

A SURVEY OF CONSUMER ATTITUDES TOWARD EARTH
INTEGRATED HOUSING AS A VIABLE
HOUSING CHOICE

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We hereby recommend that the thesis prepared under
our supervision by Mary Nobles Greer
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Integrated Housing As A Viable Housing Choice

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To protect individuals we have covered their signatures.

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TABLE OF CONTENTS

ACKNOWLEDGMENTS.	iii
LIST OF TABLES	vi
LIST OF FIGURES.	vii
Chapter	
I. INTRODUCTION.	1
Statement of a Problem.	1
Purpose of the Study.	2
II. REVIEW OF LITERATURE.	4
Overview of Earth Integrated Structures.	4
Basic Terms for Earth Integrated Structures.	7
Advantages of Earth Integrated Housing	8
Disadvantages of Earth Integrated Housing	11
Factors Affecting Consumer's Housing Expectations.	14
Attitude Toward Sensory Phenomena	19
Summary	22
III. RESEARCH PROCEDURE.	24
Purpose	24
Sample Population	24
Material Development.	25
Scheduling the Program.	27
Earth Integrated Housing Program Package and Presentation.	28
Instrument Development.	31
Interpretation of Scores.	33
Administering the Instruments	34
Statistical Treatment of Data	35

Chapter

IV.	RESULTS	37
	Demographic Data.	37
	Knowledge Pretest and Post Test	48
	Attitude Pretest and Post Test.	50
	Relationships Between Variables	53
V.	SUMMARY AND DISCUSSION.	56
	Summary	56
	Discussion.	58
	Limitations of the Study.	61
	Recommendations	61
APPENDICES		
A.	Materials Developed For Earth Integrated Housing Program.	63
B.	Introduction Letter To Agents	68
C.	Order Form For Earth Integrated Housing Program	70
D.	Agent Copy of Order Form.	72
E.	Confirmation of Order Form.	74
F.	Reference List Enclosed With Order Confirmation.	76
G.	Press Release	78
H.	Program Lesson Plan	81
I.	Slide Outline and Script.	93
J.	Pretest	106
K.	Post Test	114
L.	Additional Information Sources : Handout	119
M.	Letter of Appreciation.	122
REFERENCES		124

LIST OF TABLES

Table

1.	Percentage Distribution of Respondents by Employment Type.	39
2.	Percentage Distribution of Respondents by Income Level	40
3.	Percentage Distribution of Respondents by Housing Type	41
4.	Percentage Distribution of Respondents by Recent Changes Made to Home.	44
5.	Percentage Distribution of Respondents' Present Housing Satisfaction.	45
6.	Percentage of Respondents' Priorities Related to Ecology, Economy, Aesthetics, and Status	46
7.	Percentage Distribution of Respondents by Importance of Housing Features.	47
8.	Respondents' Knowledge Scores by Items	49
9.	T-test for Respondents' Pretest and Post Test Scores.	51
10.	Percentage Distribution of Respondents' Pretest and Post Test Attitudes Toward Earth Integrated Housing.	52
11.	Correlation Coefficients (r) for Respondents' Attitude Toward Earth Integrated Housing and Knowledge Variables	54
12.	Matrix of Correlation Coefficients of Knowledge Variables.	55

LIST OF FIGURES

Figure

1. A Simple Taxonomy of
Terratectural Types 9

CHAPTER I

INTRODUCTION

Earth integrated housing has been used as an acceptable form of shelter since prehistoric times. Natural caves were often used as protection from seasonal weather extremes as well as from hostile neighbors (Labs, 1976). Earth integrated structures have been in evidence in America since the first colonies (Labs, 1976). Early examples of earth integrated use included: subsurface root cellars, wine cellars, and dugouts.

Today there is a revival of interest in earth integrated structures of both commercial and residential types. This interest is closely related to escalating energy costs (Fairhurst, 1976). As energy bills climb, housing consumers are seeking ways of conserving energy and reducing these costs.

Statement of a Problem

Due to lack of factual information concerning earth integrated housing, consumers may have difficulty in making intelligent decisions regarding the viability of this housing alternative. Their attitudes toward earth integrated housing may be biased or emotional rather than logical. Since earth integrated housing reduces energy

consumption 50 to 75 percent (Boyer, 1980), it is a viable housing choice. This proven reduction of energy consumption and subsequent savings in fuel bills would be an incentive to encourage housing consumers to consider earth integrated housing as a choice for their home.

Many consumers have negative attitudes toward earth integrated housing assumedly due to misconceptions rather than facts. Because of increased interest in earth integrated housing as a housing alternative and as a means of reducing consumption of natural resources, facts about earth integrated housing need to be made available to consumers.

Purpose of the Study

The purpose of this study was to determine the relationship between housing consumers' knowledge of and attitude toward earth integrated housing before and after facts on earth integrated housing were presented to them. Common knowledge reveals that most people will move within the next five years. For the purpose of this study, therefore, a housing consumer is defined as any adult consumer.

The specific purposes were:

- a. To assess housing consumer knowledge related to selected aspects of earth integrated housing

- b. To determine consumers' attitudes toward earth integrated housing and selected aspects of housing in general
- c. To present a seminar to consumers participating in certain educational programs
- d. To reassess housing consumers' knowledge of earth integrated housing
- e. To reinvestigate consumers' attitudes toward earth integrated housing
- f. To determine if any significant relationship exists between consumers' knowledge of and attitudes toward earth integrated housing as a viable housing choice and certain demographic variables

CHAPTER II

REVIEW OF LITERATURE

Overview of Earth Integrated Structures

Early Examples

Earth integrated housing has been used in some manner since prehistoric times. "Found shelters" or natural caves were often used for dwellings. The "intentional creation of underground and earth-covered structures has persisted throughout the world" according to Labs (1976). Fairhurst (1976) described underground construction as "an idea as old as the hills, -or, at least, the caves in the hills." Reasons for the early use of earth integrated shelters were "for protection from the elements, from seasonal extremes, and from hostile neighbors" (Labs, 1976).

One example of ancient earth integrated housing is the village of Matmata located in southern Tunisia. This village, which lies beneath 30 feet of earth, is still in use today. It consists of a population of several thousand. Tunnels lead from the earth's surface to the housing units that "range in size from twenty to thirty feet deep and from forty to two-hundred feet in diameter" (Labs, 1976). Underground courtyards connect the units,

which according to Labs (1976) "provide a community function as well as defensive isolation of units from the surface." The purpose of this underground village structure is protection from severely hot weather and winds.

In Sicily, there are chambers cut into nearly perpendicular walls of the Anapo Valley. Rudofsky (1964) stated that originally, these chambers served as burial grounds for an adjacent prehistoric town, but in the Middle Ages they were refashioned into dwellings.

Underground dwellings were also built in northern and western China. The purpose of these dwellings was opposite to Matmata, being protection from the extreme cold as discussed by Cressay (1955). Another example of building underground to escape weather extremes can be seen in Northern Ghana in the Seripe community. Studies have documented the use of underground caves by mesolithic seal hunters to 11,000 years ago (Gorman, 1976).

In America, the Kivas are an example of early earth integrated structures. German (1970) described the Kivas as below surface dwellings that were used by different Indian tribes in the Southwest. Some of the Kivas are still in use today.

Many early churches in Turkey, Ethiopia, and India were underground. Over 70 are documented in Turkey alone according to Kostof (1962). Dempewolf (1977) described

the luxury caves presently in France's Loire Valley that were left by quarries. They have been "extended, paneled, carpeted, richly furnished, and sold to wealthy city dwellers who cherished their coolness in the summer and natural warmth on winter weekends."

Modern Examples

Some modern underground building and shopping centers are described by Labs (1976). These include several shopping centers in Japan that contain as many as 225 shops each. Other such underground shopping areas can be found in Montreal, Paris, and Kansas City, Kansas. The Kansas City development was originally a limestone mining operation but was changed into primarily a warehouse and cold storage area, although offices and showrooms are there as well. This is the only U.S. underground development comparable to the Japanese developments. The Granite Mountain Genealogical Center located in Salt Lake City, Utah, is a large underground structure owned by the Mormons and used to store valuable genealogical records.

