SSEC/SP--41227

DE82 009466

CASE STUDY REPORT HOUSTON, TEXAS DESIGN/BUILD HOUSE

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June 1981

MASTER

Prepared by
SOUTHERN SOLAR ENERGY CENTER

For
U.S. DEPARTMENT OF ENERGY
under contract DE-AC02-79CS30166

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CASE STUDY REPORT
HOUSTON, TEXAS DESIGN/BUILD HOUSE

A Cooperative Effort With
Environment Associates
Doyle Stuckey Homes
Southern Solar Energy Center

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INTRODUCTION

The Houston design/build house is one of four passive solar houses constructed during Phase I of the Southern Solar Energy Center's (SSEC) New Single-family Heating and Cooling Program. The Phase I task is part of the design/build program whose general objective is to accelerate the practical application of passive solar energy systems as an alternate energy source in the building industry. The design/build program is specifically directed to the new, single-family, detached building industry.

The intent of Phase I was to cause four houses to be designed, built, publicized, and monitored with the SSEC's guidance. The purpose was to demonstrate to the industry that houses can be designed and constructed with passive solar features and that passive solar technology is cost-effective to both the builder and the home owner.

The strategy plan involved location selection based on high potential impact, a design competition resulting in designer identification, builder selection resulting in a commitment to build and monitor, and involvement of a local design guidance team to insure local market acceptance. This strategy plan was implemented and followed in each of the four design/build projects. Slight adjustments were made in each instance due to local situations. The task activities relating to the Houston house, including problems, constructive comments, and successes, are described in this report.

STRATEGY PLAN IMPLEMENTATION

The strategy plan described was utilized for each of the four Phase I design/build projects.

Location Selection

Location selection criteria were utilized, including such factors as projected population growth areas, heating and cooling degree days, and the cost of utilities. The criteria data were accumulated and analyzed to give each area a specific numerical rating. These ratings indicated the locations that offered the highest potential for savings resulting from the use of alternate energy resources, for public exposure, and for repetition of projects or homes. A copy of the methodology for ranking locations (Working Paper 006WP) is attached to this case study. The working paper was prepared by the SSEC planning group and has proven to be an excellent indication of the locations with the highest potential for passive solar programs.

Designer Selection

Based on the results indicated in Working Paper 006WP, a design competition was announced in selected locations through the use of trade publications, local print media, and trade organization meetings.

As a result of the design competition and a review of the submitted designs, Environment Associates of Houston, Texas received the award for the best passive design. The review of the submitted competition designs was accomplished by a committee that included the SSEC design staff and industry design consultants. A design contract was awarded to Environment Associates. The contract requirements included the formulation of a local design team and basic design criteria for the house.

Builder Selection

After the designer was selected, builders were contacted in the Houston area through print media and trade journals. Recommendations for builders were solicited from industry sources such as the local Home Builders Association (HBA) chapter. A request for proposal (RFP) was distributed which required a commitment to build the house, sponsor four weekend public viewings, and monitor the house. Doyle Stuckey Homes of Houston, Texas was selected as the builder/developer and awarded the contract.

Design Guidance Team

In conjunction with Doyle Stuckey Homes, Environment Associates formulated a Design Team. Members of the Team included the designer, builder, code official, marketing consultant, a mortgage banker, and a local realtor. The purpose of this team was to insure that the design of the house was acceptable to local market, financial, and building code criteria.

Task Completion

After several Design Team meetings, a house design concept was formulated which met all criteria, including thermal performance. Based on the Design Team's recommendations, a house plan was developed, and working drawings were completed and approved by SSEC.

Materials were purchased and construction commenced. During construction, the design firm made periodic inspections of the house and reported weekly to SSEC on problems and status. The design firm also coordinated construction sequence photographs of the house.

Upon completion of the house, the builder/developer held two special event open house activities. These included a VIP Open House and a Builder/Realtor Open House. The builder then sponsored an 8-day public open house that encompassed four 2-day weekends. The builder presented the SSEC with a statement regarding the irrevocable rights to monitor the thermal performance of the house for a 12-month period. The monitoring rights were included in the purchase contract with the homeowners.

EVALUATION OF THE HOUSTON DESIGN/BUILD PROJECT

The following is an evaluation of the Houston design/build project and includes problem areas and corrective suggestions, highlights of successful actions, and comments of the parties involved.

1) Design Contract:

The design firm was selected independent of the builder for this project. This action created a problem with the initial relationship between the builder and the designer regarding control and slightly delayed the initial design of the project.

For future projects the designer and builder will be identified before the design contract is awarded.

The RFP notification was originally accomplished through print media and trade publications, causing delays in the builder and designer selection process.

For future projects, more coordination with NAHB, FmHA, HUD, and other industry organizations will be accomplished at the RFP stage of the project for design firm and builder/developer identification.

2) Design Guidance Team

The house plans were developed with the guidance of the local Design Team, which included the builder, designer, market consultant, mortgage banker, and code official.

Because of scheduling difficulties, both the builder and designer expressed a concern regarding the requirement that each Design Team member attend each design meeting. They felt that the team should offer comments regarding the design by phone or letter and be appraised of all correspondence and discussions by letter, and that the entire team should meet only three times.

The number of meetings requiring the entire Design Team attendance will be reduced to 3 in future projects.

Also, the SSEC Design Team representative will only be required to attend design meetings deemed appropriate.

The designer felt that the builder had too much control of the design. However, the builder control will not be changed because the builder is the controlling factor, absorbs the greatest monetary risk, and has the best understanding of the local market.

If performance monitoring is a continued requirement, the designer and builder prefer that a utility company representative be added to the design guidance team. This suggestion is considered appropriate for future projects.

Generally, the design process proceeded well. The actual design and construction schedule was longer than necessary and will be reduced in the future.

3) Construction

The original construction cost estimate for the house was higher than estimated. It was felt that the reason for the high estimate was that the subcontractors did not fully understand some of the passive solar details and, therefore, increased the estimates due to the uncertainty. This problem was resolved by a thorough explanation of the thermal conservation details. Therefore, it was recommended that a subcontractor's meeting be held before bids are received. We will consider this comment for future projects.

After resolving the construction costs, construction proceeded normally and was finished on schedule. (An incremental construction cost schedule is attached.)

4) Industry Support

The industry support effort was directed towards dissemination of information regarding the house through both electronic and printed news media and open house activities. The contract also included monitoring rights and monitoring equipment installation rights.

The industry support efforts in this project were successful, despite some major problems. These problems were caused by the fact that the contract was not awarded until the house was under construction, which placed some severe time limitations on the subcontractor. Future support contracts will be awarded before construction begins to allow time for the builder to coordinate activities with vendors and public service announcements.

The open house activities included a VIP Open House, a Builder and Realtor Open House, and eight Public Open Houses (four weekends) that were announced in local news media by the builder. The open house activities were considered a success; approximately 33,000 people viewed the home. Some people continue to make arrangements to view the house. School classes ranging from kindergarten through 12 have viewed the house. Also, architectural classes from the Universities of Houston and Texas have used the house as an educational tool. Builders and other people from areas as far as 250 miles away have viewed the house.

While the open house activities were successful, we feel that in future projects only one special open house for builders, realtors, lenders, and VIPs is necessary.

5) News Coverage

During construction, Houston station KPRC-TV (Channel 2) included a special report detailing the passive solar features and progress on the house in conjunction with an evening news broadcast.

During the open house activities, KPRC-TV and KHOU-TV (Channel 11) included brief stories during early evening news broadcasts.

One week after the house was open to the public, KTRK-TV (Channel 13) presented a special news program on the house following the early evening news.

Several radio stations broadcast public service announcements regarding the house during the four-week open house period.

Throughout various stages of the project, several Houston area newspapers and magazines printed stories about the Houston passive solar home.

The above mentioned announcements and news stories were broadcast/distributed to an area with a total potential audience of over 500,000 people.

GENERAL COMMENTS

The house has been sold twice. The first buyers submitted a bid because of the location, passive solar features, and floor plan. The first buyers did not move to Houston because of personal difficulties. The second buyers submitted a bid primarily due to the attractive floor plan and location. The passive features were considered a bonus, but did not influence the buying decision.

We found that homebuyers in the Houston area primarily consider the location, floor plan, price, amenities, and energy efficiencies (not specifically solar) in the purchase decision.

Lending institutions in the Houston area do not specifically consider energy efficiencies when qualifying homebuyers for mortgage loans. This is based on the fact that the energy efficiency of a house is dependent on the living habits of the homeowner and specific actual performance data is not available.

The builder has several contracts for custom energy-efficient homes with passive solar features. Seventeen speculative homes are under construction. The builder has also incorporated some passive features on several homes built following the experience with the Houston design/build house.

Doyle Stuckey Homes has now incorporated a policy of at least one highly energy-efficient or passive solar home model in each new subdivision.

The architects have designed approximately 21 passive solar homes, of which seven are either built or under construction.

In general, this particular project can be considered a success and a major step towards the practical application of solar energy in the Houston area.

APPENDIX I
DESIGN GUIDANCE TEAM

The Design Guidance Team was comprised of the following members.

Architect:	Environment Associates Mr. David Prince Mr. LaVerne Williams
Developer:	Doyle Stuckey Homes, Inc. Mr. Doyle Stuckey Mr. Bob Reed
Builder:	Mr. Merle Schmidt
Marketing Consultant:	CDS Research, Inc. Mr. Kent Dussair
Finance:	Ben Franklin Savings Association Mr. Campbell Wood
Codes:	City of Houston Public Works Mr. James Schindewolf
Utilities:	Houston Lighting and Power Mr. Will Ulrich

The following are the Design Guidance Team member comments regarding the Houston design/build project:

Architect: The public response to the house was very positive. As a direct result, we have received numerous commissions to design additional passive solar homes. To date approximately 21 solar homes have been designed, of which seven are either built or under construction. We will definitely continue to use passive solar concepts in our designs.

Developer: The project was successful as an excellent teaching tool for homebuyers, realtors, and builders. We gained a more in-depth knowledge and appreciation of both energy conservation and passive solar features and energy-conserving construction materials and techniques.

A new program has been initiated which will incorporate the most cost-effective energy conservation and passive solar features in standard house designs. Seventeen of these homes are now under construction. At least one of these home models called the "Doyle Stuckey Power House" will be in each subdivision developed.

Passive solar homes need good government participation without direct government intervention, such as builder tax credits.

Builder: The project was slow and complicated during early stages but was highly successful. The features that were interesting were the preheat water heater, the ice house roof, duct insulation, increased wall insulation, and the vented west wall. These features will be incorporated on future homes. Until homeowners and lenders specifically ask for passive solar features, not all homes will have solar features.

Marketing Consultant: During this project, some of the original marketing ideas and input were changed due to construction costs. Heavy emphasis was placed on construction costs and minimizing the incremental costs of passive solar features versus marketing features. In future projects, emphasis should be placed on marketing. Solar features should then be integrated into the plan. Also, builders should be chosen who are familiar with a marketing team approach to design.

