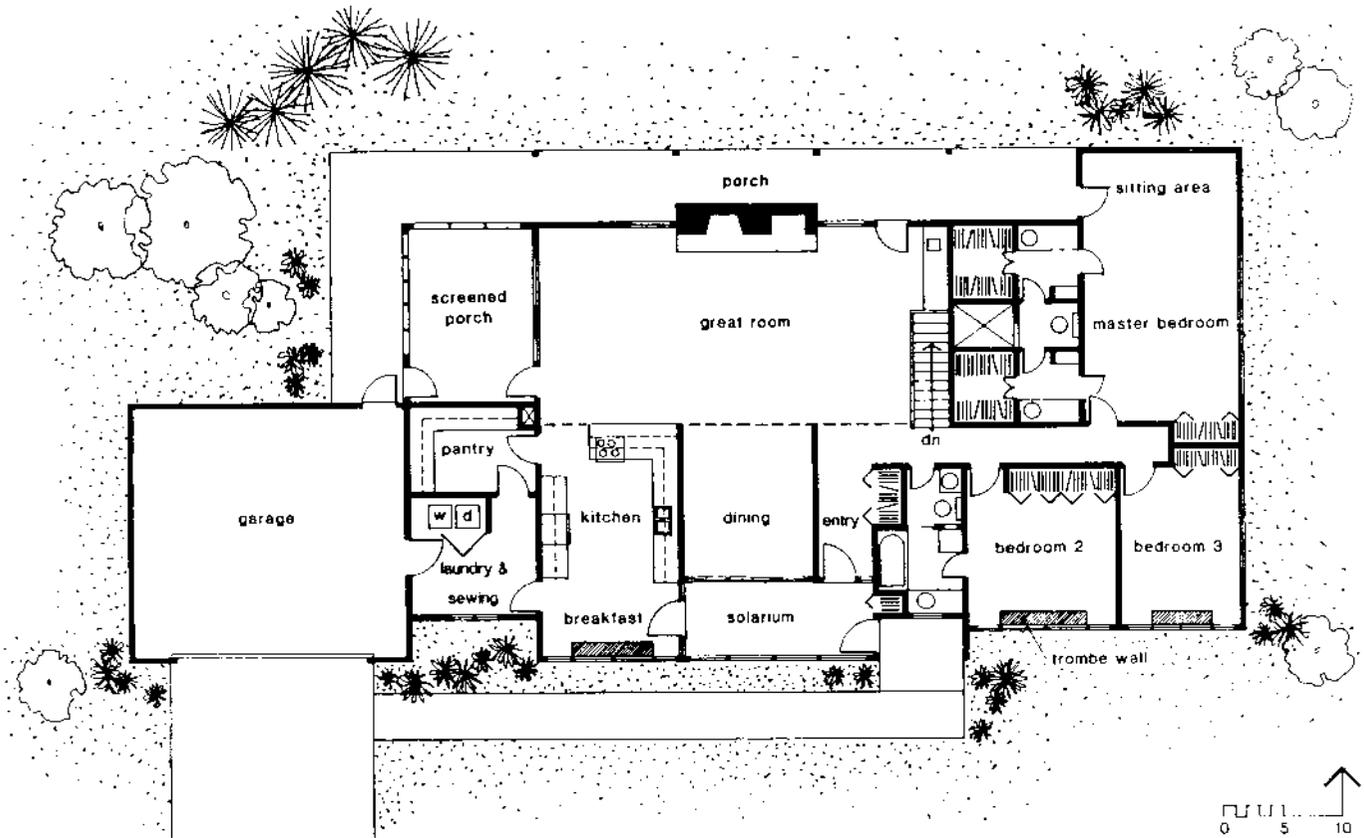
upper plan



lower plan



# EXAMPLE PROJECTS



RANCH STYLE OMAHA, NEBRASKA

ENERGY KEYWORDS: DIRECT GAIN, TROMBE WALL, GREENHOUSE, CLERESTORY AND SOLARIUM VESTIBULE

DESIGN PARAMETERS: Create an open and airy solar home with the great room as central focus.

ENERGY CONCEPTS: Clerestory windows serve to admit sunlight to master bedroom and great room. The solarium provides an airy and sunny aspect to the dining area. Trombe walls provide delayed heat to two bedrooms and kitchen area and provide additional privacy.

DESIGN SPECIFICS: The home is a single story ranch style with three bedrooms and two baths. Airlock vestibule entries are cleverly disguised as a solarium for the main entry and as a laundry room for the garage entry point. A clerestory

window area provides a vaulted space for the great room. A screened porch is located off the great room. The great room contains a large central fireplace. A porch surrounds both the great room and screened-in porch. In the summer, the western part of this porch provides shading to the west of the screened in porch. Thus the porch serves as a continuous tie-in from the master bedroom on the east side of the home all the way to the garage which anchors the west side.