Some examples of underground buildings in the United States are the Avery Library extension at Columbia University (Stephens, 1978), Florida State Museum in Gainesville, Florida (Rush, 1978), and Lake Worth Junior High School in Fort Worth, Texas (Labs, 1976). Labs listed various underground campus facilities at The University of

Northern Iowa, The University of Minnesota at Minneapolis, The University of British Columbia, Cornell University, and Hendrix College whose primary purpose is conserving open space. Residential areas have also seen a revival of interest in earth integrated buildings or construction. Among the first and most noted homes are John Barnard's Ecology House, Malcolm Wells' Solaria, the Andy Davis Cave, The Bordie residence in Austin, Texas (Sterling, 1977) and Automitat in Plainview, Texas, owned and built by Jay Swayze (Parker, 1979).

Basic Terms for Earth Integrated Structures

Several terms are used to describe underground structures. Lithospace defines a structure made far below the earth's surface within rock, while terraspaces defines a structure made near the earth's surface within the soil. Lithospace is the technique used in many of the ancient underground dwellings and buildings that were described earlier. Many of today's underground structures are made below ground level within the earth and would be examples of the terraspaces concept. Terms that are synonymous with earth integrated are terratecture, earth-covered, underground, earth sheltered, subterranean, earth architecture, and geotecture.

Definition

Although these later terms describing earth integrated are synonymous, just what do they mean? In 1979, Tom Atchison, the executive director of the American Underground Space Association, defined earth covered housing as "a house with 60-70 percent of its walls underground and its roof covered by at least eighteen inches of soil" (Gendler, 1979). Parker (1979) defined earth integrated or underground housing as "A structure which has been either dug into the earth or built on grade and covered with earth."

Terms for Designs

Labs (1976) created a simple taxonomy of terratectural housing types. These are divided into bermed and chambered. The bermed structure is built on grade, then earth is pushed against the sides and on the top. The chambered structure is actually built below grade or ground level. Labs further divided the structure types into the true underground, the atrium, the elevational, and the side wall penetrational (see Figure 1).

Advantages of Earth Integrated Housing

Conservation

Conservation is the advantage of earth integrated housing most often discussed by authorities. To some,

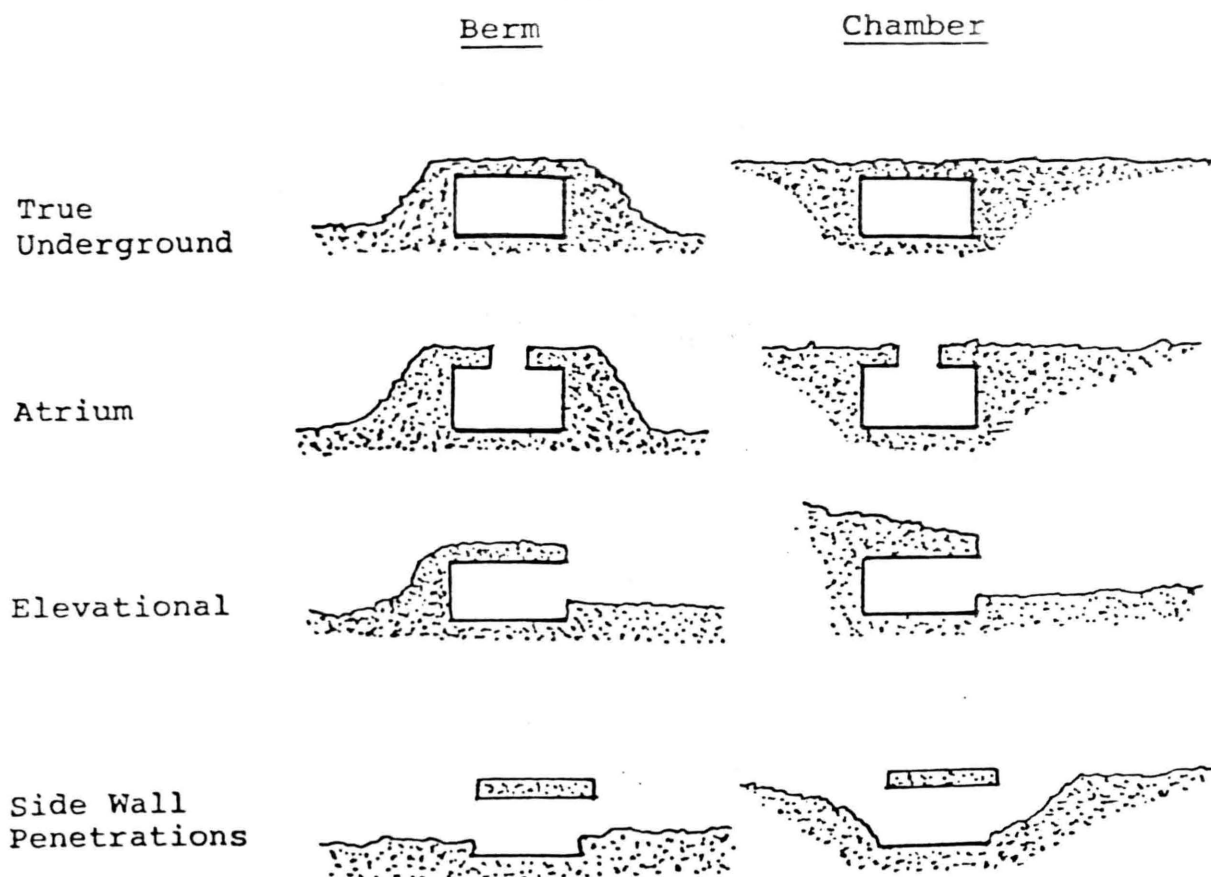


Figure 1. A simple taxonomy of terratectural types.

conservation of natural resources means a savings in dollars, while to others it means environmental preservation and conservation of natural resources for future generations. In a study recently conducted in Oklahoma, Lester Boyer (1980) said the main incentive for building earth integrated housing within the past five years has been energy savings. His research indicated that "earth-sheltered designs can reduce energy consumption by 50-75% compared with conventional designs."

Jay Swayze (1980) listed the advantages of underground living as energy conservation, less noise and air pollution, more privacy, lower insurance rates, and less maintenance. Lower insurance rates are a result of less man-originated hazards such as theft and vandalism, and more protection from natural disasters such as tornadoes.

Protection Against Disasters

Advantages listed by Harrison (1973) include protection against natural and man-originated disasters, such as storms, war, and burglary. Harrison also listed less exterior maintenance requirements, preservation of the landscape, and isolation from exterior noises as advantages. Natural disasters that have little effect on earth integrated homes are tornadoes, electrical storms, high winds, and earthquakes.

Soil is Thermal Moderator

Heat is normally transferred to and from the surroundings of a home and thus lost for purposes of heating and cooling the home itself. A reduction of this heat loss and gain means a reduction of energy consumed (Bligh, 1976). The earth around a home, which is an excellent thermal moderator, greatly reduces this heat transfer. According to Bligh (1976), "the transmission of losses depend upon the insulation and the difference in temperature between the inside and outside of the structure." Soil temperatures change slowly. Therefore, when summer temperatures above grade are rising, the cooling effect of winter will just be reaching the lower soil depths, helping to maintain a comfortable climate for those living underground.

Disadvantages of Earth Integrated Housing

Moisture Control and Lighting

There are few disadvantages of earth integrated homes. A good ventilation system is needed to prevent moisture problems and special consideration should be given to electrical lighting, since a lack of natural light is possible, according to Wells (1974). Many excellent sealants are on the market that prevent moisture problems through leakage. If natural lighting is not available

through exposed walls or skylights, special techniques such as the use of mirrors and prisms may be employed.

Construction Problems

Some problems may exist in construction of earth integrated homes in the areas of financing and building codes. Financial institutions may not be willing to finance an underground structure that they fear may not be easily resold. Some building codes, written for builders of ordinary houses and apartments, specify minimum window area and maximum sill height for ventilation and emergency exits and may present problems. According to Labs (1976) a competent architect that is knowledgeable in the area of earth integrated housing could be difficult to locate.

Consumer Acceptance of Earth Integrated Housing

After reviewing the previous information, Morgan (1979) discussed why more interest has not been shown in earth integrated housing. Morgan said,

I believe that awareness of the earth's architecture potential is increasing slowly, as indicated by recent articles, books, and exhibition, and by inquiries that reach my office. As more examples of earth-related architecture become available to the public, and as fresh approaches to such emerge--we may expect to see earth-related structures gain wider acceptance. (p. 87)

The idea behind the proposed research for this study on earth integrated housing, basically reflects the attitude of Morgan. More information about earth integrated housing can increase the public's awareness and encourage housing consumers to consider this housing alternative. That is, people's positive attitudes are related to and dependent upon their knowledge of and exposure to earth integrated housing.