Energy conservation is in vogue, which is a prerequisite to passive solar. Buyers have a good attitude towards energy conservation and passive solar energy but are not willing to sacrifice amenities at this time.

Mortgage Banker: The design project was a rewarding educational experience. Probably in a short period of time, passive solar features will have a direct impact upon qualifications for residential mortgage loans.

Code

Official: Not available for comment.

Utility

Representative: The Design Guidance Team experience was a helpful learning process. This project demonstrated that passive solar techniques can be incorporated into residential design economically.

The utility company's philosophy is to make an effort to encourage technology that will result in a reduction of peak loads. Conservation and passive solar technologies can be used to effectively reduce peak loading.

Houston Power and Lighting has an Energy and Conservation Department that has programs for energy retrofit and energy conservation in new construction.

APPENDIX II

PASSIVE SOLAR INCREMENTAL COSTS HOUSTON DESIGN BUILD HOUSE (Costs include materials plus labor)

The following are incremental costs for the passive solar features:

Glass*:	Dual glaze, thermal break plus tinted on east and west side	\$1025.00
	Clerestory glass	455.00
Ridge Vent:		\$250.00
Ice House Roof (shed roof):	Thermoply & wood strips	300.00
Vent West Wall:	Brick	0.00
	Furring Strips (Lap Siding)	80.00
Overhangs:	Movable	425.00
	Extended Overhang	75.00
Airlock Entries:	Solid Door and weather-stripping (Liv. Rm)	190.00
	(Utility Rm)	70.00
Tile Floor:	Living and Dining Area	180.00
Brick Interior Walls		300.00
Preheat Water/Heater:	Plumbing (includes tanks)	250.00
	Glass	320.00
	Door with weather-stripping	70.00
		<u>\$3990.00</u>

The following are incremental costs for energy conservation features:

Sheathing:	Including slab edge insulation	500.00
Duct Insulation**		130.00
Water Pipe Insulation		250.00
Insulation:	R-11 to R-13 in walls	100.00
	R-19 to R-30 in ceilings	400.00
Special caulking, taping, etc.		150.00
		<u>\$1430.00</u>

Total Incremental Costs \$5420.00

*Normally there is about 1200 sq. ft. of glass in a house of this size.

**Duct insulation is now a standard feature in all houses.

APPENDIX III
METHODOLOGY FOR RANKING CITIES

... rking Paper

A METHODOLOGY FOR RANKING CITIES FOR A SOLAR BUILDINGS PROGRAM

by

David M. Boyd

December 1980

NOTE: The information contained herein is either preliminary in nature or is intended only for limited distribution. This document has not been edited nor reviewed for general release. The work described herein was conducted with support through contract number DE - AC02 - 79CS30166 with the U. S. Department of Energy under the Office of the Assistant Secretary for Conservation and Solar Energy.

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A METHODOLOGY FOR RANKING CITIES FOR A SOLAR BUILDINGS PROGRAM

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**David M. Boyd
Planning & Evaluation**

December 1980

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1.0. INTRODUCTION

The early stages of a multi-year market-oriented program greatly affect the ultimate success of the program. Program areas in solar energy commercialization have market-oriented strategies and, as such, need to structure carefully the direction of the program. The key issue is to direct program efforts at the right group in order to achieve an impressive first impact and an effective long-term program.

This report discusses a simple procedure currently being used at the Southern Solar Energy Center (SSEC) to choose specific geographic locations toward which the early phases of a solar buildings program should be directed. The methodology is an example of multi-attribute decision analysis. Using this methodology candidate locations are evaluated against a key set of independent selection criteria which have been determined to be important to the long range development of a market for passive solar buildings.

Values for each selection criterion are combined to produce a composite score for each locality. By concentrating on those locations that are ranked high in the scoring, the program director and others charged with assisting program development are assured that the program is structured along appropriate lines. Furthermore, a record is established to indicate how the program was designed.

2.0 METHODOLOGY

As with any application of multi-attribute decision analysis, a set of key independent criteria must be chosen. For this application the appropriate selection criteria were narrowed to three:

- (1) Combined heating and cooling load,
- (2) Cost of conventional fuel,
- (3) Construction activity in new housing market.

It was decided that the three attributes listed above were the major determinants in selecting one city over another during the initial phase of a solar buildings program. That is, the best place to catch the public eye and encourage the market development of solar techniques would be one where the demand for heating and cooling is significantly high, where the cost of conventional fuel is a major concern, and where a strong new housing market exists. Other selection criteria considered but not chosen were insolation, thermal performance, economic performance, population density, and buying power index.

The following parameters were chosen as good measures of the three attributes:

- (1) Sum of heating degree days and cooling degree-days,
- (2) Current cost of electricity based on 1,000 kwh,
- (3) Number of single-family housing starts per year.

These data are available through existing data bases for most metropolitan areas.

The choice of electricity to serve as a gauge of the cost of conventional fuels for space conditioning does not suggest that solar energy programs will displace only electricity. Rather, solar applications for buildings, in particular passive, will affect all fuel markets. Electricity, however, captures the largest portion of the new home heating and cooling market. During the year 1978 approximately 69% of new single-family homes in the South were heated by electricity; 27% by natural gas; and 3% by oil.¹ This dominance of the new housing market and the visibility of electric rates make the cost of electricity a useful measure of fuel prices.

The final step in a decision analysis involves the development of a utility function. This function is a means of combining evaluations from the set of attributes to quantify a single overall score. Because of the parameters involved, the multiplicative product of the three parameters was chosen as the utility function. This choice is natural in that any detailed economic calculation of the program impact on fuel or dollars saved would include the product of these parameters.

Specifically, the composite score is defined to be:

$$\text{SCORE} = \frac{\text{HS} \times \text{CE} \times (\text{HDD} + \text{CDD})}{1,000,000}$$

where

HS	=	Number of housing starts per year
CE	=	Cost of electricity in ¢/kWh (based on 1,000 kWh)
HDD	=	Heating degree days
CDD	=	Cooling degree days.

¹Characteristics of New Housing: 1978 Construction Reports, U.S. Department of Commerce.

3.0 APPLICATION TO THE SSEC REGION

The decision analysis technique described above has been applied to Standard Metropolitan Statistical Areas (SMSA) in the SSEC region² for program planning purposes. Figure 1 indicates the region and the metropolitan areas that were evaluated. Because of the geographic proximity of several cities and the common influence of newspapers, television, and radio, it was decided to group certain metropolitan areas into a metropolitan cluster. These clusters are indicated in Figure 1 by large circles.

Table I presents in descending order the scores for localities in the SSEC region. Those locations with high scores represent active housing markets with good potential for a passive solar program. It is important to state that this score represents the relative potential impact to the overall program, not the value to the individual customer. For example, a consumer would not be interested in the size of the new housing market, but rather in the economics of a solar energy system for his particular home.

Housing starts in Table I represent data for 1980 and were derived from the June, 1980, Quarterly Forecasts of the National Association of Home Builders. Cost of electricity was taken from the Utility Rate Guide for SOLCOST Data Bank Cities, Johnson Environmental and Energy Center, University of Alabama in Huntsville. Rates are effective as of June 1980. For city clusters, values were averaged to develop a representative value. Electric rates for Puerto Rico and the Virgin Islands were obtained by direct contact with the utility. Puerto Rico currently has large government subsidies for small users of electricity (less than 425 kWh). Although a majority of customers receive subsidies, the full cost of electricity was used as a basis for comparison in this study.

Those locations in the southern region that have a solar buildings project funded through SSEC are indicated in Figure 1 by a small circle. These projects are geared toward passive solar technologies and match rather closely the ranking presented in Table I. Other factors, including expressed builder interest and consumer interest, entered into the actual choice of sites for projects funded by SSEC.

²The Southern Solar Energy Center serves Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, Puerto Rico, South Carolina, Tennessee, Texas, Virgin Islands, Virginia, West Virginia.

FIGURE 1. Major Metropolitan Areas/Metropolitan Clusters in the SSEC Region.

TABLE I
RANKINGS FOR SOLAR BUILDINGS PROGRAM IN SSEC REGION

RANK	METROPOLITAN AREA	HOUSING STARTS	COST OF ELEC- TRICITY ¹	HEATING DEGREE- DAYS	COOLING DEGREE- DAYS	SCORE
1.	Dallas/Ft. Worth, TX	22,210	5.9	2,382	2,587	651
2.	Baltimore, MD/ Washington, DC/ Wilmington, DE	15,672	6.7	4,627	1,172	609
3.	Miami/W. Palm Beach/ Boca Raton, FL	21,235	4.6	253	3,912	407
4.	Houston/Beaumont/ Port Arthur, TX	14,917	6.1	1,476	2,844	393
5.	Orlando/Tampa/ St. Petersburg, FL	15,800	5.4	742	3,296	345
6.	Atlanta/Macon/ Augusta, GA	12,533	4.6	2,627	1,959	264
7.	Austin/ San Antonio, TX	7,471	5.4	1,654	2,951	186
8.	Norfolk/Virginia Beach/Portsmouth/ Richmond, VA	3,816	7.2	3,714	1,397	140
9.	Jacksonville, FL	4,300	6.9	1,327	2,596	116
10.	Tulsa, OK	3,179	5.1	3,680	1,949	91
11.	Oklahoma City, OK	2,786	4.5	3,695	1,876	70
12.	San Juan, PR	1,290	9.3	0	4,982	60
13.	Charlotte/ Gastonia, NC	2,560	4.7	3,218	1,596	58
14.	Raleigh/Durham/ Greensboro/Winston- Salem/High Point, NC	2,090	4.6	3,670	1,368	48
15.	Little Rock/ N. Little Rock, AR	1,500	4.8	3,354	1,925	38
16.	New Orleans/Baton Rouge, LA	1,602	5.3	1,568	2,646	36
16.	Birmingham, AL	1,413	5.3	2,844	1,928	36
18.	Louisville/ Lexington, KY	1,199	4.6	4,687	1,233	33
19.	Charleston, SC/ Savannah, GA	1,319	5.2	2,049	2,198	29

TABLE 1 (Con't)

RANKINGS FOR SOLAR BUILDINGS PROGRAM IN SSEC REGION

RANK	METROPOLITAN AREA	HOUSING STARTS	COST OF ELEC- TRICITY ¹	HEATING DEGREE- DAYS	COOLING DEGREE- DAYS	SCORE
20.	Nashville/ Davidson, TN	1,050	3.6	3,696	1,694	20
20.	Mobile, AL/ Pensacola, FL	860	5.4	1,631	2,636	20
22.	Memphis, TN	901	3.4	3,478	1,569	15
23.	El Paso, TX	446	6.8	2,678	2,098	14
23.	Charleston/ Huntington, WV	558	4.4	4,607	1,077	14
25.	Greenville, SC	541	4.6	3,163	1,573	12
26.	Jackson, MS	304	5.8	2,300	2,321	8
26.	Columbia, SC	387	4.6	2,598	2,087	8
26.	Chattanooga, TN	413	3.6	3,505	1,636	8
26.	Corpus Christi, TX	304	6.3	930	3,474	8
30.	Knoxville, TN	453	3.0	3,478	1,569	7
31.	Virgin Islands	95	12.1	0	4,982	6
31.	Roanoke, VA	221	5.2	4,307	1,030	6
31.	Lubbock, TX	205	5.8	3,545	1,647	6
31.	Montgomery, AL	259	5.3	2,269	2,238	6
35.	Ft. Smith, AR	195	3.2	3,336	2,022	3

¹Cost of electricity expressed in ¢/kWh, based on 1,000 kWh in June 1980.