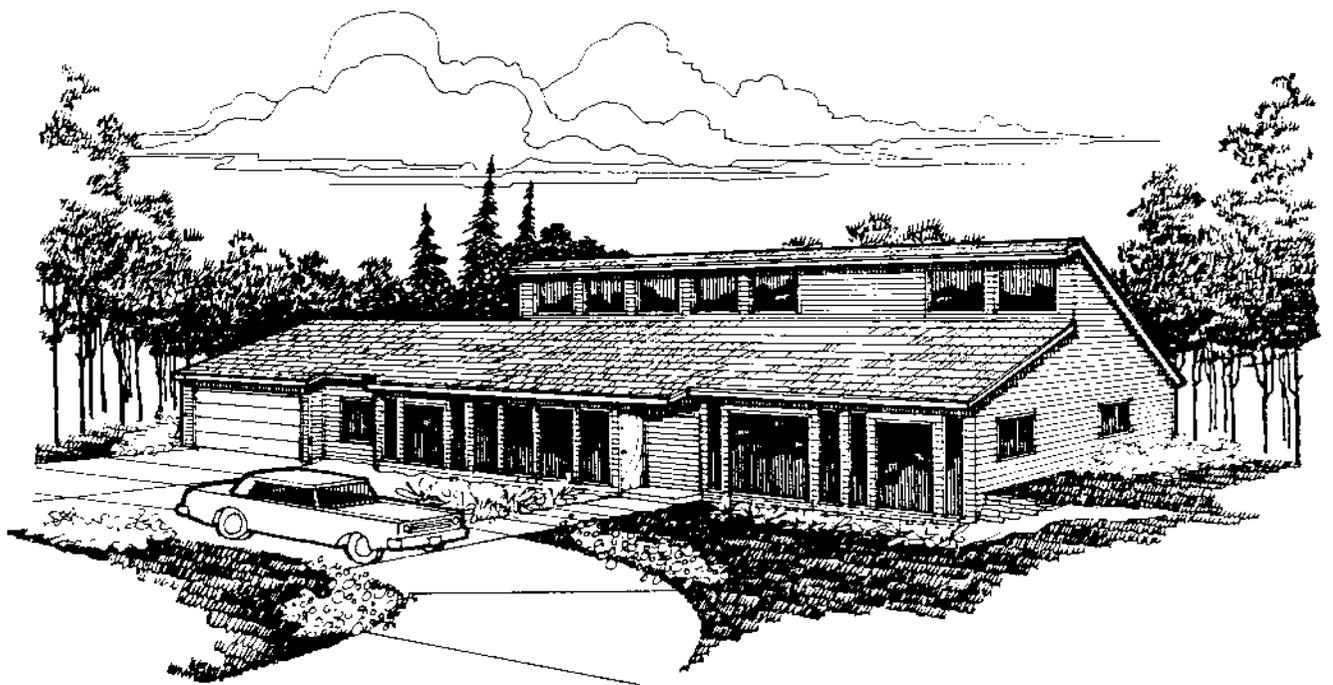
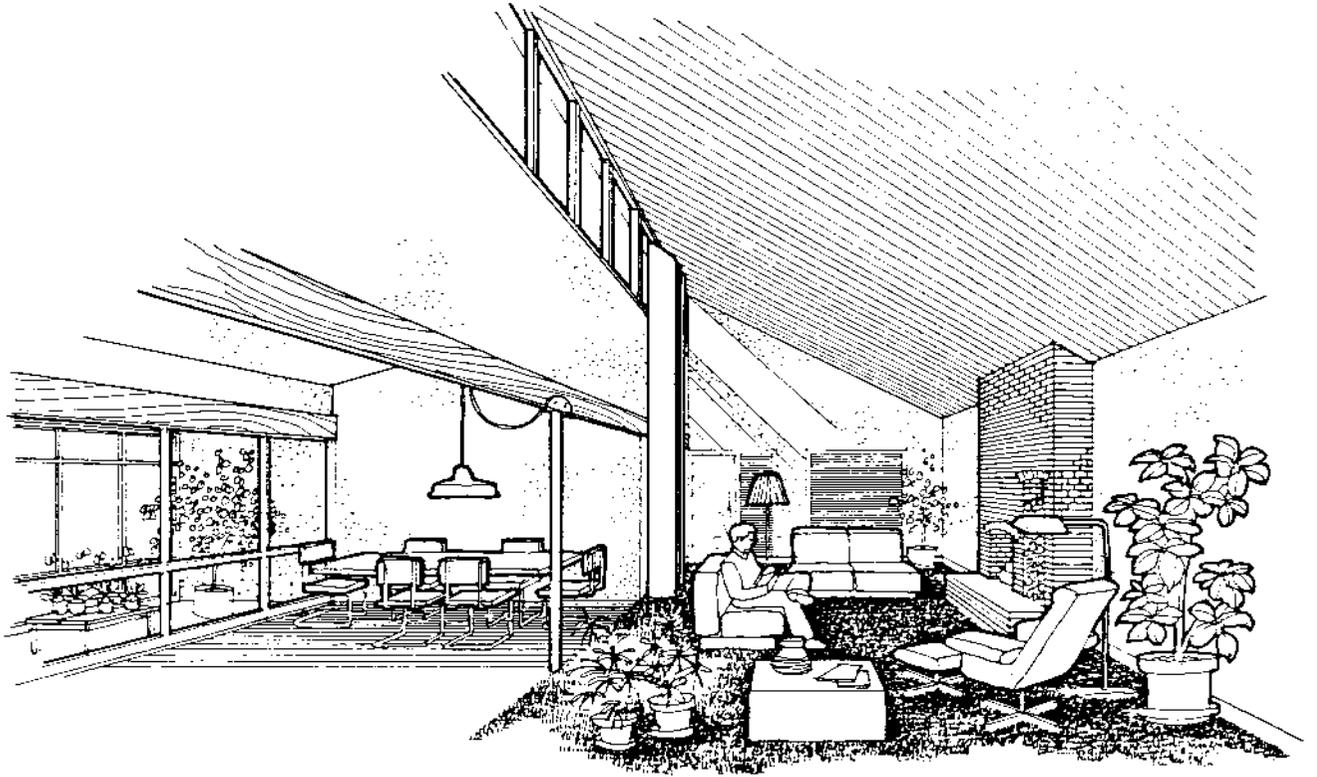
FLOOR AREA: Living 1925 sq ft  
Solarium 110 sq ft  
Screened porch 110 sq ft  
Garage 480 sq ft

SOUTH GLAZING:

Clerestory window 140 sq ft  
Trombe walls 125 sq ft  
Remaining 200 sq ft

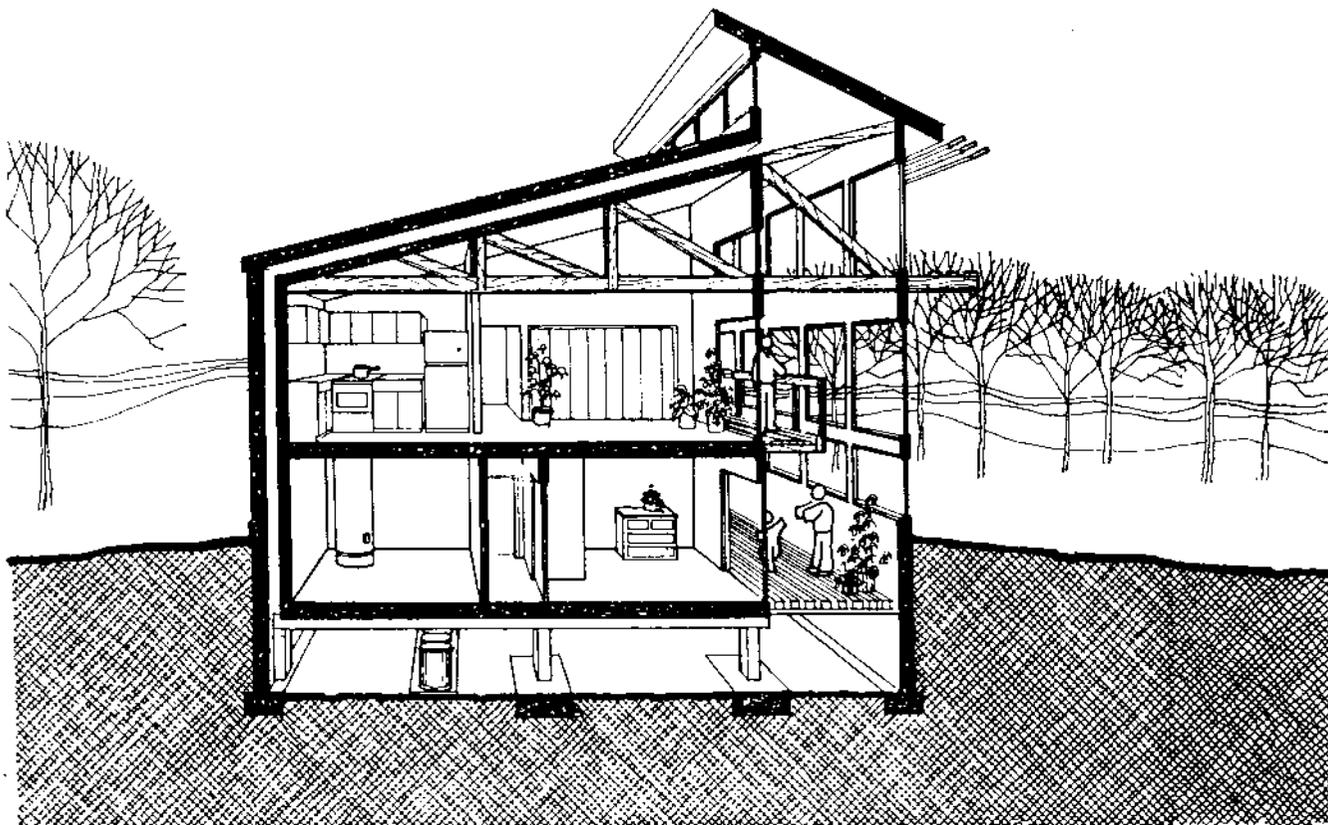
INSULATION:

WALLS R-27  
CEILING R-38



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# EXAMPLE PROJECTS



## DOUBLE SHELL HOME COLUMBUS, NEBRASKA

**ENERGY KEYWORDS:** DOUBLE SHELL, GREENHOUSE, NORTH-FACING CLERESTORY VENTILATION

**DESIGN PARAMETERS:** Develop a 2-story double shell home utilizing the upper story as primary living space.

**ENERGY CONCEPT:** This double shell design includes a greenhouse which bathes the roof and north wall area with warm air. The crawl space provides additional storage of excess heat.

**DESIGN SPECIFICS:** The bedrooms are on the lower floor in this floor plan to take advantage of the way the space is utilized -- as the family tends to congregate in the living areas, which have been designed with cathedral ceilings, during the daylight hours. In a double shell the warmest daylight locations are in the upper floors.

### FLOOR AREA:

Lower Level: Living 758 sq ft  
Sunspace 283 sq ft  
Upper Level: Living 855 sq ft  
Balcony 60 sq ft  
Breezeway 136 sq ft  
Garage 544 sq ft

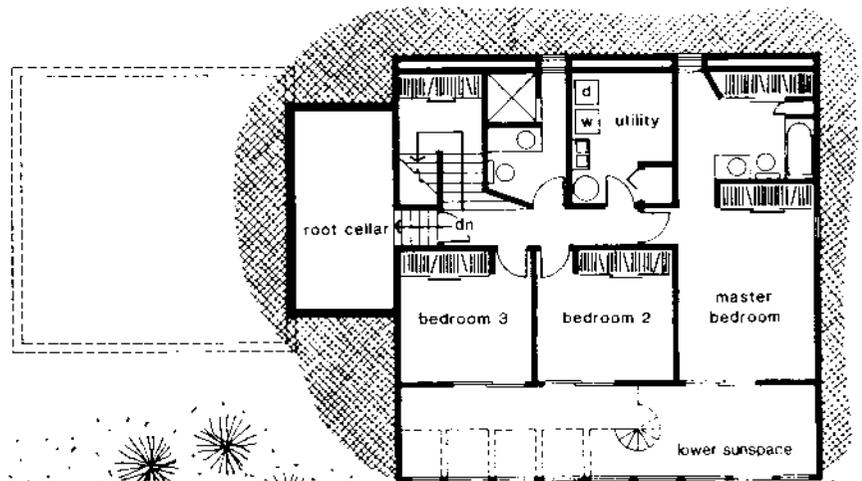
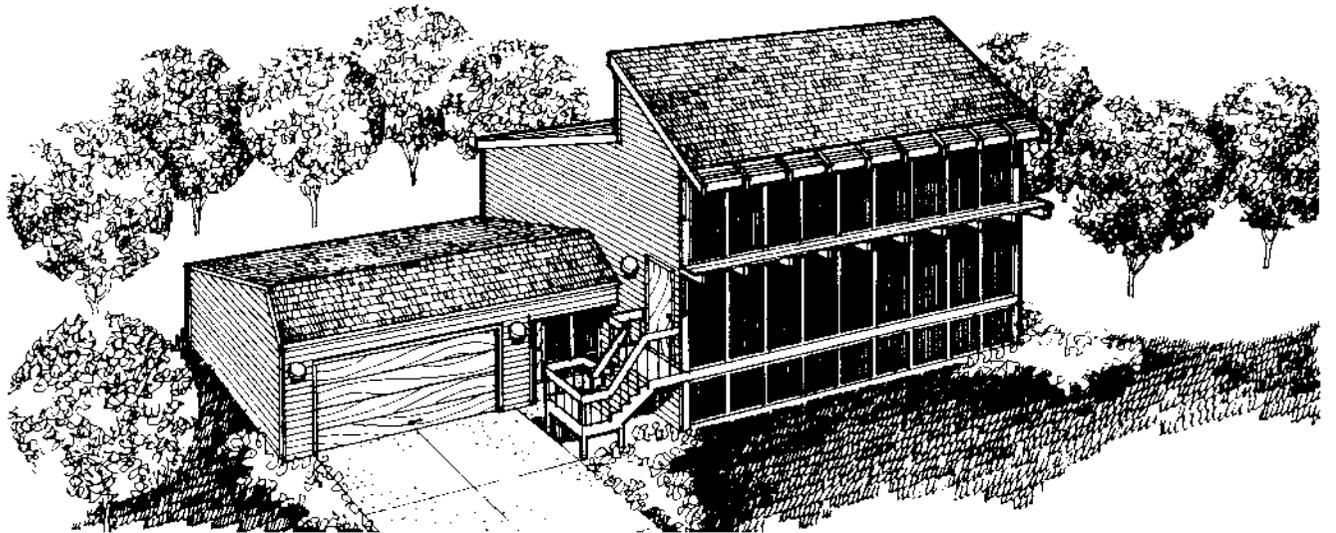
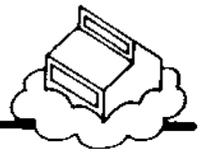
**SOUTH GLASS:** 500 sq ft