According to Bell (1978) a study was conducted on an experimental earth-insulated solar dwelling built by researchers at Clemson University in South Carolina. A research study dealing with the consumer's attitudes toward the house indicated a positive response to the idea of living in an earth-insulated solar home after being exposed to such a home. The majority of those included in the sample responded that they would like to live in this type house. In addition, more than 40% indicated that they were likely to build an underground home in the next five years.

Another study was conducted involving consumers who were seriously interested in earth-sheltered housing. The study was conducted by Gary Solomonson and Associates (1979), with a sample identified as being primarily between 25 and 35, married, professionals, and without

children. Major reasons for their interest in earth-sheltered homes were energy and environmental conservation techniques.

Both of these studies indicate that exposure to and knowledge of earth integrated houses contribute to positive consumer attitudes toward such housing. To better understand an individual's attitude toward any type housing, their expectations, knowledge, and satisfaction related to housing should be studied.

Factors Affecting Consumer's Housing Expectations

Housing aspirations and satisfaction may be obtained in different ways for different people, but basic norms and expectations are found to be common to most individuals. The American dream of owning the single-family dwelling is still present (Winter & Morris, 1977) and can be satisfied through an earth integrated home as well as a conventional home.

Housing Aspirations

McCray and Day (1977) stated that "housing aspiration refers to the quality and design of the housing unit sought by an individual or family to satisfy housing needs or desires." In other words, does the house satisfy the wants and needs of that particular family? Housing aspirations identified by this study reflect that the "families

aspired to have a modern house with features typical to middle-class Americans." Would an earth integrated house meet these aspirations? The results of the present research study should indicate whether or not these aspirations can be met through an earth integrated house. McCray and Day found that the housing needs most sought by the respondents centered around the basic needs of security and safety. Therefore, if individuals were aware of the extra security and safety provided by an earth integrated home, their attitude might be more favorable toward it.

Housing Satisfaction

Brink and Johnston (1977) defined housing satisfaction as

a subjective response to housing need gratification which the consumer gauges by the degree of fulfillment of his housing expectations and aspirations and by housing improvement achieved over his previous dwelling. (p. 344)

This definition simply stated that housing satisfaction was greatest when individual expectations and aspirations were met by a particular housing unit. Different people have different needs in housing, but three basic criteria were used in the Brink and Johnston study. These criteria stated: that satisfaction was present if the consumer found what was wanted at the price that could be paid,

if at least some of the features wanted in the ideal home were present, and if the new home contained more of the desired features than the previous home. According to these criteria, the home that satisfies one consumer may not satisfy another. All of these criteria could apply to an earth integrated home as easily as a conventional home. The rise in energy costs in 1981 may produce dissatisfaction for a home that only a short time ago was satisfactory. A consumer in this situation might view housing satisfaction in terms of lower energy bills. The solution for such a consumer could revolve around an earth integrated home with much lower energy consumption. The key here might be educating the consumer so that he could make an intelligent decision concerning his choice of housing alternatives.

Brink and Johnston also looked at the relationship between housing satisfaction and cost. It was determined that cost was an enabling condition rather than a determining factor. The money spent for desired features in a home resulted in satisfaction and these desired features could be built into any home.

Ferrell, Kelley, and Bertrand (1977) also conducted a study that related to housing satisfaction. The authors found that "socioeconomic variables and consumer preferences were directly associated with housing adequacy," and

therefore related to housing satisfaction. Consumer preferences and attitudes were used interchangeably. The socioeconomic variables analyzed in this study were race, town, tenure, education, occupation, and income. These variables were found to be closely related to adequate housing. Consumer preferences in the study were categorized by eleven items "constructed to measure consumption alternatives to housing" (Ferrell, Kelley, & Bertrand, 1977), and were divided into long-range and short-range consumption alternatives. Some of these consumption alternatives were clothing, appliances, foods, furniture, savings, and college education for children. Findings were that a direct relationship between these consumption alternatives and the socioeconomic variables did not exist although both were directly related to housing adequacy. Since consumption alternatives were also related to housing adequacy, it would be possible to determine the willingness of a person to make energy conservative housing choices over other non-home related alternatives by ranking consumer preferences of certain items.

Housing Norms

A study conducted by Dillman, Trambly, and Dillman (1979) evaluated the influence of housing norms and personal characteristics on stated housing preferences.

Results of the study supported "the owned, single-family dwelling as the preferred housing situation" of families. With over 80 percent of the respondents listing this type dwelling as their main choice, earth integrated housing would give another possible alternative to the conventional single family dwelling. The authors discussed certain cultural norms that were used to evaluate housing (Morris, Crull, & Winter, 1976). These norms were home ownership, detached dwellings, private outside space, and materials and process from which a dwelling is constructed, all of which can be met through earth integrated housing.

Housing Quality

Harris (1976) analyzed the effect of housing quality on housing satisfaction in a 1976 study. The author pointed out that the attributes one family considered quality may not contribute to quality as defined by another family. Therefore, the following specific housing attributes were used: floor plan, physical condition of housing, house comfort, house style, house image, landscaping, and number of baths. Results of the study indicated that housing satisfaction is affected by housing quality. Also determined was that "race, sex of head of household and marital status did not affect the relationship of housing quality to housing quality satisfaction" (Harris, 1976). The study indicated that an individual or family may be

dissatisfied with a present housing situation because of less than quality housing. Another housing alternative may be sought due to dissatisfaction and the quality of an earth integrated home could be the alternative selected. The same housing attributes given previously could be used to determine the satisfaction of housing quality in earth integrated homes as well as conventional homes.

Attitude Toward Sensory Phenomena

Little research has been conducted on attitudes toward earth integrated housing; however, consumer's negative attitude toward earth integrated housing could be related to psychological feelings. Due to a lack of knowledge and experience, people may expect an earth integrated home to have a damp, dark cellar atmosphere. A closer look at these two attributes, humidity and lighting, may improve a person's attitude.

Lighting

Paulus (1980) indicated that people react negatively toward a lack of windows. The reason given for this negative attitude was boredom due to lack of visual stimulation. Although, for conservation purposes, natural lighting has been eliminated from many above ground structures such as libraries, museums, theaters, and manufacturing plants, few complaints have been voiced by occupants of these type buildings.

In 1970, Ruys (1970) found that in a study concerning occupants of windowless offices, 47.5 percent felt that the lack of windows affected them physically. Reasons given for the dislike of windowless office conditions included no daylight, poor ventilation, no outside visibility, a feeling of isolation and claustrophobia, and a feeling of depression and tension. Thirty percent of the reasons given were physical and 70 percent of the reasons were psychological and sociological.

Lutz (1976) reported that studies have been conducted concerning the Abo Elementary School in Artesia, New Mexico. This school was built in 1962 and is an earth integrated structure. Results of two studies indicated that the structure did not produce physical or mental problems to its students, nor did it have psychological effects resulting in behavioral problems. Three physicians were impressed with the ventilation system on respiratory diseases and "the school nurses felt there was a noticeable differences in the general demeanor and behavior in the children" (Lutz, 1976). Lutz concluded that the use of this earth covered structure had no negative results, but instead had favorable effects on the mental and physical health of pupils attending the school.

As seen in these studies, positive results may be gained from earth integrated housing. Although a negative

psychological effect may first result from lack of windows and natural lighting, advantages may be the end result. If a psychological reaction is constant after knowledge of positive effects are gained, steps can be taken to provide some natural lighting. The elevational design earth integrated home is built with one wall exposed to sunlight. With proper designing, this light can be diffused throughout the home. The atrium design home also has natural lighting. Skylights are another source of lighting for an underground home. Therefore, for psychological purposes, natural lighting can be provided in an earth integrated structure if desired. Paulus (1976) suggested if windowless surroundings produced a low level of visual arousal, wall-size murals or various color schemes could project desired results.

Humidity

Humidity is the attribute in earth integrated housing that may turn thoughts to the damp, cellar illusion of such a dwelling. Humidity is a consideration of earth integrated structures and proper planning to alleviate such a problem is important. Sterling (1977) listed the problems related to humidity as excessive static electricity build up, drying out and cracking of wood furniture, people feeling uncomfortably hot during summer with

high relative humidity, dry skin problems during winter, and condensation in a home on wood finishes and wallpaper. Sterling (1977) stated that relative humidity and ambient air temperatures are unique problems to earth integrated housing, and this problem is aggravated by the curing process of cast-in-place concrete common to this type housing. The water vapor produced by this process can be controlled with a portable dehumidifier. A precast concrete structure can also lessen the problem.