4.0 APPLICATION TO THE NATION

Presented in Table II are major metropolitan areas in the United States and their composite scores under the same formula as for the SSEC region in the section above. This table is presented to allow the reader to compare findings in the southern region with representative localities throughout the nation. For this analysis no clustering was used.

006 WP
December 1980

TABLE II
NATIONAL RANKINGS FOR SOLAR BUILDINGS PROGRAMS

RANK	LOCALITY	STATE	HOUSING STARTS	COST OF ELEC- TRICITY ¹	HEATING DEGREE- DAYS	COOLING DEGREE- DAYS	SCORE
1.	Dallas/ Ft. Worth	TX	22,210	5.9	2,382	2,587	651
2.	Phoenix	AZ	15,000	7.0	1,5252	3,508	531
3.	Chicago	IL	10,630	6.6	6,127	925	494
4.	Denver	CO	12,700	5.3	6,016	630	447
5.	Detroit	MI	12,500	5.0	6,228	743	436
6.	Philadelphia	PA	9,000	7.8	4,865	1,104	419
7.	Minneapolis/ St. Paul	MN	9,200	5.1	8,159	585	410
8.	Houston	TX	14,550	6.2	1,434	2,889	390
9.	Salt Lake City/Ogden	UT	6,700	7.5	5,983	527	327
10.	St. Louis	MO	8,980	5.5	4,750	1,475	307
11.	Washington	DC	9,500	5.2	4,211	1,415	278
12.	West Palm Beach/ Boca Raton	FL	12,335	5.2	299	3,786	262
13.	Atlanta	GA	12,00	4.6	3,095	1,589	259
14.	Riverside/ San Bernardino/ Ontario	CA	16,000	5.9	1,818 ³	614 ³	229
15.	Tampa/ St. Petersburg	FL	8,900	5.9	718	3,366	214
16.	Baltimore	MD	5,650	6.4	4,729	1,108	211
17.	Boston	MA	3,200	10.4	5,621	661	209
18.	Tucson	AZ	6,000	6.8	1,752	2,814	186
19.	Pittsburg	PA	4,770	6.0	5,278	948	178
20.	Los Angeles/ Long Beach	CA	10,000	7.3	1,245	1,185	177
21.	Kansas City	MO	4,000	6.6	5,161	1,421	174
22.	San Francisco/ Oakland	CA	8,000	6.6	3,042	108	166
23.	Cleveland	OH	4,000	6.1	6,154	613	165
24.	New York City	NY	2,300	11.8	4,848	1,068	161
25.	Portland	OR	8,000	3.8	4,792	300	155
25.	Miami	FL	8,900	4.1	206	4,038	155
27.	Ft. Lauderdale/ Hollywood	FL	8,960	4.1 ²	299 ³	3,786 ³	150
28.	Austin	TX	5,431	5.7	1,737	2,908	144
29.	Orlando	FL	6,900	5.0	766	3,226	138
30.	Sacramento	CA	10,600	3.1	2,842	1,157	131

TABLE II (con't)
NATIONAL RANKINGS FOR SOLAR BUILDINGS PROGRAMS

RANK	LOCALITY	STATE	HOUSING STARTS	COST OF ELEC- TRICITY ¹	HEATING DEGREE- DAYS	COOLING DEGREE- DAYS	SCORE
31.	Jacksonville	FL	4,300	6.9	1,327	2,596	116
32.	Cincinnati	OH	4,300	4.4	4,844	1,188	114
32.	San Diego	CA	7,000	7.3	1,507 ³	722 ³	114
34.	Norfolk/ Portsmouth/ Virginia Beach/ Chesapeake	VA	3,200	7.1	3,488	1,441	111
35.	Anaheim/ Santa Ana/ Garden Grove	CA	6,000	7.3	1,818 ³	614 ³	107
36.	Tulsa	OK	3,179	5.1	3,680	1,949	91
36.	Milwaukee	WS	1,800	6.4	7,444	450	91
38.	Columbus	OH	2,298	5.6	5,702	809	84
39.	Newark	NJ	1,700	8.1	5,039	1,024	83
40.	Allentown/ Bethlehem	PA	2,350	5.2	5,827	772	81
41.	Toledo	OH	1,600	6.9	6,381	685	78
42.	Rochester	NY	2,000	5.3	6,719	536	77
43.	Seattle/ Everett	WA	9,570	1.4	5,185	129	71
44.	Oklahoma City	OK	2,786	4.5	3,695	1,876	69
45.	Colorado Springs	CO	2,500	3.9	6,473	461	68
46.	Grand Rapids	MI	1,460	6.2	6,801	575	67
47.	Dayton	OH	1,650	5.9	5,641	936	64
48.	Buffalo	NY	1,900	4.3	6,927	437	60
48.	Hartford	CT	1,470	5.9	6,349 ³	583 ³	60
48.	Akron	OH	1,481	5.9	6,224	634	60
51.	Daytona Beach	FL	3,250	4.0	902	2,919	50
52.	Charlotte/ Mecklenburg County	NC	2,560	4.7	3,218	1,596	58
52.	Albuquerque	NM	1,200	7.5	4,292	1,316	50
52.	Flint	MI	1,200	5.6	7,041	438	50
55.	San Antonio	TX	2,040	5.0	1,570	2,994	47
56.	Madison	WS	1,000	5.7	7,730	460	47
57.	Lakeland/ Winter Haven	FL	2,000	5.4 ²	678	3,298	43
58.	Roanoke	VA	1,500	5.2	4,307	1,030	42

TABLE II (con't)
NATIONAL RANKINGS FOR SOLAR BUILDINGS PROGRAMS

RANK	LOCALITY	STATE	HOUSING STARTS	COST OF ELEC- TRICITY ¹	HEATING DEGREE- DAYS	COOLING DEGREE- DAYS	SCORE
59.	Boise	ID	1,965	3.2	5,833	714	41
60.	Little Rock/ N. Little Rock	AR	1,500	4.8	3,354	1,925	38
61.	Columbia	SC	1,650	4.6	2,598	2,087	36
61.	Birmingham	AL	1,413	5.3	2,844	1,928	36
63.	Salem	OR	1,800	3.8	4,852	232	35
64.	Fresno	CA	1,040	6.6	2,650 ³	1,670 ³	30
65.	Raleigh	NC	1,300	4.5	3,514	1,394	29
66.	Evansville	IN	860	5.4	4,629	1,364	28
67.	Greenville	SC	1,200	4.6	3,163	1,573	26
68.	Charleston	SC	1,100	5.2	2,146	2,078	24
68.	Atlantic City	NJ	600	6.8	4,946	869	24
70.	Santa Barbara/ Santa Maria/ Lompoc	CA	1,000	6.6	3,053	84	21
71.	Nashville	TN	1,050	3.6	3,696	1,694	20
72.	Knoxville	TN	1,200	3.0	3,478	1,569	18
73.	Spokane	WA	1,200	1.9	6,835	388	16
74.	Asheville	NC	400	4.5	4,237	872	9
75.	Wilmington	NC	300	4.5 ²	2,433	1,969	6

¹ Cost of electricity expressed in ¢/kWh, based on 1,000 kWh in June, 1980.

² Approximate value based on data from nearby city.

³ Approximate value based on nearby weather station.

APPENDIX IV
HOUSE INFORMATION SHEET

SSEC HOUSTON HOUSE

PASSIVE SOLAR HOME DESIGN SSEC 2108-3/2.5

SOUTH VIEW

ABOUT THE HOUSE

The Houston passive solar home is the product of a cooperative effort of the Southern Solar Energy Center, Doyle Stuckey Homes, and the Houston-based architectural firm Environment Associates. Significant support was also provided by a team of prominent local advisors.

The 2,108-square-foot home receives a significant portion of its heating needs from the sun, and this, combined with other energy-saving features and special passive cooling techniques, reduces annual energy use to less than 50% of that for a typical new home. Primary design consideration was given to reducing the cooling energy use in order to meet the demands of the hot and humid climate. The house is bright, comfortable, and in keeping with the prevailing style of homes in suburban Houston.

The chart at right shows this home's projected year-round energy savings.

ABOUT SOUTHERN SOLAR

The Southern Solar Energy Center (SSEC) was established in May, 1979, as one of four regional solar energy centers funded by the U.S. Department of Energy. SSEC's function is to help commercialization of solar technologies and to facilitate the South's transition to renewable energy sources.

SSEC has assembled a professional staff with broad experience in dealing with the unique characteristics and needs of the southern region. Commercialization programs, though consistent with national planning, are structured to meet regional needs. Efforts are concentrated on those solar technologies which offer the most promise to the nineteen states and jurisdictions which comprise the SSEC region.

NORTH VIEW

SECOND FLOOR

FIRST FLOOR

PASSIVE ENERGY FEATURES for heating and cooling

	heat	cool
1. Passive direct solar heating in winter	X	
2. Movable overhang shades first floor windows as needed	X	X
3. Special wide fixed overhangs control solar exposure on second floor	X	X
4. Masonry floors to store solar heat in winter, cool in summer	X	X
5. Brick interior walls store heating and cooling	X	X
6. Site orientation for proper solar exposure	X	X
7. Passive solar water pre-heater	-	-
8. Heat recirculating fireplace	X	
9. High insulation standards throughout	X	X
10. Tight shell construction for infiltration control	X	X
11. Vestibule and laundry room serve as entry air locks	X	X
12. Windows with dual glazing and thermal breaks or wood frames	X	X
13. Reflective glazing on east wall		X
14. Window design for cross ventilation		X
15. High clerestory over kitchen/dining vents out excess heat		X
16. Garage location on northeast side protects living spaces from cold winter winds	X	
17. "Vented" west wall with no windows rejects summer heat		X
18. Attic fan ventilation		X
19. Ridge and soffit attic venting		X
20. Radiant barrier in roof rejects summer heat		X

APPENDIX V
THERMAL PERFORMANCE ANALYSIS

SSEC HOUSTON HOUSE

THERMAL PERFORMANCE ANALYSIS

Estimates of the monthly energy usage of the Houston passive solar home were obtained through the use of ASHRAE¹ load calculations combined with passive solar analysis methods developed by the Los Alamos Scientific Laboratory (LASL).² Annual heating loads shown are the auxiliary loads predicted by the LASL Solar Savings Fraction analysis. Annual cooling loads were obtained using the ASHRAE equivalent full load hours of operation in conjunction with the cooling load temperature difference design load analysis.