### INSULATION:

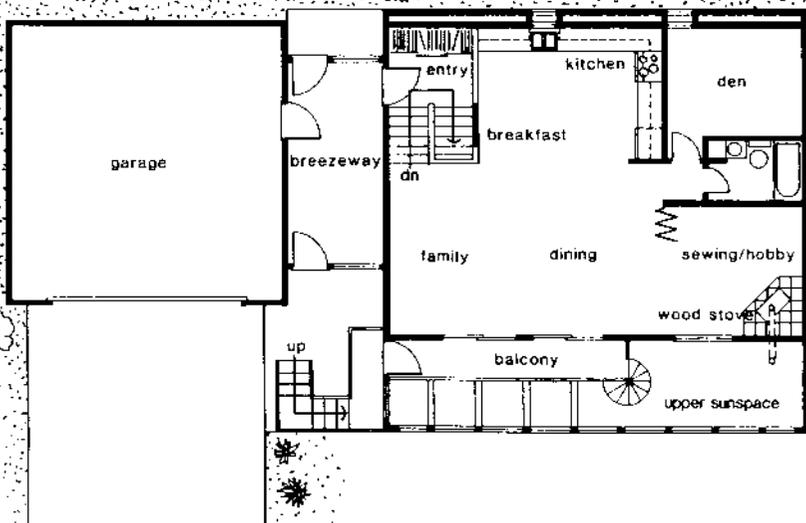
Exterior East & West Walls R-27  
Exterior South Wall R-19  
Exterior North Wall R-27  
Roof R-18  
Inner Walls R-11 (R-18 in ceiling)

### OTHER COMMENTS

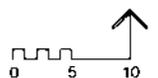
1. Crawl space designed for 2" slab.
2. No night shutter system.
3. Water barrels in crawl space for additional storage.
4. Air envelope between walls is 8" thick.
5. Operable north-facing clerestory windows take advantage of prevailing summer winds.