As Sterling suggested, humidity can be properly controlled and no related problems exist. In understanding how to control lighting and humidity in an earth integrated dwelling, the consumers' attitude should be a positive one.

Summary

Earth integrated housing has been in existence in some form since prehistoric times. The primary reasons for this type shelter were protection from severe weather as well as from hostile neighbors.

Interest in earth integrated housing is developing again. This renewed interest is mostly accredited to the rise in home fuel bills and the energy conservation attributes of earth integrated housing. The lack of consumer knowledge concerning this type housing alternative has

affected consumers' attitudes negatively, and therefore decreased the probability of considering earth integrated housing as a viable housing choice.

The advantages of earth integrated housing are many. A few of these advantages include conservation of energy, protection against natural and man-originated disasters, more privacy, lower insurance rates, and less maintenance.

The disadvantages of earth integrated housing are few and most of them can easily be overcome. Moisture control and lighting are no problem with proper planning. The most difficult problem to control is consumers' negative attitudes toward earth integrated housing. Studies indicated that exposure to and knowledge of earth integrated housing might have a positive affect on these attitudes.

Certain factors have been found to affect consumers' housing expectations. These factors are housing aspirations, satisfaction, norms, and quality. All of these factors can be met through earth integrated housing as easily as through conventional housing.

The research reported in the following chapters has attempted to show that with increased knowledge of earth integrated housing comes a more positive attitude. The relationship between demographic data and consumers' attitudes will also be investigated.

CHAPTER III

RESEARCH PROCEDURE

Purpose

The purpose of this study was to investigate the relationship between consumer attitudes toward and knowledge of earth integrated housing. Since many consumers may know little about this housing alternative and may have biased attitudes, a program was planned to present consumers with factual, unbiased information concerning earth integrated housing. During the program, information was gathered that related to their knowledge of and attitude toward earth integrated housing.

Sample Population

The sample population for this study was identified by first contacting the headquarters of the Texas Agricultural Extension Service. Permission was procured from the Extension Service to offer the program to those counties in Texas with indepth home economics program areas in housing. Thirty-seven counties with housing program areas were identified and the county agents were contacted. Eight agents chose to use the program and contacted the people who comprised the audiences for the seminars on earth integrated housing. The sample population consisted

of participants who attended these seminars conducted by the County Extension Agents-Home Economics of the Texas Agricultural Extension Service.

Material Development

Materials developed for the earth integrated housing seminar are identified and described in Appendix A. The materials are categorized as introductory materials, program scheduling materials, and earth integrated housing program materials. Each piece of material is listed and the initiation and completion dates for material development is also shown. The materials include:

Introduction Materials

1. Letter sent to all agents with the Texas Agricultural Extension Service with housing indepth program areas that described the educational package on earth integrated housing.
2. Order form that was returned to researcher to request earth integrated housing program.
3. Agent copy of order form for easy reference.

Program Scheduling Materials

4. Letter that confirmed date agent would receive program package.
5. Copies of articles on earth integrated housing and list of places to write for more information that provided agents background material for discussion portion of program.
6. Program check out schedule that provided researcher organized means of scheduling programs with agents.

7. Check out calendar that provided researcher double check system on program package mail outs and returns.

Earth Integrated Housing
Program Materials

8. News release packet for agents' use in promoting program.
9. Lesson plan with needed information to present program for agents. This lesson plan included:
 - a. Purpose
 - b. Objectives
 - c. Earth integrated housing program content
 - d. Delivery procedure
 - e. Instructions for administering pretest and post test
 - f. Instructions for returning pretest and post test
10. Instruments to pretest participants' attitude toward and knowledge of earth integrated housing prior to educational program and to collect demographic data.
11. Slide/tape presentation on earth integrated housing.
12. Post test to determine participants' knowledge of and attitude toward earth integrated housing after educational program.
13. Key to knowledge part of post test that provided program participants with answers to questions for measuring knowledge gained.
14. Duplicated list of additional information sources.
15. Sign up sheet for participants who wanted results of the study.
16. Appreciation letter to agents who participated in study.

Scheduling the Program

Contacting the Agent

Each County Extension Agent in the thirty-seven counties identified by the Texas Agricultural Extension Service as having indepth program areas in housing was contacted by the researcher through an introduction letter (Appendix B). This letter described the ready-to-use program package on earth integrated housing available upon request. Use of the program was voluntary. Agents who chose to use the program returned the order form (Appendix C) that was included with the introduction letter, and retained the agent copy of the order form (Appendix D) for their files.

Confirming Program Dates

A letter was returned to the agents as requests were received and as dates were scheduled. The letter (Appendix E) confirmed the program date that the agent could use the program and the mailing date for the package. Included with this letter were two lists. One was a list of information sources that was being sent with the letter and the other was a list of information sources that the agent could write and request information prior to their program (Appendix F). Photo copies of these references were included so that the agent would have background information for a discussion during the program.

Check Out Forms

Two check out instruments were developed for scheduling the program with agents. The first was a calendar for April through August, which was the time period the program was available. Four calendars for this five month period were developed for each of the four slide sets. Two weeks were allocated for each program request, allowing for mailing time, program time, and return time. The second schedule was a chart organized into months and slide set numbers. The name, address, and telephone number of the agent requesting the program and the mailing date of the program package, the publicity packet mailing date, program date, and return date could be listed on this chart.

Earth Integrated Housing Program Package and Presentation

A complete program package on earth integrated housing was developed for the use of County Extension Agents. The purposes of the program were to inform consumers about earth integrated housing and to gain information about consumers' knowledge and attitudes toward earth integrated housing.

The complete package used by the agents contained the following information and materials:

1. Welcome to program

2. Pretest
3. Introduction to earth integrated housing
4. Slide set presentation
5. Discussion of earth integrated housing
6. Post test
7. Review of test answers
8. Handout
9. Closing statements
10. Request for results of study
11. Instructions for return of pretest and post test and program package

Press Release

A press release (Appendix G) was mailed to each agent four weeks prior to individual program dates. The release contained some interest attracting statements about earth integrated housing as well as blank spaces for inserting local information. The agents used this release in local newspapers and on local or county radio stations to publicize the program.

Lesson Plan

A lesson plan (Appendix H) was prepared and used for the complete educational program on earth integrated housing titled "Staying On Top By Going Underground." The teaching objectives were that program participants would be presented facts concerning earth integrated housing and would gain knowledge about earth integrated housing. The agents who taught these programs followed the lesson plan step by step.

Materials within the lesson plan were:

1. Welcome and explanation of program plans
2. Instructions for and administering pretest with numbers for coding tests
3. Introduction of earth integrated housing
4. Instructions for use of slide/tape set
5. Guide for discussion of earth integrated housing
6. Instructions for administering post test
7. Instructions for use of key to post test
8. Explanation of sign up sheet for participants to request results of study
9. Educational handout distribution instructions
10. Closing statements for program
11. Instructions for return of pretest and post test

Slide/Tape Presentation

A slide/tape set was developed by the researcher and used by the agents as part of the housing program. This presentation contained a 10 to 12 minute overview of earth integrated housing. See Appendix I for the outline and script of the slide presentation.

Result Sign Up Sheet

A sign up sheet requesting a summary of results of consumer attitudes toward earth integrated housing study was made available to participants by the agents. The list with names and addresses was kept by each agent, and at the conclusion of this study, a summary of results was mailed to each participating agent to share with program participants who requested the data. This summary was mailed with a letter of appreciation (Appendix M) to each agent.

Supplemental Information

To complete the program, each agent distributed a printed list of additional sources (Appendix L) that consumers could contact for further information on earth integrated housing.

Instrument Development

An instrument was developed to collect data for this study. It was administered as both a pretest and post test. The instrument gathered demographic, knowledge of, and attitudes toward earth integrated housing data.