The basic design data for the Houston passive solar house used to calculate heating and cooling loads are as follows:

Location:	Houston, Texas
Latitude:	29.7°N
Longitude:	95.3°W
Elevation:	50 feet
Total conditioned floor space:	2108
Total unconditioned floor space:	546

	Heating	Cooling
Inside Design Temperature:	70°F	75°F
Outside Design Temperature:	32°F	94°F
Infiltration (ACH):	0.75	.50
Internal heat gain:	2500 BTU/hr	
Typical wall R-Value:	16.4	
Ceiling R-Value:	28.6	
Typical window R-Value:	1.8	

Calculated heating design temperatures for unconditioned areas:

Attic:	33°F
Entry:	42°F

The above data and the ASHRAE UA Δ T design heating method give the following load breakdown for the Houston passive solar house.

Source of Load Load Description	Non-South Walls	South Wall	Non-South Windows	South Windows	Doors	Roof & Ceiling	Floor	Infiltration	Total
Design Heat Loss (BTU/hr.)	2,714	1,334	1,657	2,934	730	1,722	3,580	9,090	23,761
Design UA (BTU/hr.°F)	71.9	35.1	43.6	77.2	22.4	46.0	94.2	239.2	625
Heat Loss Excluding South Wall	2,714	--	1,657	--	730	1,722	3,580	9,090	19,493
UA Excluding South Wall	71.9	--	43.6	--	22.4	46.0	94.2	239.2	517

The design heat loss calculations indicate a Building Load Coefficient of 13,154 BTU/DD. The passive system on the Houston house consists of 140 square feet of direct gain, yielding a Load Collector Ratio of 93.4. In determining the monthly solar performance, internal heat gains are accounted for by a reduction of the monthly degree days by the LASL design method.

A monthly summary of the average auxiliary heating energy required by this house along with the solar energy available, effective number of degree days, and total building heat loss is given below.

Month	Incident Solar (MMBTU)	Modified Building Load (MMBTU)	Effective Degree Days (°F-Day)	Ambient Temp. (°F)	Solar Aux. (MMBTU)
January	3.89	6.62	441	52	5.74
February	3.90	4.51	300	55	3.51
March	4.03	2.74	183	61	1.75
April	3.19	0.00	0	70	0.00
May	1.34	0.00	0	75	0.00
June	0.00	0.00	0	81	0.00
July	0.00	0.00	0	82	0.00
August	.70	0.00	0	84	0.00
September	2.16	0.00	0	79	0.00
October	5.06	0.00	0	72	0.00
November	4.50	2.66	177	61	1.44
December	3.93	4.99	333	55	3.99
Year	32.91	21.52	1434		16.46

The design cooling load for the Houston house was determined through the use of the ASHRAE CLTD method. A summary of the annual cooling load calculations is given below.

Source of Heat Gain	Area (Sq. Ft.)	Summer U-Value (BTU/ft ² -hr-°F)	Cooling Load Temp. Diff. (°F)	Design Heat Gain ₂ (BTU/hr-ft ²)	Heat Gain (BTU/hr)
Walls	1,858	.061	22.6	--	2,505
North & South Windows*	202	--	--	19.4	3,866
East Windows	18	--	--	58.4	1,022
Ceiling & Roof	1,348	.035	43	--	1,974
Doors	44	.50	22.6	--	492
Infiltration	--	--	--	--	3,013
Internal	--	--	--	--	2,550
Total Sensible Gain					15,422
Latent Gain					9,763
Total					25,185

*Note: Shaded south windows treated as unshaded north window.

Monthly cooling loads were found by multiplying the design cooling load by the number of equivalent hours of full load operation for each of the cooling months. Values of equivalent hours of full load operation for the Houston area were provided by Houston Gas and Electric.

Monthly Cooling Loads

Full load heat gain - 25,200 BTU/hr

Month	Equivalent Full load hours	Monthly Cooling Load (MMBTU/month)
January	13	0.33
February	12	0.30
March	31	0.78
April	62	1.56
May	181	4.56
June	296	7.45
July	371	9.34
August	362	9.12
September	244	6.15
October	112	2.82
November	28	0.71
December	9	0.23
Total	1721	43.35

The cooling load was divided by a coefficient of performance of 2.7 to obtain the energy consumption.

References:

1. ASHRAE Fundamentals Handbook, 1977.
2. Passive Solar Design Handbook, Vol. II., Balcomb, J.D. et. al., January, 1980, DOE/CS-0127/2.

APPENDIX VI
ARCHITECTURAL INFORMATION RELEASE

THE DEMONSTRATION HOME AND THE ARCHITECTS

HOUSTON'S FIRST PASSIVE DESIGN DEMONSTRATION HOME IS BASED UPON CENTURIES OLD ARCHITECTURAL CONCEPTS WHICH THE ARCHITECTS HAVE UPDATED AND TUNED TO HOUSTON'S OVERHEATED GULF COAST CLIMATE. THE HOUSE IS DESIGNED TO DEMONSTRATE THAT A LOW ENERGY CONSUMING SOLAR HOME CAN BE COST COMPETITIVE IN HOUSTON'S DYNAMIC HOUSING MARKET. ALTHOUGH THIS IS A 'SOLAR' HOME IN THE SENSE THAT IT USES SUNLIGHT TO ASSIST IN WINTER HEATING AND WIND TO ASSIST IN COOLING, MANY UTILITY COST-SAVING FEATURES HAVE ALSO BEEN INTRODUCED THROUGH INNOVATIVE AND SIMPLE ASSEMBLY OF CONVENTIONAL LOCAL BUILDING MATERIALS; HENCE, MUCH LESS PURCHASED ENERGY IS NEEDED TO PROVIDE A MORE NATURALLY COMFORTABLE INTERIOR ENVIRONMENT. HOWEVER, PERHAPS THE HOME'S GREATEST IMPORTANCE IS THAT EVERYONE NOW HAS THE OPPORTUNITY TO 'REDISCOVER' HOW PASSIVE ARCHITECTURAL CONCEPTS BENEFICIALLY RESPOND TO THE NATURAL ENVIRONMENT IN TODAY'S WORLD.

IN SEEKING TO ADVANCE THE USE OF RENEWABLE RESOURCES IN THE HOME BUILDING INDUSTRY, THE SOUTHERN SOLAR ENERGY CENTER COMMISSIONED ENVIRONMENT ASSOCIATES TO DESIGN A PASSIVE SOLAR DEMONSTRATION HOME WHICH APPEALS TO THE NEEDS OF HOUSTON'S HOME BUILDERS AND BUYERS. DOYLE STUCKEY HOMES VOLUNTEERED TO BUILD THIS FIRST HOME AND PROVIDED CRITICAL GUIDANCE DURING THE PLANNING PROCESS. A TEAM OF LOCAL EXPERTS IN MARKETING, FINANCING, CONSTRUCTION, AND BUILDING CODES PROVIDED FURTHER VALUABLE SUPPORT. THIS HOUSE IS TRULY A GULF COAST AREA ACCOMPLISHMENT.

GENERAL DATA ABOUT THE HOUSE

- APPROXIMATELY 2100 SQUARE FEET OF LIVING AREA, EXCLUDING GARAGE.
- CONSTRUCTION COST IS APPROXIMATELY 5% HIGHER THAN COMPARABLE CONVENTIONAL HOUSES HAVING SIMILAR APPOINTMENTS BUT POORER ENERGY USE.
- ESTIMATED SPACE COOLING AND HEATING ENERGY COSTS COULD BE LESS THAN \$400.00 PER YEAR. THIS IS LESS THAN 50% OF THE AVERAGE USED BY CONVENTIONAL HOUSTON HOMES, AND IS BASED UPON AVERAGE OCCUPANCY AND WEATHER CONDITIONS. ACTUAL EXPERIENCE WILL BE DIFFERENT.

MAJOR PASSIVE FEATURES

ORIENTATION ● SOUTH FACING REAR WINDOWS ARE SOLAR COLLECTORS FOR WINTER HEAT BUT ARE SHADED IN THE SUMMER. ● OPERABLE WINDOWS LOCATED TO 'CATCH' SOUTHEASTERLY BREEZES AND CARRY THEM THROUGH THE HOUSE. ● NORTH FACING WINDOWS PROVIDE NATURAL DAYLIGHT INTO THE HOUSE INTERIOR WITHOUT THE OVER-HEATING PROBLEMS OF SKYLIGHTS. ● THE GARAGE IS LOCATED TO HELP SCREEN THE HOUSE FROM COLD NORTHWEST WINDS. ● AIR CONDITIONED SPACES HAVE NO WEST FACING WINDOWS TO REDUCE HEAT LOAD.

DESIGN ● INTERIOR 'HEAT STACK' EFFECT FOR PASSIVE VENTILATION WITH WINDOWS OPEN. ● ROOF OVERHANGS DESIGNED TO LET IN WINTER SUN AND KEEP SUMMER SUN OUT OF UPPER FLOOR WINDOWS. ● MOVABLE SHADES OVER SOUTH FACING (REAR) FIRST FLOOR WINDOWS ALLOW SPRING SUN IN AND HELP KEEP FALL SUN OUT. ● AIR-LOCK FRONT AND REAR ENTRIES REDUCE LOSS OF INTERIOR CONDITIONED AIR. ● MASSIVE INTERIOR BRICK AND FLOOR TILE PROVIDE 'COOLTH' AND HEAT STORAGE. ● AWNING TYPE WINDOWS AT THE CLERESTORY ALLOW THEM TO BE OPENED DURING RAIN. ● OPERABLE SCREENED WINDOWS THROUGHOUT, LOCATED TO PROVIDE EFFECTIVE FLOW-THROUGH VENTILATION.

INSULATION ● EXTERIOR WALL CAVITIES THOROUGHLY INSULATED; EVERY CRACK AND SPACE. ● ALL EXTERIOR WALLS HAVE A LAYER OF 1/2 INCH THICK FOAM BOARD INSULATING SHEATHING WHICH IS CLAD WITH REFLECTIVE FOIL. ● INSULATED CONCRETE FOUNDATION TO REDUCE HEAT CONDUCTION THROUGH FLOORS. ● EXTERIOR BRICK IS THERMALLY ISOLATED FROM THE INSULATED FOUNDATION. ● EXTERIOR DOORS EXPOSED TO OUTSIDE TEMPERATURES ARE INSULATED. ● INSULATED-CORE STEEL DOORS AT ENTRANCES. ● DOUBLE GLAZED, THERMAL-BREAK ALUMINUM WINDOWS EXCEPT CLERESTORY. ● TRIPLE GLAZED WOOD WINDOWS IN CLERESTORY. ● INSULATED HOT WATER PIPES. ● EXTRA INSULATION WRAP AROUND ALL AIR CONDITIONING DUCTS.

INFILTRATION CONTROL ● EXTERIOR FOAM BOARD SHEATHING TAPED AND SEALED AT ALL JOINTS AND PENETRATIONS. ● INTERIOR OF EXTERIOR WALLS SEALED WITH PLASTIC FILM. ● BOTTOM PLATES OF ALL EXTERIOR WALL FRAMES SEALED TO THE CONCRETE SLAB. ● WEATHER STRIPPING AT ALL DOORS AND WINDOWS EXPOSED TO EXTERIOR TEMPERATURES INCLUDING ATTIC FAN, ATTIC ACCESS, AND MECHANICAL ROOM DOORS.