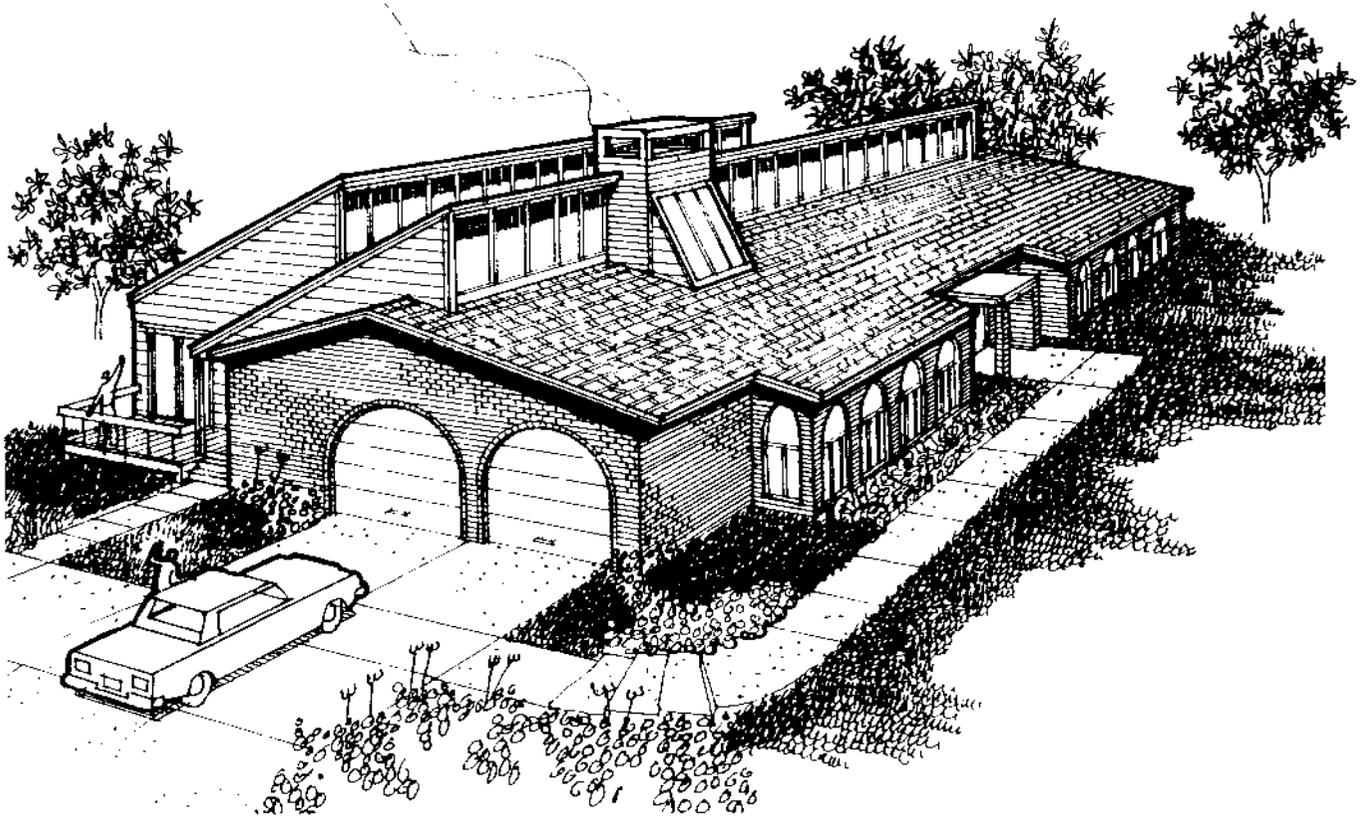
lower plan



upper plan



# EXAMPLE PROJECTS



## VOLLERTSEN RESIDENCE HAMBURG, IOWA

**ENERGY KEYWORDS:** DIRECT GAIN, CLERESTORY, GREENHOUSE, ACTIVE FLAT PLATE DOMESTIC HOT WATER HEATER, POOL WATER HEATER, AIR TO AIR HEAT EXCHANGER

**DESIGN PARAMETERS:** Develop an energy-conscious, spacious home centered about the indoor swimming pool and whirlpool.

**ENERGY CONCEPT:** The greenhouse passive solar heating technique is utilized along the south side of the home by the master bedroom and the living room - dining room area. For the bedrooms and kitchen area there is a direct gain passive solar collection system using a clerestory window concept. A second clerestory is used for the swimming pool area. Air must be vented from the pool area in order to maintain acceptable humidity levels. An air to air heat exchanger captures most of the heat from the vented air. Flat plate collectors are used to provide domestic hot water heating.

**DESIGN SPECIFICS:** The living-dining room and bedroom are anchored by sunspaces. Dark indoor brick located throughout the home serves as thermal mass. The north wall of the swimming pool consists of 12" of concrete which serves as additional thermal mass to store solar energy.

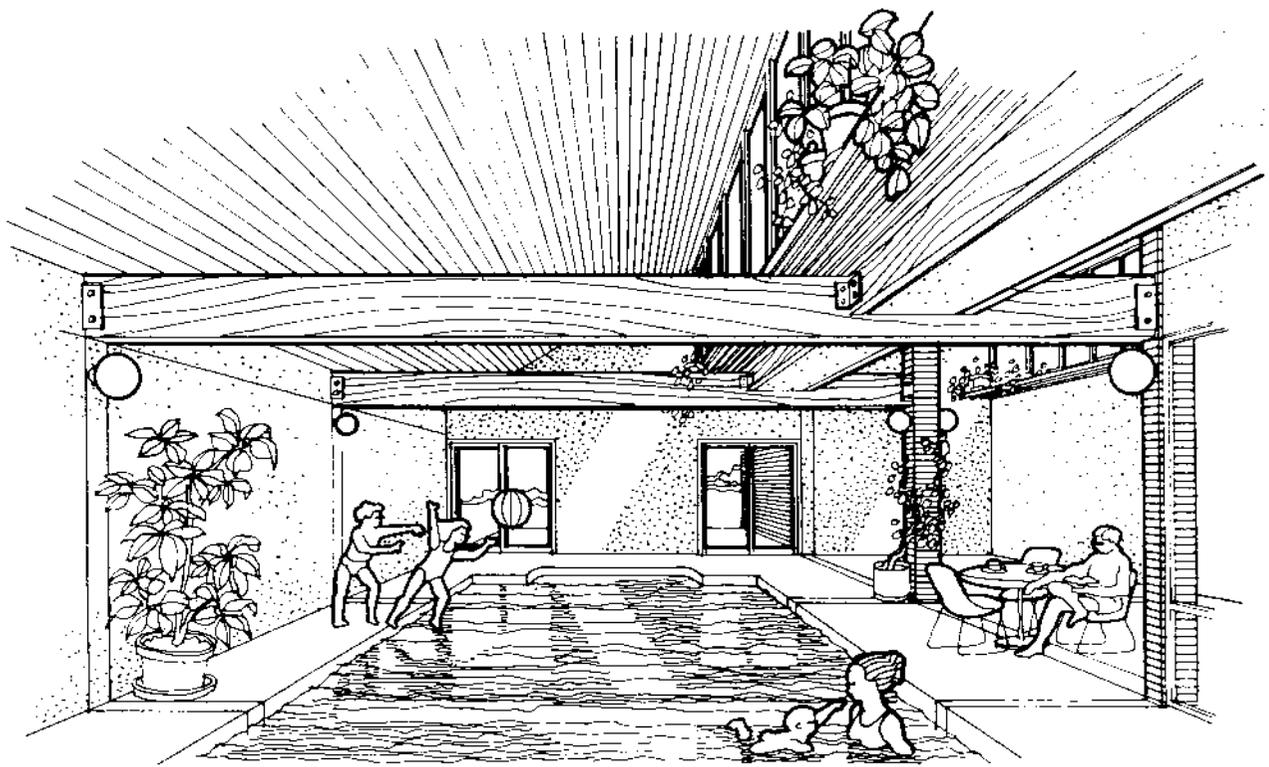
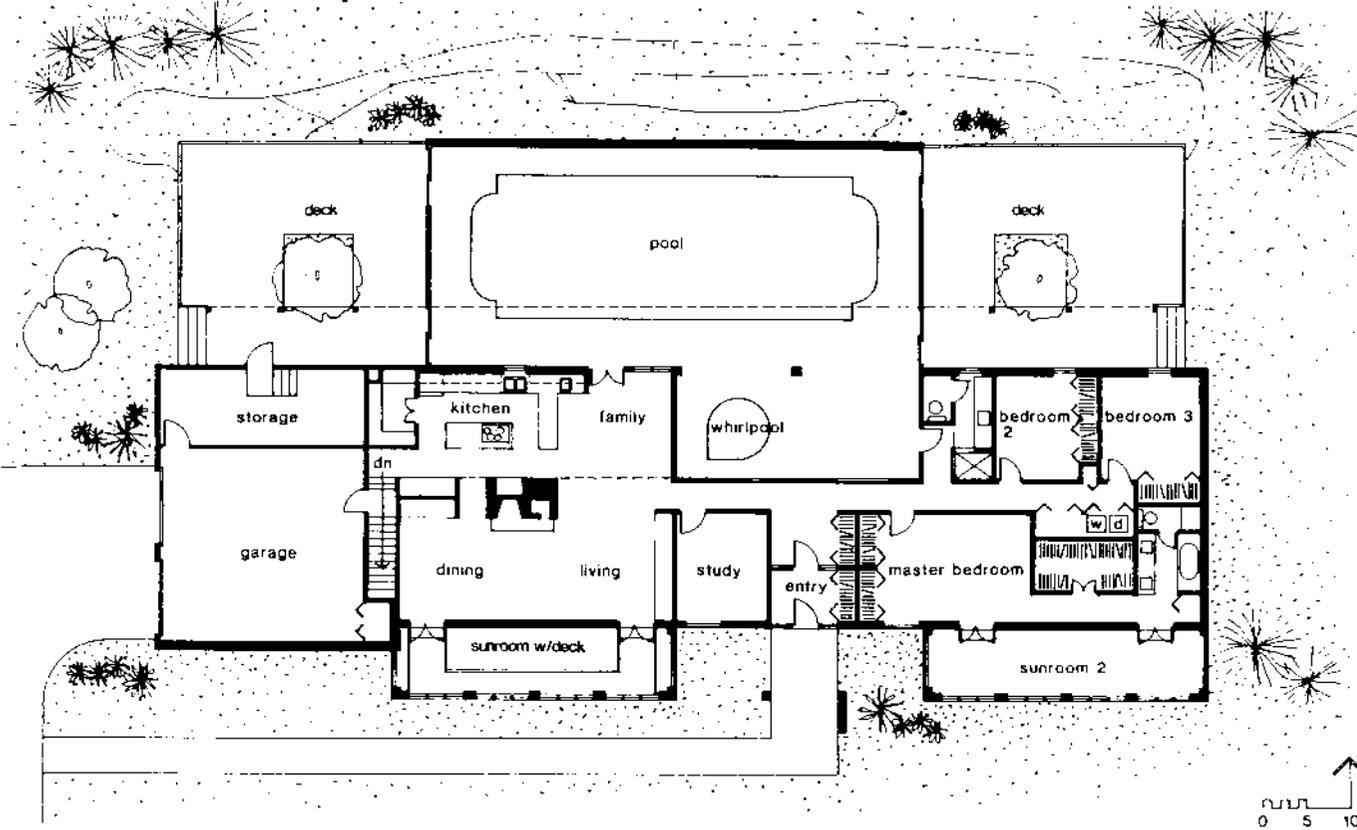
**FLOOR AREA:** House 2254 sq ft  
Pool 1792 sq ft  
Sunrooms 512 sq ft  
Basement 1008 sq ft  
Garage 764 sq ft