Demographic Section

The first 20 questions on the "Consumer Attitudes Toward Earth Integrated Housing" instrument administered to participants prior to the program presentation dealt with demographic information. The instrument administered following the program presentation omitted this demographic section. Data collected included the following item numbers and information:

Item number:

1. Sex
2. Education
3. Employment type
4. Occupational status
5. Self-employed
6. Income
7. Family composition
8. Home ownership
9. Housing type

10. Lived in present home how long
11. Condition of house
12. Location of house
13. Size of house
14. Market value of house
15. Maintenance or repair time spent
16. Monthly housing costs
17. Major house changes
18. Satisfaction with present housing
19. Importance of privacy, light, peer approval, little maintenance, energy efficiency, and storm protection
20. Importance of status, economy, ecology, and aesthetics

Knowledge Section

Questions 21 through 34 on the pretest assessed consumers' knowledge of earth integrated housing. The same knowledge questions were asked on the post test but were numbered 1 through 14. Knowledge questions dealt with the following topics:

Item number--pretest:

Item number--
post test:

- | | |
|--|-----|
| 21. Energy efficiency | 1. |
| 22. Construction costs | 2. |
| 23. Insurance rates | 3. |
| 24. Lighting | 4. |
| 25. Privacy | 5. |
| 26. Maintenance | 6. |
| 27. Protection from disasters | 7. |
| 28. Moisture control methods | 8. |
| 29. Economical and ecological advantages | 9. |
| 30. Favorable soil characteristic | 10. |
| 31. Soil temperature | 11. |
| 32. Design names | 12. |
| 33. Earth integrated definitions | 13. |
| 34. Building concepts | 14. |

Attitude Section

Questions 35 through 37 on the pretest and questions 15 through 17 on the post test were identical. Attitude questions dealt with the following:

Item number--pretest:	Item number-- post test:
35. Preference of earth integrated or conventional housing or no preference	15.
36. Possibility of moving	16.
37. Attitude toward earth integrated housing if visited, lived in, or presently live in	17.

Interpretation of Scores

Knowledge Scores

There were 14 knowledge questions. Three of these questions contained more than one correct answer. A perfect knowledge score was 22.

Attitude Scores

Consumers' attitudes toward earth integrated housing were investigated by asking if they were to buy a home in the near future would they strongly or somewhat prefer earth integrated housing, strongly or somewhat prefer conventional housing, or they had no preference. Scores for analyzing data were assigned for the preference indicated with strongly prefer earth integrated given 5 points, somewhat prefer earth integrated given 4 points, no preference given 3 points, somewhat prefer conventional given 2 points, and strongly prefer conventional given 1 point.

If the participant had visited, lived in, or presently lived in an earth integrated house, they were asked to indicate their attitude toward it by circling a number from a 1 to 5 range. Extremely liked was given 1 point, liked was given 2 points, neutral was given 3 points, disliked was given 4 points, and extremely disliked was given 5 points.

Correlation

The knowledge scores were statistically compared to the degree of preference of earth integrated housing scores and the extremely liked to extremely disliked scores to determine if a relationship existed between consumers' knowledge of and attitude toward earth integrated housing.

Administering the Instruments

Prior to Presentation

A number was given to each program participant by the agent at the beginning of the housing program. This number was used on the pretest and post test rather than a name to ensure each participant's anonymity.

Administering Pretest

Prior to the program presentation, the "Consumer Attitudes Toward Earth Integrated Housing" instrument (Appendix J) was administered to participants. In addition to pretesting consumers' knowledge of and attitudes toward

earth integrated housing, demographic data were also collected. Pretests were gathered upon completion and held until after the end of the program.

Administering Post Test

The post test, consisting of the knowledge and attitude sections of the earth integrated housing instrument (Appendix K), was given to each participant following the program presentation. Participants again used their assigned number on the post test for the purpose of test matching. Reason for identical questions on the pre and post test was to compare knowledge level and attitude of consumers concerning earth integrated housing before and after facts were gained on this housing alternative. Post tests were collected upon completion. Agents then gave program participants correct answers to the knowledge questions on the post test as a learning activity. Following the program, each agent attached matching pre and post tests and returned them to the researcher.

Statistical Treatment of Data

Percentages and frequencies of both earth integrated housing knowledge and earth integrated housing attitude were statistically calculated. The following percentages and frequencies on earth integrated housing knowledge were calculated:

1. Percentages and frequencies on pretest
2. Percentage and frequencies on post test
3. Scores on pretest
4. Scores on post test
5. Gain Scores

The following percentage and frequencies on earth integrated housing attitudes were calculated:

1. Percentage and frequencies on pretest
2. Percentage and frequencies on post test
3. Scores on pretest
4. Scores on post test
5. Gain scores

Correlations were calculated on the following variables:

Number	Variable
1	Pretest knowledge of earth integrated housing
2	Post test knowledge of earth integrated housing
3	Pretest attitude toward earth integrated housing
4	Post test attitude toward earth integrated housing
5	Family composition
6	Overall housing satisfaction
7	Economy
8	Ecology
9	Status
10	Aesthetics

CHAPTER IV

RESULTS

Data for this study were collected by means of the instrument, "Consumer Attitudes Toward Earth Integrated Housing," that was administered by County Extension Agents at seven seminars on earth integrated housing. Ninety-one program participants completed the instruments. Demographic, knowledge of, and attitude toward earth integrated housing data were collected.

Demographic Data

Program participants were potential housing consumers who were interested in earth integrated housing. There were 51 males and 40 female respondents. Demographic data pertaining to educational level, employment status, income range, family composition, and present housing were treated by percentages and frequency counts.

Educational Level

The educational level data choices were: a) less than 12 years, b) high school graduate, c) associate degree, d) bachelor's degree, e) master's degree, and f) doctoral degree. Only 3.3 percent of the respondents had less than a high school education while 52.3 percent had either completed high school or held an associate degree.

Participants that held a bachelor's, master's, or doctoral degree comprised 44.4 percent of the sample.

Employment Status

Instrument items 3, 4, and 5 pertained to employment type, occupational status, and whether participant was self-employed. Twelve employment types were included as choices. These types were not marked by any respondent: a) transport equipment operator, b) farm worker, c) other laborer, and d) service worker. The distribution of respondents' employment type is shown in Table 1. Occupational status of participants included 83.7 percent employed full-time, 4.7 percent part-time, 3.5 percent retired, and 8.1 percent were unemployed. Self-employed participants comprised 28.2 percent of the sample.

Income Range

Respondents indicated total family income from eight income ranges. The majority of respondents fell in the \$10,000 to \$40,000 range (Table 2).

Family Composition

Adults living in respondents' households ranged in age from 22 to 77 years. No more than three adults were in any respondent's household. Eighty-six households were comprised of only two adults.

Forty-three percent of the participants reported no children presently living in the household. Four percent

Table 1
Percentage Distribution of Respondents
by Employment Type

Employment Type	Number	Percentage
Professional	32	36.4
Technical and Kindred	7	8.0
Manager	13	14.8
Sales Worker	2	2.1
Clerical and Kindred	5	5.7
Craftsman and Kindred	7	8.0
Other Operators	4	4.5
Homemaker	18	20.5
Total	88	100.0

Table 2
Percentage Distribution of Respondents
by Income Level

Income Level	Number	Percentage
Less than \$10,000	3	3.4
\$10,001 to \$20,000	16	18.0
\$20,001 to \$30,000	16	18.0
\$30,001 to \$40,000	25	28.1
\$40,001 to \$50,000	16	18.0
\$50,001 to \$60,000	3	3.3
\$60,001 to \$70,000	2	2.2
Over \$70,000	8	9.0
Total	89	100.0

had four children at home. Of all the children, 40 percent were preschool age, 57 percent were school age, and 3 percent were over school age ranging from ages 20 to 29.

Present Housing

Items 8 through 20 pertained to consumers' present housing situation. Homes were owned by 86.8 percent of respondents and rented or leased by 13.2 percent.

Housing type. Housing type was represented by five categories. These include: a) single family dwelling, b) mobile home, c) apartment, d) duplex, and e) condominium or townhouse. The percentage distribution of housing types is shown in Table 3.

Table 3
Percentage Distribution of Respondents
by Housing Type

Housing Type	Number	Percentage
Single family dwelling	82	90.1
Mobile home	5	5.5
Apartment	3	3.3
Duplex	1	1.1
Condominium or Townhouse	0	0.0
Total	91	100.0

Tenure. Respondents indicated housing tenure from five choices. There were 6.6 percent who had resided in their present dwelling for less than 6 months, 27.6 percent for 6 months to 3 years, 19.8 percent for 4 to 6 years, 15.4 percent for 7 to 10 years, and 30.8 percent for more than 10 years.

Condition. The condition of present housing choices ranged from excellent to poor. Respondents indicated 35.6 percent of present housing types were in excellent condition, 57.5 percent were in good condition, 6.9 percent were in fair condition and none were in poor condition.