BUFFER VENTILATION ● HIGHLY VENTILATED ATTICS AND A UNIQUE VENTED 'ICE HOUSE' TYPE ROOF OVER VAULTED CEILING AREAS TO REDUCE HEAT LOADING OF CEILING INSULATION. ● 'VENTED' WEST FACING EXTERIOR WALLS TO REDUCE HEATING BY DIRECT SUNLIGHT.

OTHER PASSIVE FEATURES ● HEAT RECIRCULATING, CONVECTIVE (WITHOUT FAN) FIREPLACE. ● OUTSIDE AIR SUPPLY FOR CLOTHES DRYER AND COMBUSTION FOR FIRE-PLACE, BACKUP WATER HEATER, AND FURNACE. ● LOW WATER USING PLUMBING FIXTURES, FAUCETS, AND SHOWER HEADS. ● EXHAUST FLUE DAMPER IN FURNACE TO RETAIN FURNACE HEAT. ● PASSIVE SOLAR WATER HEATER; MAY PROVIDE APPROXIMATELY 50% OF HOT WATER SUPPLY AT APPROXIMATELY 1/3 THE INITIAL COST OF AN ACTIVE SOLAR SYSTEM.

OTHER ENERGY CONSERVING FEATURES ● HIGH EER AIR CONDITIONER. ● WHOLE HOUSE (ATTIC) FAN WITH ATTACHED INSULATED, WEATHERSTRIPPED DOOR. ● HIGH EFFICIENCY BACK UP WATER HEATER. ● PILOTLESS, ELECTRONIC IGNITION FOR THE GAS FURNACE. ● FREQUENT USE OF FLUORESCENT LIGHTING (MORE ENERGY EFFICIENT THAN INCANDESCENT). ● DIMMER SWITCHES USED ON ALL MAJOR INCANDESCENT LIGHTS. ● SHUNT DAMPER ON THE CLOTHES DRYER ALLOWS EASY CHANGE TO PUT WARM AIR INTO THE HOUSE IN WINTER AND OUTSIDE IN SUMMER. ● SUMMER/WINTER DAMPERS IN THE AIR CONDITIONING DUCTS TO ALLOW EASY REDISTRIBUTION OF AIR IN SUMMER AND WINTER. ● SPECIAL THERMOSTAT IN THE GREAT ROOM WHICH TURNS ON AIR CIRCULATION BLOWER TO ALLOW DISTRIBUTION OF COLLECTED SOLAR HEAT.

ENERGY CONSCIOUS/PASSIVE DESIGN HOMES

SOME THOUGHTS FROM ENVIRONMENT ASSOCIATES

ONE OF THE PRIMARY PURPOSES OF ANY HOME IS TO PROVIDE FOR THE COMFORT AND CONVENIENCE OF ITS INHABITANTS. WITH ENERGY COSTS CONSTANTLY RISING, MEETING THESE NEEDS POSES A SPECIAL CHALLENGE FOR ARCHITECTS, BUILDERS AND HOMEBUYERS OWNERS ALIKE. HOW CAN NEW HOMES INCORPORATE THE BEST ENERGY-SAVING FEATURES AVAILABLE WITHOUT BECOMING UNAFFORDABLE? ENVIRONMENT ASSOCIATES WISHES TO TAKE THIS OPPORTUNITY TO SHARE WITH YOU SOME IDEAS, EXPERIENCE, AND CONCERNS ABOUT THE DESIGN, CONSTRUCTION AND OPERATION OF 'ENERGY CONSCIOUS' HOMES-- AND COMMERCIAL BUILDINGS AS WELL.

DESIGN

WHAT IS AN ENERGY CONSCIOUS/PASSIVE DESIGN HOME?

SOME ARCHITECTS AND BUILDERS CALL THEIR HOMES 'ENERGY CONSERVING' OR 'PASSIVE SOLAR.' IT IS IMPORTANT TO REALIZE THAT IT DOESN'T MATTER WHAT A HOUSE IS CALLED, BUT RATHER WHAT IT DOES AND HOW IT PERFORMS. WHAT ENVIRONMENT ASSOCIATES CALLS AN ENERGY CONSCIOUS/PASSIVE DESIGN HOME IS ONE THAT COMBINES COMMONLY RECOMMENDED ENERGY CONSERVATION PRACTICES WITH A VARIETY OF ADDITIONAL INNOVATIVE FEATURES, IN ORDER TO ACHIEVE A HIGHER DEGREE OF HUMAN COMFORT, CONVENIENCE AND ENERGY/DOLLAR SAVINGS.

COMMONLY RECOMMENDED ENERGY CONSERVATION PRACTICES

THESE PRACTICES (MOST OF WHICH SHOULD BE USED IN ALL HOMES) INCLUDE:

- GOOD QUALITY INSULATION PROPERLY INSTALLED TO RECOMMENDED (OR HIGHER) R-VALUES
- RIDGE AND SOFFIT VENTS FOR PROPER VENTILATION AND MOISTURE CONTROL
- CAREFUL USE OF CAULKING/WEATHERSTRIPPING TO REDUCE AIR INFILTRATION
- HIGH QUALITY INSULATED GLASS AND DOORS

ADDITIONAL PASSIVE DESIGN FEATURES

'PASSIVE DESIGN' FEATURES ARE USUALLY A PERMANENT PART OF THE HOUSE ITSELF, AND REQUIRE LITTLE IF ANY MAINTENANCE. SIMPLE IN DESIGN, THEY CONTAIN FEW IF ANY MOVING PARTS, REQUIRE MINIMAL OR NO ENERGY FROM POWER COMPANIES TO OPERATE, AND TAKE ADVANTAGE OF NATURAL ENERGY SOURCES, SUCH AS THE SUN.

PASSIVE COOLING AND HEATING FEATURES INCLUDE SUCH PRACTICES AS:

- BUILDING SITE EVALUATION FOR PROPER HOUSE LOCATION
- PROPER ORIENTATION TO THE SUN FOR WINTER HEAT AND SUMMER SHADE
- USE OF WALLS AND FLOORS FOR ENERGY COLLECTION AND STORAGE
- HOUSE SHAPED TO CAPTURE COOLING BREEZES AND LESSEN EXPOSURE TO COLD WINTER WINDS
- THERMAL 'CHIMNEYS' AND WINDOWS THAT OPEN FOR NATURAL VENTILATION
- EARTH BERMING AS WEATHER BUFFER AND SEASONAL HEAT/COOL STORAGE
- PROPER ROOF SLOPE FOR POTENTIAL USE OF ACTIVE HOT WATER OR PHOTOVOLTAIC SYSTEMS
- LOW WATER USE PLUMBING FIXTURES
- USE OF NATIVE OUTSIDE VEGETATION FOR CLIMATE CONTROL AND THERMAL PROTECTION
- SOLAR PRE-HEAT SYSTEMS FOR HOT WATER
- AIR LOCKS AND INTERIOR BUFFER ZONES
- OUTSIDE COMBUSTION AIR FOR FIREPLACES AND DRYERS
- FOUNDATION INSULATION

GULF COAST DESIGN NEEDS DIFFER FROM COLDER CLIMATES

MOST POPULARIZED INFORMATION ABOUT SOLAR ENERGY AND PASSIVE DESIGN HAS GROWN OUT OF THE HEATING NEEDS FOUND IN COLDER REGIONS OF THE COUNTRY.

IN THE GULF COAST AREA, COOLING--NOT HEATING--IS OUR PRIMARY CONCERN.

ENERGY CONSCIOUS HOME DESIGNS MUST BE CAREFULLY BALANCED AND 'TUNED' FOR THIS CLIMATE. TOO MUCH USE OF PASSIVE SOLAR ENERGY IN A HOME HERE CAN PRODUCE DISASTROUS OVERHEATING IN THE SUMMER, RAISING RATHER THAN LOWERING ENERGY BILLS. IN THIS CLIMATE HOUSES SHOULD BE DESIGNED TO TAKE FULL ADVANTAGE OF FAVORABLE OUTSIDE CLIMATE CONDITIONS FOUND HERE DURING MUCH OF THE YEAR. THIS ALSO LESSENS THE LOAD ON BACK-UP MECHANICAL COOLING SYSTEMS.

COST EFFECTIVE DESIGN DESIREABLE, IF NOT ESSENTIAL

THERE ARE DEGREES OF ENERGY SAVINGS POSSIBLE IN ANY HOME DESIGN, DEPENDING ON THE AMOUNT OF MONEY A PERSON WISHES TO SPEND. A PERSON COULD PAY UP TO

50% MORE FOR A HOME THAT INCORPORATES INNOVATIVE IDEAS AND ACHIEVES ENERGY AND DOLLAR SAVINGS. THE SECRET IS TO COMBINE THESE FEATURES IN SUCH A WAY AS TO MINIMIZE EXTRA BUILDING COSTS, A REQUIREMENT THAT WILL BECOME MORE IMPORTANT IN TODAY'S SENSITIVE HOUSING MARKET. IN HOUSTON'S FIRST PASSIVE DESIGN DEMONSTRATION HOME, ENVIRONMENT ASSOCIATES EXPECTS TO PROVE THAT IT IS POSSIBLE TO BUILD A HOME WITHIN 5% OF THE FINISHED CONSTRUCTION COSTS OF COMPETING SPECULATIVE HOMES IN THE SAME AREA. THE DESIGN OF THIS HOUSE--PROJECTED TO SAVE AT LEAST 50% ON SPACE COOLING AND HEATING REQUIREMENTS--WAS COMMISSIONED BY THE SOUTHERN SOLAR ENERGY CENTER.

CONSTRUCTION

HIGHLY DETAILED PLANS NEEDED

OUR EXPERIENCE HAS SHOWN THAT IT IS USUALLY NOT POSSIBLE TO BUILD A TRULY ENERGY CONSCIOUS/PASSIVE DESIGN HOME FROM A NORMAL SET OF BUILDER PLANS. BUILDERS AND SUB-CONTRACTORS CANNOT BE EXPECTED TO FILL IN THE DETAILS FOR PROPERLY BUILDING AND INSTALLING THE VARIOUS FEATURES FOUND IN ONE OF THESE HOMES. IT IS NECESSARY TO SHOW IMPORTANT DETAILS ON THE WORKING PLANS THEMSELVES.

SUPERVISION OF ACTUAL INSTALLATION NECESSARY

THE CONSTRUCTION PRACTICES USED TO BUILD AN ENERGY CONSCIOUS HOME OR COMMERCIAL BUILDING MUST BE CAREFULLY MONITORED IN THE FIELD, OR THE DESIGN IS SUBJECT TO FAILURE. CONTRACTORS AND THE PEOPLE WORKING FOR THEM NEED TO GAIN EXPERIENCE IN THESE NEW TECHNIQUES, AND THIS TAKES TIME. MEANWHILE, AN ARCHITECT AND THE BUILDING OWNER CAN WORK TOGETHER TO HELP INSURE THAT WHAT IS SPECIFIED ON THE PLAN IS DELIVERED ON THE BUILDING SITE. SPECIAL EDUCATIONAL AND TRAINING PROGRAMS IN NEW TECHNIQUES ARE ESPECIALLY HELPFUL HERE.