**INSULATION:** Roof R-38 to R-44  
Walls R-20

**GLAZING:** Greenhouse 215 sq ft  
Clerestory: 700 sq ft  
(293 sq ft pool and 407 sq ft in living areas)

**Special features:**

1. 320 sq ft active flat plate collector for pool water heating.
2. Active solar domestic hot water heater with 82 gallon storage.
3. Air to air heat exchanger for exhausting humid pool air.



# EXAMPLE PROJECTS

## TRIPLEX OMAHA, NEBRASKA

**ENERGY KEYWORDS:** DIRECT GAIN, GREENHOUSE, CLERESTORY, EARTH SHELTERING

**DESIGN PARAMETERS:** Create an earth sheltered, energy efficient multi-family urban residence that makes optimum use of the entire lot.

**ENERGY CONCEPT:** Earth sheltering, natural cooling, and passive solar heating for multi-family housing are utilized in this design. Electric downflow furnaces will provide the back-up heating for the minimal load. Fireplaces in each of the units can be used to raise interior space temperatures.

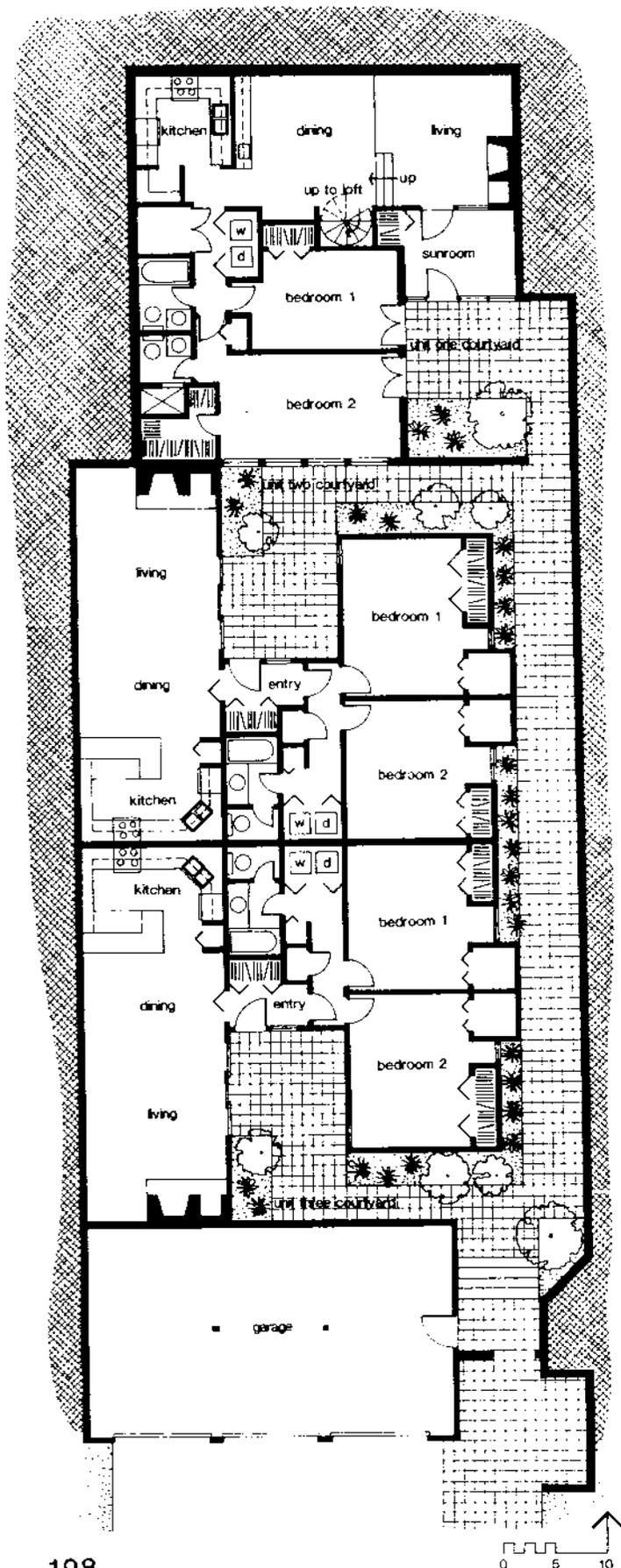
**DESIGN SPECIFICS:** The triplex is sited on a single house site in an urban setting. Because of the earth sheltering, zero lot line was utilized. Each unit has two bedrooms and two bathrooms. South-facing clerestories have been incorporated to capture solar energy. Losses are partially offset by the use of night shutters. The north unit contains a greenhouse entry and a loft space which is directly lit by its own clerestory. Private courtyards are employed to provide a means to draw the outside into the living spaces. A cathedral ceiling is incorporated in each of the three units.