Location. Location of present housing choices were: a) rural - open country, b) town - less than 10,000, c) city - 10,000 to 50,000, d) suburb - outlying part of city, and e) central city - over 50,000. Responses were: 32.1 percent, rural; 6.2 percent, town; 38.3 percent, city; 17.3 percent, suburb; and 6.2 percent, central city.

Market value. Response choices for market value of participants' housing ranged from less than \$20,000 to more than \$80,000. Responses were distributed as follows: a) less than \$20,000, 9 percent; b) 20,000 to \$39,999, 14.6 percent; c) \$40,000 to \$59,999, 22.5 percent; d) \$60,000 to \$79,999, 22.5 percent; and e) more than \$80,000, 31.5 percent.

Maintenance. Participants were requested to estimate the number of hours spent monthly on home maintenance and repairs. Responses ranged from 72.7 percent of respondents who estimated spending 0 to 10 hours monthly on repairs, 20.5 percent spent 11 to 20 hours, 5.7 percent spent 21 to 30 hours, 1.1 percent spent 31 to 40 hours, and none spent more than 40 hours.

Monthly costs. Average monthly housing costs were included by mortgage or rent payment, utilities, and maintenance repairs. Mortgage or rent costs of less than \$100.00 or more than \$701.00 were indicated by 7.2 of respondents. Participants indicated that 68.7 percent of costs were between \$100 and \$400 and 16.9 percent were between \$401 and \$700. Respondents by utility costs were: 34.5 percent, less than \$100; 58.6 percent, from \$100 to \$200; and 6.8 percent, from \$201 and upward. The maintenance and repair costs ranged from less than \$100 (90.7 percent) to over \$300 (9.3 percent).

Major changes. Respondents were asked to indicate changes made to present housing within the last three years for purposes of: a) energy conservation, b) recreation, c) external appearance, d) additional space, and e) remodeling (see Table 4). Thirty-five percent of respondents indicated that no major changes were made to

their homes. Total cost of changes ranged from less than \$1,000 to over \$17,000. The majority of changes cost participants \$1,000 to \$5,000.

Table 4
Percentage Distribution of Respondents
by Recent Changes Made to Home

Change	Number	Percentage
Energy conservation	38	41.8
Recreation	5	5.5
External appearance	14	15.4
Additional space	15	16.5
Remodeling	23	25.3
Total	95	104.5 ^a

^aSome respondents made more than one change to home.

Housing satisfaction. Consumers' overall housing satisfaction was investigated. Respondents were requested to check one of five degrees of satisfaction, ranging from extremely satisfied (1) to extremely dissatisfied (5). Respondents' overall housing satisfaction is reported in Table 5.

Table 5
Percentage Distribution of Respondents'
Present Housing Satisfaction

Degree of Satisfaction	Number	Percentage
Extremely dissatisfied	15	16.7
Somewhat dissatisfied	18	20.0
Satisfied	40	44.4
Somewhat satisfied	12	13.3
Extremely satisfied	5	5.6
Total	90	100.0

Respondents' priorities. Four sets of four phrases, each representing aesthetics, economy, ecology, and housing status priorities were presented to respondents. They were asked to rank the four phrases in each set according to their priorities. Ecology and economy were selected by the majority of respondents as most important 75 percent of the time and as moderately important 100 percent of the time. Table 6 shows percentage of respondents' choices within each set.

Respondents were asked to rank four choices related to financial priorities for: a) housing, b) savings,

TABLE 6
 Percentage of Respondents' Priorities Related to
 Ecology, Economy, Aesthetics, and Status

Importance Ratings	Set 1/ Percent Resp.	Set 2/ Percent Resp.	Set 3/ Percent Resp.	Set 4/ Percent Resp.
Most Important	Ecology (71.1)	Economy (41.6)	Economy (85.4)	Status (57.3)
Moderately Important	Economy (40.0)	Economy (37.1)	Ecology (50.6)	Economy (58.4)
Important	Economy (30.0)	Status (39.3)	Status (43.8)	Aesthetic (57.3)
Least Important	Status (53.3)	Aesthetic (57.3)	Aesthetic (64.0)	Status (5.6)

c) being out of debt, and d) education for children. The majority of the respondents ranked them in the following order: 1) housing, 2) being out of debt, 3) education for children, and 4) savings.

Importance of certain housing features. Respondents were requested to indicate whether six housing features were: a) very important, b) moderately important, c) important, d) slightly important, or e) not important (see Table 7). Energy efficiency and little maintenance were considered most important.

Table 7
Percentage Distribution of Respondents by
Importance of Housing Features

Features	Very Imp.	Mod. Imp.	Impor- tant	Slight Imp.	Not Imp.	Total
Privacy from Neighbors	43.3	28.9	15.6	10.0	2.2	100.0
Natural Light	45.5	15.9	27.2	11.4	0.0	100.0
Little Maintenance	74.2	16.9	7.8	1.1	0.0	100.0
Peer Approval	4.5	15.9	27.3	18.2	34.1	100.0
Energy Efficiency	84.4	7.8	6.7	1.1	0.0	100.0
Storm Protection	61.1	17.8	16.7	3.3	1.1	100.0

Knowledge Pretest and Post Test

Respondents' knowledge of earth integrated housing was tested both before and after the program presentation. They were tested on earth integrated housing information related to the following facts and concepts:

1. Energy efficiency
2. Construction costs
3. Insurance rates
4. Lighting
5. Housing privacy
6. Maintenance required
7. Moisture control methods
8. Economical and ecological advantages
9. Favorable soil characteristics
10. Soil temperature
11. Design names
12. Earth integrated definitions
13. Building concepts

The percentage of correct answers on each knowledge pretest and post test items is shown in Table 8. An increase of correct answers on all but two questions from the pretest to the post test is evident. The knowledge test was comprised of fourteen questions. Three of these questions contained more than one correct answer, therefore, a perfect knowledge score was twenty-two. Two respondents had 22 correct answers on the pretest and 11 respondents had 22 correct answers on the post test.

The mean score on the pretest was 14.9 and the mean score for the post test was 18.2, indicating a mean gain of 3.3 (Table 9). A t-test of the difference between

Table 8
 Respondents' Knowledge Scores by Items

Question Topic	Percentage Correct on Pretest	Percentage Correct on Post Test
Energy efficiency	63.7	91.2
Construction costs	53.8	90.1
Insurance rates	76.9	93.4
Lighting	89.0	97.8
Housing privacy	95.6	96.7
Maintenance required	68.1	93.4
Protected from earthquakes	8.8	67.0
Protected for tornadoes	98.9	96.3
Moisture control	89.0	87.9
Economy advantages	85.7	93.4
Favorable soil characteristics	51.6	53.8
Soil temperatures	45.1	60.4
<u>Identify design types</u>		
Type 1	67.0	85.7
Type 2	81.3	87.9
Type 3	70.3	80.2
Type 4	81.3	91.2

Table 8--Continued

Question Topic	Percentage Correct on Pretest	Percentage Correct on Post Test
<u>Definition of terms</u>		
Chambered	79.1	84.6
Atrium	75.8	89.0
Hillside design	34.1	54.9
Totally below grade design	41.8	62.6
Berming	89.0	92.3
Building concepts	39.6	69.2

means identified a significant gain in knowledge from the pretest to the post test.

Attitude Pretest and Post Test

Respondents' attitudes and/or preferences related to earth integrated housing were investigated (Table 10). Respondents indicated that if they were to buy a home in the near future, they would: a) strongly prefer earth integrated (59.3 percent), b) somewhat prefer earth integrated (26.4 percent), c) no preference (7.7 percent), d) somewhat prefer conventional (3.3 percent), and e) strongly prefer conventional (3.3 percent). Strongly

Table 9
T-Test for Respondents' Pretest and

Test	Post Test Scores				2-tail Prob.
	Mean	Standard Deviation	Mean Gain	T Value	
Pretest	14.9	3.5			
Post Test	18.2	3.1	3.3	9.02*	0.000**

*Critical t value = 3.40

**p \geq .001

df = 90

prefer and somewhat prefer earth integrated contained 80.0 percent of respondents' choices in the pretest and 85.7 percent in the post test for a gain of 5.7 percent.