OPERATION

UTILITY BILL SAVINGS HARD TO PREDICT

THE ACTUAL ENERGY USE OF TWO FAMILIES LIVING IN IDENTICAL ENERGY CONSCIOUS HOMES COULD VARY AS MUCH AS 50% OR MORE, DEPENDING ON THE PERSONAL HABITS AND SIZE OF EACH FAMILY. YEARLY WEATHER AND CLIMATE DIFFERENCES CAN ALSO ALTER THE CONSUMPTION OF OUTSIDE ENERGY, AS CAN DEFICIENCIES IN CONSTRUCTION.

ENVIRONMENT ASSOCIATES

OUR SPECIALITY--ENERGY CONSCIOUS DESIGN AND CONSULTING

WE SPECIALIZE IN THE DESIGN OF ENERGY CONSCIOUS BUILDINGS FOR TEXAS AND THE GULF COAST--BOTH RESIDENTIAL AND COMMERCIAL. WE ALSO CONSULT ON PROBLEMS WITH EXISTING BUILDINGS AND HELP OTHERS IMPROVE THE ENERGY EFFICIENCY OF BUILDINGS UNDER CONSTRUCTION--PREFERABLY BEFORE DESIGN AND CONSTRUCTION BEGINS. OUR FIRM ALSO HAS EXTENSIVE EXPERIENCE IN THE CONSTRUCTION AND REAL ESTATE DEVELOPMENT INDUSTRIES. THIS ENABLES US TO BETTER UNDERSTAND COST-EFFECTIVE CONSTRUCTION METHODS, AND TO COMMUNICATE EFFECTIVELY WITH THE VARIOUS BUILDING TRADES.

ONGOING RESEARCH PROGRAM

WE CONDUCT AN ACTIVE PROGRAM OF RESEARCH INTO STATE-OF-THE-ART DESIGN CONCEPTS, BUILDING COMPONENTS/MATERIALS AND CONSTRUCTION PROCESSES. IN THE INTEREST OF OFFERING UNBIASED RECOMMENDATIONS TO OUR CLIENTS, OUR FIRM DOES NOT HAVE A FINANCIAL STAKE IN THE SALE OF ANY BUILDING MATERIAL, HARDWARE OR SYSTEM.

SEPTEMBER, 1980

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APPENDIX VII
PRESS RELEASES AND NEWS CLIPPINGS

PRESS RELEASE

CONTACT: DAN BLANCHARD or
PEGGY AMES

Peggy Ames & Associates
3133 Buffalo Speedway, Suite 213
Houston, Texas
627-3680

(FACT SHEET)

HOUSTON'S FIRST PASSIVE SOLAR HOME

Houston's first and revolutionary PASSIVE SOLAR HOME is now completed. The home is the flagship of present-day energy-conscious architectural concepts, designed specifically for Houston and similar climates. The most prominent result of the home's passive solar concept will be an overall savings of energy consumption that could exceed fifty percent.

The official showing of the home to the public will begin Saturday, October 25th at its 14807 West Bend Drive location in "Butler's Bridge" subdivision near Highway 6 and Westheimer.

The two-story 2,108 square foot home is the end result of a cooperative effort by:

(Planning).....Southern Solar Energy Center (SSEC)
Atlanta, Georgia

(Designing).....Environment Associates
Architects: LaVerne A. Williams,
AIA and partner, David W. Prince
Houston, Texas

(Building).....Doyle Stuckey Homes, Inc.
Houston, Texas

The house was planned by the Southern Solar Energy Center, a regional center operated for the U. S. Department of Energy, which was organized to accelerate the commercialization of solar technology.

-more-

The project involved planning, designing and building a house that:

-Utilizes the combination of sun and building design to regulate the heating and cooling of its inner climate with a minimum of mechanical devices.
-Decreases energy consumption at least fifty percent.
-Offers comfortable family living.
-Is attractive and conventional in appearance.
-Is very cost-competitive with conventional suburban homes (Priced under \$100,000).
-Can be built by competent builders and mass-marketed.

"Passive solar" design concepts applied in the Houston home are timely architectural ideas and methods which:

-Consider climatical compatibility in overall design.
-Rely on renewable energy, such as that from the sun, for at least half of the energy required to comfortably heat and cool the house.
-Contain a minimum of mechanical parts or hardware.
-Reduce energy consumption.
-Tend to be cost-competitive.
-Result in homes that are more liveable, comfortable and maintainable.

Specific passive energy features of the Houston house include:

-Passive direct solar heating in winter.
-Window design for cross ventilation.
-Passive solar water pre-heater.
-Entry air locks.
-"Vented" west wall with no windows to reject summer heat.
-Attic fan ventilation.
-Moveable window overhang shades and extended second story eaves.
-Site orientation for proper solar exposure.
-Heat-recirculating fireplace.
-Special wide fixed overhangs control solar exposure on second floor.
-Masonry floors to store solar heat in winter, cool in summer.
-Brick interior walls that store heating and cooling.
-High insulation standards throughout.
-Windows with dual glazing and thermal breaks or wood frames.
-Absorbable glazing on east windows.
-Ridge and soffit attic venting.
-Radiant barrier in roof to reject summer heat.
-Garage location on northwest side helps protect living spaces from cold winter winds.

Southern Solar Energy Center (SSEC)

In May, 1979, the Southern Solar Energy Center (SSEC), located in Atlanta, Georgia, was established as one of the four regional solar energy centers operated for the U.S. Department of Energy. SSEC's major function is accelerated commercialization of solar technologies in the southern region utilizing renewable energy sources.

A non-profit corporation, the SSEC's specific role in the building of Houston's first PASSIVE SOLAR HOME involved project initiation, planning and management. Its all-encompassing area of interest is rapid solar energy commercialization. The building of the Houston PASSIVE SOLAR HOME has been a major step toward encouraging the southern Gulf Coast building industry and the general public to practice and thus benefit from energy-conscious, passive solar technology.

The SSEC selected the Houston-based architectural firm, Environment Associates, to design the home to the following specifications (non-all-inclusive):

-Medium-priced/cost competitive.
-Easily mass-produced by builders using fairly standard materials and construction methods.
-Having popular consumer features.
-Attractive and "normal" in appearance.

.....Family-oriented/liveable.

.....That air-conditioning loads be less than half
the amount required by conventional Houston homes.

.....That passive solar applications supply fifty
percent or more of the total space heating needs.

.....Be specifically and compatibly designed for the Houston
and similar climates.

.....Specifically address the needs of the Houston market.

Doyle Stuckey Homes, Inc. -- Builder

The major function of the Southern Solar Energy Center is to accelerate the commercialization of viable solar technologies and to facilitate the South's transition to renewable energy resources. The key accomplishment will entail successful mass marketing of the passive solar suburban home by competent and committed builders.

Believing in the importance of energy conservation and energy consciousness by the public in general, Doyle Stuckey, with considerations reaching beyond those involving ordinary business decisions, accepted the responsibility of building Houston's first PASSIVE SOLAR HOME-- the flagship of energy-conscious suburban home design. The finished product and its demonstrated construction history is an important part of the proof that the passive solar suburban home can be successfully mass-marketed by the local building industry. This can be attributed to the relatively simple, yet functional design requirements of the home along with the project's overall cost-competitiveness.

-more-

Environment Associates -- Architects

The SSEC selected the Houston-based architectural firm, Environment Associates, to design a passive solar home compatible to the Houston climate. Design architect, LaVerne A. Williams, AIA and his partner, David W. Prince, gave primary consideration to reducing the cooling energy use in order to meet the demands of the hot and humid Houston conditions. Houston's first PASSIVE SOLAR HOME is the result of the firm's accomplishments.

Application of passive solar concepts involving energy-conscious design and consulting has been a major service of Environment Associates for several years. A founder of the Houston Solar Energy Society and the chairman of the local American Institute of Architects Energy Committee, design architect Williams has established himself as an expert in making practical use of solar energy and other natural site energies through passive systems. His activities in the energy, behavioral and environmental aspects of architecture led him to become an author of Houston's Solar Energy Code, an advisor to the Texas' Governor's Energy Advisory Council, and Technical Consultant to the Texas Energy Development Fund for passive solar and building energy conservation proposals.

Additional activities have included instructing architects, engineers, builders and building owners on energy conservation and alternative energy uses at several government and university-sponsored seminars, as well as through independent lecturing engagements.

Richard and Mildred Eilertson -- Owners

Having heard about the Houston PASSIVE SOLAR HOME quite by accident at a Houston Solar Society exposition, the home's owners, Richard and Mildred Eilertson are delighted with every aspect of its design. They are especially pleased with the home's passive architectural concepts that they feel beneficially respond to the Houston climate.

The Eilertson's have always had a genuine interest and appreciation for energy-conscious and energy-saving home design concepts. The Houston PASSIVE SOLAR HOME offered everything they had hoped to find including an attractive, conventional appearance, and the definite potential to be a very "liveable" and comfortable residence.

-- end --

Peggy Ames & Associates, Inc.

Advertising/Public Relations
3133 Buffalo Speedway, Suite 213
Houston, Texas 77098
713/627-3630

CLIENT: SOUTHERN SOLAR/DOYLE STUCKY HOMES
STATION: KPRC, KENR, KILT, KULF
DATE: October 23 - 26 '80
SPOT # SSEC-001....60-Second

ANNCR: At last...a medium-priced and very liveable suburban home that can cut utility costs in half. This weekend, Doyle Stucky Homes unveils Houston's first Passive Solar Home-- a revolution of suburban home design. This attractive and affordable home, designed by the architects of Environment Associates, can be called a masterpiece of common sense. Every square foot is designed to cut utility costs without sacrificing comfort. Every passive solar feature is incorporated for positive response to the Houston climate. Houston's first Passive Solar Home is now open in Butler's Bridge Subdivision, just off Highway 6 South near Westheimer. Look for the Doyle Stucky Homes sign at West Bend Drive. See the suburban home of the future... that's very practical and affordable today.

Houston's Passive Solar Home is a cooperative accomplishment of the Southern Solar Energy Center...and Doyle Stucky Homes in coordination with Environment Associates.

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CLIENT: SOUTHERN SOLAR/DOYLE STUCKY HOMES
STATION: KPRC, KENR, KILT, KULF
DATE: October 23 - 26 '80
SPOT # SSEC-002...60 Seconds Passive Solar Home

ANNCR: Today's energy costs have never been higher, and there is every indication that they will only continue to rise. What can be done about it?...Doyle Stucky Homes has a solution. This weekend, Doyle Stucky Homes will unveil a revolution in suburban home-building concepts-- the first Passive Solar Home built in Houston-- a medium-priced, affordable home that can reduce energy use to less than fifty percent of that for a typical new home. That's correct...this Passive Solar Home can cut utility costs in half without sacrificing comfort. All that is required is common sense^{and proper} use of its passive solar features. This weekend, see Houston's first Passive Solar demonstration home in Butler's Bridge Subdivision...Highway 6 just south of Westheimer.