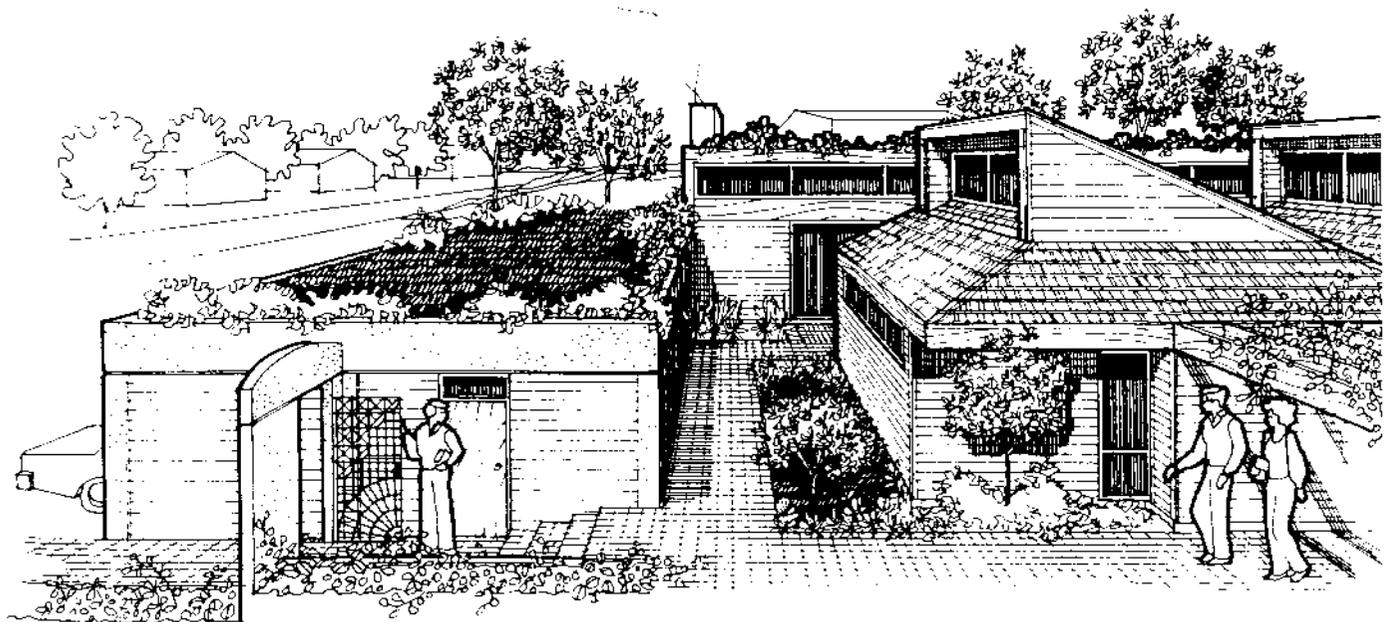
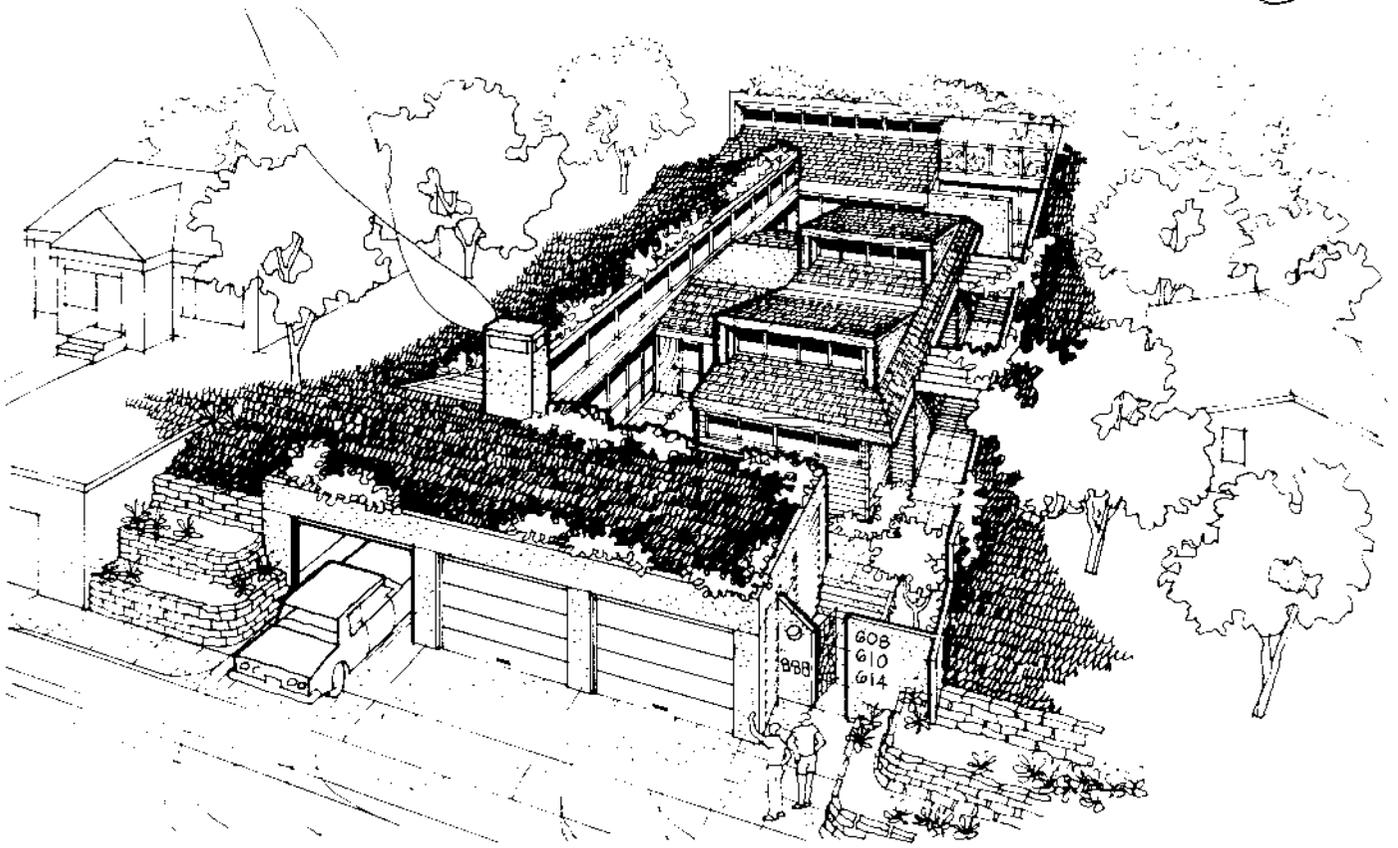
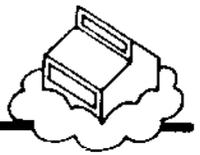
### FLOOR AREAS:

Middle and south unit 1025 sq ft  
 North unit 1050 sq ft main floor  
 and 425 sq ft in loft space  
 Garage 710 sq ft

### SOUTH GLAZING:

Middle and south units 90 sq ft  
 North unit clerestory 80 sq ft  
 greenhouse 150 sq ft





# EXAMPLE PROJECTS

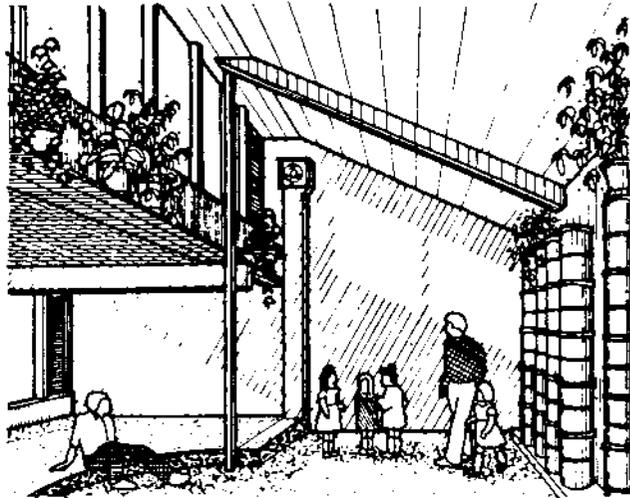
PRESCHOOL OMAHA, NEBRASKA

**ENERGY KEYWORDS:** DIRECT GAIN, CLERESTORY, WATER MASS, FLOOR MASS, INSULATION, MOVABLE INSULATION, RADIANT ELECTRIC AUXILIARY

**DESIGN PARAMETERS:** Create a one-room open plan schoolhouse that exemplifies the strengths of early American schoolhouses: self-sufficiency, energy common sense, academic teamwork, simplicity, human sensitivity, construction economy and low operational cost.

**ENERGY CONCEPT:** Mandated to minimize energy consumption and yet be as low-cost as possible. Natural gas was not to be used due to the high hookup costs relative to the building size. South-facing louvered ventilation openings capture south winds in the summer to provide a cooling path. North dormer windows help move the air. Except for small window units, air conditioning was to be kept to a minimum. Daylighting would be utilized as an energy conservation strategy to minimize the electric consumption due to lights, yet the problem of glare had to be considered at the same time. Natural cooling and space heating plus daylighting were the three main considerations for the design with a severe constraint on cost.

**DESIGN SPECIFICS:** The building wall consists of 6" of blanket insulation plus 1" of foil-faced "thermax" board. The ceiling consists of 12" of batt insulation plus the "thermax" board. The window area of 448 sq ft is evenly divided between a clerestory and lower floor. Because of this large expanse of window area, movable insulation at night was required. As a result of the large glazing area and the high vertical space



there is a tendency toward over-heating and stratification. Water stored in civil defense cans absorbs solar energy from the clerestory windows. Two fans located in the clerestory area move hot air through ducts to storage in the thermal mass in the concrete floor.

**FLOOR AREA:** 1465 sq ft

**SOUTH GLAZING:** 448 sq ft

Clerestory: 224 sq ft double acrylic sheet

Lower level: 224 sq ft double pane clear glass

**R VALUES:** Walls R-27, Roof R-36

**OTHER COMMENTS:**

1. No night shutters.
2. Adjustable and demountable canvas awning system.
3. Civil defense water barrels in back wall of main room which are stacked and held in place by nylon ropes.
4. 30' of 3" pvc pipe buried in slab on main floor in direct sun