Table 10
Percentage Distribution of Respondents' Pretest
and Post Test Attitudes Toward
Earth Integrated Housing

Attitude	Pretest		Post Test	
	Number	Percent	Number	Percent
Strongly prefer earth integrated	44	48.9	54	59.3
Somewhat prefer earth integrated	28	31.1	24	26.4
No preference	9	10.0	7	7.7
Somewhat prefer conventional	7	7.8	3	3.3
Strongly prefer conventional	2	2.2	3	3.3
Total	90	100.0	91	100.0

There was a percentage of 62.9 of the respondents who indicated that they plan to move in the next five years and 37.1 percent indicated that they did not plan to move.

Respondents were asked if they had visited, lived in, or presently lived in an earth integrated home. Response choices for these questions were: a) extremely liked, b) liked, c) neutral, d) disliked, or e) extremely disliked. Twenty-nine participants had visited an earth integrated home and a) 58.6 percent extremely liked, b) 34.5 percent liked, and c) 6.9 percent extremely liked them. Two respondents had previously lived in earth integrated homes. One respondent "extremely liked" it and the other reported they "liked it." Four respondents indicated presently living in an earth integrated home. Of these, two reported "extremely liked" and two "liked" their homes.

Relationship Between Variables

Attitude and knowledge data on the pretest and post test were analyzed by use of Pearson Correlation Coefficients. Results indicated that a significant relationship existed between respondents' knowledge gain of and attitude toward earth integrated housing ($p = .367$).

The relationship between preference or attitude for earth integrated housing and a) status, b) ecology, c) economy, d) aesthetics, e) pretest knowledge, and f) post test knowledge were investigated. Status, ecology, and economy were found not significant while aesthetics, pretest knowledge, and post test knowledge were significantly related to preference and attitudes (Table 11).

Table 11
Correlation Coefficients (r) for Respondents'
Attitude Toward Earth Integrated Housing
and Knowledge Variables

Variables	r	p
Economy	0.41	0.00
Ecology	0.31	0.00
Status	-0.29	0.00
Aesthetics	-0.07	0.25*
Pretest knowledge	-0.16	0.06*
Post test knowledge	-0.12	0.13*
Knowledge gain	-0.047	0.37*

*p 0.05.

Correlation coefficients of all knowledge variables explored in this study are shown in the following matrix (Table 12). As shown in the table, the variables were highly correlated. In other words, if respondents knew about one aspect of earth integrated housing, they tended to know about other aspects of earth integrated housing .

TABLE 12

MATRIX OF CORRELATION COEFFICIENTS OF KNOWLEDGE VARIABLES

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1. Energy Conservation		.26*	.02	.03	-.05*	.12*	-.01	.14*	.10*	.08*	.14*	.09*	.15*	.22*	.11*	.11*	.06*	-.05	.01	.13*	.03	.03*
2. Construction Costs			-.04	.03	.12*	.08*	.54*	.11*	.03	.31*	.16*	-.18*	.10*	.12*	.17*	.18*	.01	-.06*	.01	.07*	-.04	.07*
3. Insurance				.14*	.01	.02	.08*	.19*	.22*	-.07*	-.27*	-.08*	.06*	-.06*	.10*	.01	-.02	.07*	.05*	-.01	.06*	-.04
4. Lighting					.10*	.06*	.11*	.30*	.10*	.06*	-.06*	.04	.05*	.01	.08*	.01	.01	.03	.18*	.16*	-.01	-.08*
5. Privacy						-.03	.07*	.50*	.10*	.37*	.01	-.02	.08*	.03	.10*	.17*	.15*	.13*	.15*	.18*	.10*	.06*
6. Maintenance							.05*	.15*	.06*	.06*	.19*	.10*	.22*	.04	.18*	.10*	-.00	.22*	-.06*	-.09*	.14*	.02
7. Protected--earthquakes							.03	-.02	.02	.15*	.11*	.05*	-.05*	.20*	-.05*	-.13*	-.01	.10*	.13*	.11*	.23*	
8. Protected--tornadoes								.30*	.26*	.11*	.10*	.15*	.22*	.16*	.22*	.21*	.19*	.08*	.09*	.30*	.09*	
9. Moisture Control									.26*	.15*	.04	.05*	.10*	.16*	.01	.08*	.13*	.10*	.01	.10*	.07*	
10. Economical Adv.										.17*	.12*	.31*	.21*	.22*	.29*	.02	-.01	-.04	-.04	-.04	.14*	
11. Favorable Soil											.04	.30*	.10*	.19*	.10*	.15*	.12*	.05*	-.03	.15*	.15*	
12. Soil Temperature												.07*	.15*	.06*	.09*	.03	.10*	.00	.08*	.11*	.04	
13. Design 1														.50*	.67*	.50*	.27*	.20*	.06*	.12*	.35*	.18*
14. Design 2															.31*	.49*	.31*	.19*	-.07*	.06*	.37*	.04
15. Design 3																.55*	.32*	.31*	.01	.01	.39*	.33*
16. Design 4																	.38*	.26*	.05*	.17*	.46*	.21*
17. Definition 1																		.59*	.20*	-.00	.42*	.19*
18. Definition 2																			.24*	.11*	.54*	.30*
19. Definition 3																				.75*	.10*	.13*
20. Definition 4																					.08*	.14*
21. Definition 5																						.14*
22. Concepts																						

p < .05.

CHAPTER V

SUMMARY AND DISCUSSION

The purpose of this study was to investigate the relationship between consumer attitudes toward and knowledge of earth integrated housing. A program was planned to present consumers with factual, unbiased information concerning earth integrated housing, since many consumers know little about this housing alternative. During the program, information was collected that related to their knowledge of and attitude toward earth integrated housing. The sample population consisted of interested housing consumers who attended seminars on earth integrated housing conducted by County Extension Agents with the Texas Agricultural Extension Service.

Summary

This study focused on consumers' attitudes toward earth integrated housing. Data were collected and analyzed on demographics, knowledge of, and attitude toward integrated housing. The instrument developed to collect this data was titled Consumer Attitudes Toward Earth Integrated Housing. It was administered prior to and after the program on earth integrated housing as a pretest and post test.

Each County Extension Agent who presented this program was provided a program package complete with press release, lesson plan, slide/tape presentation, handouts, background information for discussion, and instructions for use of all materials. Agents administered the pretest and post test to program participants, attached matching pre and post tests, and returned them to the researcher for data analysis.

The instrument had three sections. The first section of the instrument was designed to collect demographic data. The demographics were: a) sex, b) educational level, c) employment status, d) income, e) family composition, f) present housing, g) maintenance required, h) monthly housing costs, i) major housing changes, j) overall housing satisfaction, and k) importance of certain housing characteristics.

The second section of the instrument was designed to test respondents' knowledge of earth integrated housing. This section contained 14 questions with 22 possible answers. Each correct answer received one point.

The final section of the instrument was designed to investigate respondents' attitude toward earth integrated housing. Attitude toward housing preference was indicated by checking strongly or somewhat prefer earth integrated, strongly or somewhat prefer conventional, or no preference.

The complete instrument was used for the pretest and the sections on knowledge and attitude constituted the post test. Demographic data were reported in frequency and percentage. Data from pre and post knowledge and attitude tests were analyzed by using Pearson correlation coefficients.

Findings indicated that respondents' knowledge scores increased significantly from the pretest to the post test. Respondents also indicated a gain in preference for earth integrated housing from the pretest to the post test. Pearson's correlation coefficient analysis confirmed that gain in respondents' knowledge of earth integrated housing related significantly to gain in respondents' attitude toward earth integrated housing. Respondents' interest in aesthetics was also significantly related at the .05 level to respondents' attitudes toward earth integrated housing while the expected economical, ecological, and housing status items were found not significantly related.

Discussion

Demographic Data

Program participants for this study consisted of 51 males and 40 females. This number of males in attendance is unusual for a housing program offered by County Extension Agents-Home Economics. Audiences are usually

primarily females and are often homemakers. This increase in male participants may indicate that males are taking more interest in housing and, in particular, this type of housing. Participants' level of education was also high with 44.4 percent holding a bachelor's, master's, or doctoral degree. Forty-three percent of the participants reported no children living in the household which is similar to the audience described in an earth integrated housing study by Solomonson and Associates (1979). Their sample was identified as primarily between 25 and 35, married, professional, without children, and interested in earth integrated housing.

Winter and Morris (1977) indicated that the American dream of owning the single-family dwelling is still present. Their findings are compatible with the current study in which 90.1 percent of the respondents reported owning a single-family dwelling.