Houston's Passive Solar Home is a cooperative accomplishment of the Southern Solar Energy Center...and Doyle Stucky Homes in coordination with the architects of Environment Associates.

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Archetypes

GARY McKAY

In the Spotlight: A Solar Home For the Suburbs

Architect LaVerne Williams, AIA, has designed an energy-efficient solar home that suburban developers can build for a mass market.

Bill Stries

Mention the term "solar home" and many people still think only of black, rectangular solar-collector panels lined up on a roof, probably installed only to heat water. A truly energy-saving house, however, is designed so that every aspect of its form and construction aids in cutting down utility costs. And a *successful* energy-saving house is attractive and more liveable as well.

This fall, marking a first for the Houston area, a brand-new, good-looking and thoroughly energy-saving house will be open to the public. It was commissioned by a nonprofit corporation called the Southern Solar Energy Center, which was organized to promote economically viable solar technologies. The house was designed by LaVerne Williams, AIA, of Environment Associates, and is being built by Doyle Stuckey Homes, Inc., at 14807 West Bend Dr., near Westheimer and High-

way 6. Asking price is under \$100,000. (For more information, call 496-1787.)

The SSEC asked Environment Associates to plan a medium-priced house that could be easily mass-produced by local builders using fairly standard materials and construction methods. The group also wanted it to exhibit popular builder-house features, such as a "great room" living area and a master bedroom suite with spacious dressing and bath areas. Even though the sale price had to be competitive with the usual speculative house of similar size, the SSEC also requested that air-conditioning loads be less than half the amount required by conventional Houston homes and that passive solar supply 50 percent or more of the total space-heating needs. It also had to exhibit better thermal comfort, and should future owners choose not to use all the house's passive features,

Archetypes (continued)

they should still expect substantial savings in their energy bills.

For this project, Williams, a founder of the Houston Solar Energy Society and the chairman of the local AIA's Energy Committee, and his partner David Prince designed a two-story, 2,043-square-foot house facing north. A double-garage wing in front helps to shield the house from chilly north-northwest winter winds. Tucked behind the garage is an entrance foyer which, since it has both an outer front door and then a second door opening into the great room, functions as an "air lock" passageway through which very little conditioned air can escape. Windows line the house's rear, south-facing facade. In the summer these are shielded by overhanging eaves and adjustable sunshades; but during the winter, sunlight will be allowed to stream through them to warm the dark, heat-holding masonry tile floors and brick walls in the living area. (These same floors and walls also store coolness during summer nights, allowing the house's cooling system to run more efficiently during hot summer days.) There are no windows on the

west facade, which protects the house from afternoon summer sun. But operable, screened windows are spaced at regular intervals around the rest of the house to allow for maximum cross-ventilation.

For water heating, the architects designed a low-cost (about \$600) passive solar system that has no moving parts or complicated controls. Essentially, this is a glazed, insulated box surrounding two stripped-down 30-gallon storage tanks connected to a regular gas-heated tank. If most of the bathing and washing occur in the evening, Williams believes, the sun will have heated almost all of the hot water used.

Other energy-conscious devices include a heat-recirculating fireplace with glass door and outside combustion air supply; an adjustable dryer vent that can be used to help heat the home in winter; a backup whole-house fan that won't leak conditioned air from the house when not in use; a ceiling fan in the kitchen along with energy-efficient appliances. Use of fluorescent lighting is extensive; incandescent lights have dimmer switches; and water-conserving plumbing

fixtures are used exclusively along with shower heads that have cut-off switches to conserve water while bathers "soap up."

Important energy-conscious structural details include insulated hot water lines, an insulated foundation and full-length ridge and soffit openings at roof level to vent the attic. Altogether, the residence seems about as carefully and comprehensively planned for low utility expenditures as it possibly can be. Williams himself says that, given the house's mass-market premise, he feels "really good" about its design.

For years now, people have expected the kinds of model homes labeled "houses of the future" to be spectacularly modernistic — glass-walled, wildly angular or even round, with plenty of newfangled, energy-draining gadgetry. The house that the SSEC, Environment Associates and Doyle Stuckey Homes have built is none of the above. It looks very much like many other clean-lined, comfortable suburban family homes. But it is, nevertheless, a trend-setter, chock-full of ideas, and certainly, for anyone planning on building a home, worthy of an afternoon's tour. ♦

Award Winning Landscaping by Teas

The home of Mr. & Mrs. Regal Porter in Memorial, designed by Butch Estes, Landscape Architect, Teas Landscape Department, has received the Grand Award of The Texas Society of Landscape Architects and a Certificate of Merit from the National Landscape Association. For an award winning landscape of your own, call 668-6261 in Southwest Harris County or 353-8579 in North Harris County.

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Therefore, while the home may cost slightly more than a conventionally heated home, it will save an estimated 70% on fuel bills, and it has the style to make it attractive to Kentucky's traditional home buyers. While Jim admits that he may not incorporate all of the passive features of the "Solar Garden" in his future home, he says "he would never build a house without some of these features".

Those features include:

Tight solar shell, well-constructed and well-insulated.

House design--placing frequently used rooms together, with stairwells, laundries and storage on opposite side.

House orientation--placing those frequently used rooms due south.

Garage location--on northern side for house protection from cold north wind.

Direct heat gain from windows facing south and a minimum of cold infiltration by reducing glass size and number of windows on north side.

Trombe wall with operable vents on south--a black painted wall of solid concrete block and insulated glass on exterior for heat collection and retention.

Wood trellis over Trombe wall, blocking summer sun but allowing winter sun penetration.

Air-recirculating fan and ductwork to pick up unused warm air from top of trombe wall and return it to furnace.

Wide overhangs on windows, blocking summer sun but allowing winter sun penetration.

Solarium in south side for heat collection.

Masonry floor in solarium and breakfast sun room for heat retention.

Natural convection loop for interior air circulation in stairwell and breakfast sun room for better use of generated heat. (This feature includes a circulating fan mounted on sunroom ceiling.)

Reflective Venetian blinds for summer

heat rejection.

Prefabricated air-recirculating fireplace with heated air intake.

Air-lock vestibule to minimize heat loss while entering or leaving building.

Mounding, through landscaping, on north side to divert winter winds up and over house.

Evergreens on north side to protect against winter winds.

Deciduous shade trees on south side for shade in summer and to allow sun to enter in winter.

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Houston's first Passive Solar Home previews in Butler's Bridge

9957

In light of today's high home utility costs, a welcome sight in Houston is the new Passive Solar Home recently completed by Doyle Stuckey Homes, Inc. Now being shown in Butler's Bridge subdivision, the new passive solar home is the first of its kind in Houston, and the result of cooperative accomplishment by the Southern Solar Energy Center (SSEC), Doyle Stuckey Homes and the Houston-based architectural firm, Environment Associates.

The home is expected to reduce necessary energy consumption at least fifty percent.

The Southern Solar Energy Center, headquartered in Atlanta, Georgia, initiated the project as part of its function to promote the accelerated commercialization of viable solar technologies in the southeastern region of the U.S. The SSEC is a regional center operated for the U.S. Department of Energy. Completion of the Houston Passive Solar Home has been the first step toward encouraging the southern Gulf Coast building industry and the

general public to practice, and thus benefit from energy-conscious passive solar designs and applications.

Passive solar features in home construction utilize the combination of sun and building design to help regulate the heating and cooling of the inner climate with a minimum of mechanical devices. The SSEC Houston home has many such passive features incorporated in its construction that will make substantial utility savings possible. Particular design consideration was given to reducing the cooling energy use in order to meet the demands of the hot and humid Houston conditions.

After choosing Houston for the home's location, the SSEC selected the architectural firm, Environment Associates, to conceive the home's design. The firm was chosen because of its past accomplishments and expertise in solar design applications. LaVerne A. Williams, AIA, and his partner, David W. Prince, are responsible for achieving three major goals in their passive solar home's design. First,

and most important, the passive features of the home enable it to rely on natural energy, such as that from the sun, for at least half of the energy required to comfortably heat and cool the house. Secondly, the home is cost-competitive and can be built and mass-marketed by competent home-builders. And finally, the Houston passive solar home is attractive and conventional in appearance and offers comfortable suburban family living.

This weekend marks the beginning of the public showing of Houston's first Passive Solar demonstration home.

Butler's Bridge Subdivision can be reached easily by driving south on Highway 6 to West Bend Drive, just south of the Westheimer intersection. The home is located at 14807 West Bend Drive.

Doyle Stuckey's Passive Solar Home

HOUSTON CHRONICLE
HOUSTON, TEXAS
D. 324.301 SUN. 418.130

OCT 25 1980

14807 West Bend

Doyle Stuckey designs passive solar home

BY JOEL NASH
Your Home Editor

A passive solar home designed for Doyle Stuckey Homes in cooperation with Environment Associates, Inc. and the Southern Solar Energy Center of Atlanta has been unveiled in Butler's Bridge for public viewing until December 12.

The long time Houston builder will also be showing an energy-saving house in West Branch, which has been constructed to demonstrate energy-saving construction techniques in the 1980s. Stuckey is among 10 prominent nationally-known home builders selected in competition by the National Association of Home Builders and the National Council of the Housing Industry to build the home.

Through the cooperation of the Department of Energy the 10 homes will be monitored for a period of two years by the NAHB Research Foundation to determine how they achieve the designed energy savings. The other homes are located in Oklahoma, California, Colorado, Florida, Minnesota, Ohio, Maryland, Tennessee and Washington, D.C.

Stuckey's two-story, 1800-square-foot home uses passive cooling techniques. The air-conditioned home uses interior brick. Ceiling fans circulate air in the living and dining rooms, which are cooled by the bricks and reduce load on the air condition unit.

A hot water back surge recovers hot water in pipes so that water in the heater does not require re-heating. Waste water from the air conditioner condensing unit is used to heat domestic hot water during the six-month Houston summer season.

Expanding polyseal foam blocks air infiltration through seams at windows and doors and any penetration necessary for wire or pipes.

Ed Garcia, the builder for Stuckey, said the home has two-by-six studs, rather than the usual two-by-four stud construction, in order to accommodate the six-inch batting insulation. The ceiling has 12 inches of insulation with an R-30 rating. Walls are R-19 rated plus three-quarter-inch Styrofoam brand insulation for a total of R-23.

All duct work in the home is heavily insulated in addition, he said. Ceiling fans are reversible, which permits the blades to force warm air down into the rooms during the winter season.

Other features include hi-efficiency kitchen appliances and hi-efficiency heating and air conditioning system.

The fireplace is designed to return warm air into the living room and does not emit colder air from the outside. A Ventaridge along the home's ridge now permits

(See DOYLE STUCKEY Page 24) A

DOYLE STUCKEY
HOUSTON, TEXAS
713-557-4121

NOV 1 1980

Doyle Stuckey designs solar home

(From Page 1)

the escape of hot air from the attic in the warm months, according to Garcia.

The design includes an air space between exterior and interior walls to further provide insulation. The outside wall on the dining area, which faces north, is 18 inches thick, he added.

The home, in the \$85,000 price range also has Styrofoam insulation on top of the slab to prevent cold air from the outside from penetrating floor areas during cold weather.

A house of an entirely different nature is the SSEC Houston House, which is the product of the combined efforts of the Atlanta center, the Houston-based architectural firm Environment Associates and Doyle Stuckey Homes.

This 2108-square-foot home gets a significant part of its heating needs from the sun, which is combined in the design with passive cooling techniques to reduce annual energy use to less than 50 percent of that used by the typical home, according to Laverne A. Williams and David W. Prince of Environment Associates.

The Houston architectural firm's primary design consideration was "to reduce the cooling energy use in the home in order to meet the demands of Houston's hot and humid climate."

The contemporary home doesn't appear to be different from the exterior of any other home in suburban Butler's Bend. However it does utilize passive energy features for heating and cooling.

SECOND FLOOR

A passive solar home designed for Doyle Stuckey has been unveiled in Butler's Bridge for public viewing until Dec. 12.

The home has been decorated and furnished by The Changing Look & Friends.

The Southern Solar Energy Center, established in 1979, is one of four regional solar energy centers funded by the U.S. Department of Energy.

Passive energy design is actually centuries old, and the demonstration house is a step in "back-to-basics" design. Construction cost is about five percent higher than comparable conventional houses having similar appointments "but poorer energy use," according to the architects. They estimate space cooling and heating energy costs could run less than \$400 annually. That is about 50 percent of the average used by other Houston homes and is based upon average occupancy and weather conditions. The home is in the \$100,000 price range.

Butler's Bend is located off State Highway 6 in southwest Houston. West Branch is located in northwest Houston on Durbin off Clay Road. Both homes are open daily. Each provides an alternative to spiraling fuel costs for Houston home buyers.

PASSIVE ENERGY FEATURES for heating and cooling

	beat cool
1. Passive direct solar heating in winter	X
2. Movable overhand shades first floor windows as needed	X X
3. Special wide fixed overhangs control solar exposure on second floor	X X
4. Masonry floors to store solar heat in winter, cool in summer	X X
5. Brick interior walls store heating and cooling	X X
6. Site orientation for proper solar exposure	X X
7. Passive solar water pre-heater	-
8. Heat recirculating fireplace	X
9. High insulation standards throughout	X X
10. Tight shell construction for infiltration control	X X
11. Vestibule and laundry room serve as entry air locks	X X
12. Windows with dual glazing and thermal breaks or wood frames	X X
13. Reflective glazing on east wall	X
14. Window design for cross ventilation	X
15. High clerestory over kitchen dining vents out excess heat	X
16. Garage location on northeast side protects living spaces from cold winter winds	X
17. "Vented" west wall with no windows rejects summer heat	X
18. Attic fan ventilation	X
19. Ridge and soffit attic venting	X
20. Radiant barrier in roof rejects summer heat	X

Houston Post
HOUSTON, TEXAS
NOV 2 1980

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The home is expected to reduce neces-

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Passive solar features in home construction utilize the combination of sun and building design to help regulate the heating and cooling of the inner climate with a minimum of mechanical devices. The SSEC Houston home has many such passive features incorporated in its construction that will make substantial utility savings possible. Particular design

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After choosing Houston for the home's location, the SSEC selected the architectural firm, Environment Associates, to conceive the home's design. The firm was chosen because of its past accomplishments and expertise in solar design applications.

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Secondly, the home is cost-competitive and can be built and mass-marketed by competent home-builders. And finally, the Houston Passive Solar Home is attractive and conventional in appearance and

'Passive Solar Home' opened today at Butler's Bridge

View of the back of the new 'Passive Solar Home'

offers comfortable suburban family living.

This weekend marks the beginning of the public showing of Houston's first Passive Solar demonstration home. During the public showing, decorating is furnished by Changing Look & Friends using a rich, earth-toned eclectic theme.

Windows throughout the house are adorned with stylish and functional one-inch decor blinds.

Butler's Bridge Subdivision can be reached easily by driving south on Highway 6 to West Bend Drive, just south of the Westheimer intersection. The home is located at 14807 West Bend Drive.

Houston's first Passive Solar Home previews in Butler's Bridge

Weekend of October 25-26, 1980

Houston Chronicle

Your Home Section—Page 31

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Doyle Stuckey's Passive Solar Home

14907 West Bend

Houston's first PASSIVE* Solar Home

HOUSTON'S FIRST PASSIVE SOLAR HOME is the product of a cooperative effort of the Southern Solar Energy Center, Doyle Stuckey Homes, and the Houston-based architectural firm, Environment Associates. Significant support has also been provided by a team of local advisors.

The 2,108-square-foot Passive Solar demonstration home was designed with primary consideration given to reducing the cooling energy use in order to meet the demands of Houston's hot and humid climate. The home also receives a significant portion of its heating needs from the sun, and thus, combined with the special passive cooling techniques, reduces annual energy use to approximately 50% of that for a typical new home.

The house is bright, comfortable, and in keeping with the prevailing style of homes in suburban Houston. Houston's first PASSIVE SOLAR HOME is the flagship of energy-conscious suburban home design in the South.

"Our overall goal in the Houston project was to plan, design and build a marketable medium-priced passive solar home that could be easily mass-produced by the local building industry using readily available standard materials and construction methods. I'm proud to say that the Houston passive solar home is everything we planned it to be."

The all-encompassing function and area of interest of the SSEC is solar energy commercialization, structured to meet regional needs. One responsibility is to facilitate

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A PASSIVE SOLAR HOME is a home designed to utilize the combination of sun and building design to regulate the heating and cooling of its inner climate with a minimum of mechanical devices. Much emphasis is given to climatical compatibility in its initial planning. The ultimate goal of using PASSIVE SOLAR technology is to dramatically reduce the necessary heating and cooling energy consumption. The Houston PASSIVE SOLAR HOME demonstrates the benefits of such technology. It is attractive and conventional in appearance, very cost-competitive with conventional suburban homes, and can be built and effectively marketed for the general home-buying public.

Established in May, 1979, the Southern Solar Energy Center (SSEC),

located in Atlanta, Georgia, was created as one of the four regional solar energy centers operated for the U.S. Department of Energy. A non-profit corporation, the SSEC's major function is to help the commercialization of viable solar technologies in the southern region, utilizing renewable energy sources. The SSEC's role in the building of Houston's first PASSIVE SOLAR HOME involved project initiation, planning and management.

responsibility to facilitate the South region's transition to renewable energy sources. The building of the Houston PASSIVE SOLAR HOME is one of the first steps toward encouraging the Southern Gulf Coast building industry and the general public to practice and thus benefit from energy-conscious, passive solar designs and applications utilizing natural energy sources.

Kal Turkia
Head of Building Systems
Division
SSEC

Typical New Home

PROJECTED ENERGY CONSUMPTION
FOR HEATING AND COOLING

PUBLIC PREVIEW!

BEGINS
TODAY!

LeVern A. Williams, AIA
Design Architect
Environment Associates

Application of passive solar concepts involving energy-conscious design has been a major service of Environment Associates for several years. Design architect, LeVern A. Williams, AIA and his partner, David W. Prince, gave primary consideration to reducing the cooling energy use in order to meet the demands of the hot and humid Houston conditions. The result — a medium-priced, energy-saving, comfortable suburban home designed specifically for the Houston climate.

"Every aspect of the form and construction of the Houston PASSIVE SOLAR HOME aids in reducing utility costs. I think this design will definitely appeal to the home-buying public."

Mrs. Mildred Ellertson
Homeowner

Having heard about the Houston PASSIVE SOLAR HOME quite by accident at a Houston Solar Society exposition, the home's owners, Richard and Mildred Ellertson are delighted with every aspect of its design. They are especially pleased with the home's passive architectural features that they feel beneficially respond to the Houston climate. They are also convinced that the home will offer much comfort and be very liveable in general. The Ellertsons are very proud to be the owners of Houston's first PASSIVE SOLAR HOME. "We have always had a genuine interest in and appreciation for energy-conscious and energy-saving home design concepts."

STREETVIEW

SOUTHVIEW

During the home's demonstration dates, decorating will be furnished by CHANGING LOOK & FRIENDS under the supervision of Lilly Arnold. Special Flexalum™ one-inch decor blinds and vertical blinds have also been furnished during this period. Mrs. Arnold observed that the interior construction of the PASSIVE SOLAR HOME, with its light and

airy characteristics, could lend itself easily to either contemporary or traditional themes.

The Changing Look & FRIENDS
Decorative Services

SECOND FLOOR

BUTLER'S BRIDGE

PASSIVE ENERGY FEATURES

for heating and cooling	Heat loss
1. Passive direct solar heating in winter	X
2. Movable overhanging awnings first floor windows as needed	X X
3. Special wide fixed overhang control solar exposure on seasons floor	X X
4. Masonry floors to store solar heat in winter, cool in summer	X X
5. Brick interior walls store heating and cooling	X X
6. Site orientation for proper solar exposure	X X
7. Passive solar water pre-heater	X
8. Heat recirculating fireplace	X X
9. High insulation standards throughout	X X
10. Tight shell construction for filtration control	X X
11. Vestibule and laundry room serve as entry air lock	X X
12. Windows with dual glazing and thermal breaks or wood frames	X X
13. Absorbable glazing on east windows	X
14. Window design for cross ventilation	X
15. High-ceilinged over kitchen dining vents out excess heat	X
16. Garage location on northwest side protects living spaces from cold winter winds	X
17. Vented west wall with no windows reflects summer heat	X
18. Attic fan ventilation	X
19. Ridge and eave attic venting	X
20. Reflective barrier in roof reflects summer heat	X

Doyle Stuckey
Doyle Stuckey Homes, Inc.

"Our finished product helps prove that the PASSIVE SOLAR HOME can be successfully mass-marketed by competent home-builders in the industry."

The key accomplishment of the SSEC's overall goal will entail successful mass marketing of the PASSIVE SOLAR HOME by the Southeastern home-building industry. Believing in the importance of energy conservation and energy consciousness by the public in general, Doyle Stuckey, with considerations reaching beyond mere involving routine business decisions, accepted the responsibility of building Houston's first PASSIVE SOLAR HOME. The successful accomplishment of Doyle Stuckey Homes and the confidence the builder has in the marketability of the home can be attributed to its relatively simple, yet functional design requirements, along with the project's overall cost-compatibility.

APPENDIX VIII
HOUSE PICTURES

Houston Design/Build - south elevation - movable overhang shades

Houston Design/Build - north elevation

Houston Design/Build - great room - masonry floors and brick walls store solar heat in winter, cool in summer