Major changes made to the home within the last three years in this study showed a percentage of 41.8 made for energy conservation. This finding supports the theory that home energy conservation is important to consumers. Boyer (1980) found that the main incentive for building earth integrated housing within the past five years has been energy savings. Housing consumers in this study

that indicated energy efficiency as very important comprised 84.4 percent of the sample. When consumers were given housing descriptors to rank in order of importance to them, economy and ecology were highest on the scale at least 75 percent of the time. However, when housing preference was correlated with economy, ecology, aesthetics, and housing status, only aesthetics was found to have a significant relationship. This relationship may indicate that although consumers contend that energy efficiency is of most importance, aesthetics may still be the determining factor when selecting housing.

Relationship of Knowledge and Attitude

The results of this study indicated that consumers gain knowledge about earth integrated housing when exposed to unbiased facts concerning this housing alternative. Knowledge gain was significant from pretest to post test. Findings also indicated an increase in respondents' positive attitudes toward earth integrated housing from the pre to post test. The relationship between knowledge and attitude on the post test was significantly higher than the relationship between knowledge and attitude on the pretest. Pretest correlation was significant at $p = .062$ and post correlation was significant at $p = .127$. This finding parallels Morgan's (1979) belief that increased

exposure to earth integrated related structures increases public acceptance. Findings also correspond to studies conducted by Bell (1978) and Solomonson (1979) that indicated a positive response to earth integrated housing after being exposed to one.

Limitations of the Study

1. The sample for this study was comprised of volunteers rather than of a more representative random sample.
2. It is assumed that participants in the seminars already had some level of interest in earth integrated housing, therefore, the generalizability of the findings is limited.

Recommendations

Educational Recommendations

1. When consumers gain additional information about earth integrated housing they may feel more positive about it, therefore, efforts to disseminate more information about earth integrated housing could have positive effects on our energy conservation concerns.
2. Consumer level information about earth integrated housing is limited, therefore, additional resource materials need to be developed and made easily available.

3. Expertise in the planning and construction areas of earth integrated housing is limited, therefore additional information and training for contractors and architects are needed.

Research Recommendations

1. Further research of consumers' knowledge and attitudes concerning earth integrated housing in specific geographic areas of Texas is needed since soil type, weather conditions, and other factors affecting housing changes in different Texas areas.
2. A survey conducted with consumers in Texas who live in earth integrated housing is needed to gain more specific data on energy efficiency and other advantages.
3. Consumers' attitudes toward specific design types of earth integrated housing such as atrium, hillside, penetrational, and chambered should be investigated.
4. Specific design types of earth integrated housing and the energy efficiency of each should be investigated to determine the most energy conservative designs.

APPENDIX A
MATERIALS DEVELOPED

MATERIALS DEVELOPED FOR EARTH INTEGRATED
HOUSING EDUCATIONAL PROGRAM

Material	Purpose	Person Responsible	Initiation Date	Completion Date
<u>Introduction Materials</u>				
Letter to send all agents with TAEX with housing in-depth program area	To describe the educational program package to CEA's and encourage them to order program	Mary Greer	2/1/81	3/10/81
Order form to be returned for housing program	To provide agents an easy, efficient way of ordering package	Mary Greer	2/1/81	3/10/81
Record of order form for agents to keep	To provide agents a record of dates chosen for use of educational package	Mary Greer	2/1/81	3/10/81
<u>Scheduling of Program Package</u>				
Confirmation of date to receive program package	To provide a means of confirming dates with agents--mailing and return dates included	Mary Greer	4/1/81	7/1/81
Sources of information--sent with confirmation letter	To provide the agent with background material for discussion part of program	Mary Greer	4/1/81	4/15/81

MATERIALS DEVELOPED--Continued

<u>Material</u>	<u>Purpose</u>	<u>Person Responsible</u>	<u>Initiation Date</u>	<u>Completion Date</u>
Program check out schedule	To provide organized means of scheduling programs with agents	Mary Greer	4/1/81	7/1/81
Check out calendar	To provide double check on program package mail outs and returns	Mary Greer	4/1/81	7/1/81
<u>Earth Integrated Housing Program Materials</u>				
News release packet -newspaper -radio	To provide advance publicity for agents' use--sent 4 weeks prior to meeting date	Mary Greer	3/1/81	4/1/81
Written lesson plan -purpose -objectives -earth integrated housing program content -delivery procedure	To provide agents with needed information and for ease of program presentation	Mary Greer	3/11/81	4/15/81
Instructions for administering pretest	To provide agents with knowledge for administering pretest	Mary Greer	3/11/81	4/1/81
Pretest	To determine participants' attitudes and knowledge toward earth integrated housing prior to educational meeting	Mary Greer to prepare and agents to administer	3/11/81	4/1/81

MATERIALS DEVELOPED--Continued

Material	Purpose	Person Responsible	Initiation Date	Completion Date
Slide/tape presentation	To provide participants facts concerning earth integrated housing	Mary Greer with assistance of Frank Moreland & Dr. Impson	12/15/80	3/15/81
Instructions for administering post test questionnaire	To provide agent directions for properly administering questionnaire	Mary Greer prepare and agent to use	3/11/81	4/1/81
Pretest and post test questionnaires	To gather data concerning consumer attitudes toward earth integrated housing	Mary Greer prepare; Agents administer	3/11/81 4/15/81	4/1/81 8/15/81
Informational handout	To provide support material for participants to gain further information	Mary Greer	3/11/81	4/1/81
Instructions for returning questionnaires	To provide agents directions for properly returning questionnaires in an organized manner	Mary Greer	3/11/81	4/15/81
Key to test questions	To provide program participants answers to questions so that they can measure knowledge gained	Mary Greer	3/11/81	4/15/81

MATERIALS DEVELOPED--Continued

Material	Purpose	Person Responsible	Initiation Date	Completion Date
Sign up sheet to request report of results	To provide program participants results of study if they are interested	Mary Greer	3/11/81	4/15/81
Appreciation letter to agents	To thank agents for assisting with study	Mary Greer	3/11/81	4/15/81

APPENDIX B

INTRODUCTION LETTER TO AGENTS

Box 133
Graham, TX 76046
March 27, 1981

Dear

Would you like to receive a ready-to-use packaged program on earth integrated housing? A program that is complete, will take minimal preparation, and be of interest to many residents of your county? Such a program will be available from April 15 through August 15, 1981 .

The program includes advance publicity, a written lesson plan, slide-tape set, visual aids, and educational handout. All you will have to do is order the package, review the materials, contact the people, arrange for the facilities, and use the self-contained package. The program title is "Staying On Top By Going Underground."

Since energy costs are rising so rapidly and people are realizing the necessity of conserving natural resources, the Texas Agricultural Extension Service has placed special emphasis on teaching energy conservation in all phases of programming. Because of this emphasis, this program package will be most useful in teaching people about earth integrated housing and the fact that it can save 50 to 75 percent on home energy consumption.

With your assistance in presenting this educational program, we will gather information concerning how much people know about earth integrated housing and how this knowledge affects their attitude toward it. This information will be gained by using a pretest before the actual program begins and a post-test after the program. These are incorporated into the total lesson package. We will also be teaching consumers about a housing alternative that conserves energy and therefore saves money.

If you are interested in receiving this ready-to-use program, please fill out the enclosed order form and return no later than May 1. Don't wait because this package will only be available April 15 through August 15, 1981. I will confirm dates as requests are made.

Sincerely yours,

APPENDIX C
ORDER FORM FOR EARTH INTEGRATED
HOUSING PROGRAM

ORDER FORM FOR EARTH INTEGRATED HOUSING PROGRAM
"Staying On Top By Going Underground"

RETURN TO:

Mrs. Mary Greer
County Extension Agent
Box 133
Graham, TX 76046

Please indicate your first, second, and third choices of dates to use the program package anytime between April 15 and August 15, 1981. Due to the limited number of program packages and the anticipated demand, check out period is for one week. A schedule will be devised on a first come basis. Confirmation of date will be returned as requests are received.

DATES

FIRST CHOICE _____

SECOND CHOICE _____

THIRD CHOICE _____

Anticipated audience number _____

Name _____

Address _____

County _____

Telephone number _____ /
area code

APPENDIX D
AGENT COPY OF ORDER FORM

AGENT COPY OF ORDER FORM

EARTH INTEGRATED HOUSING PROGRAM

I requested the use of "Staying On Top By Going Underground" for the following dates:

FIRST CHOICE _____

SECOND CHOICE _____

THIRD CHOICE _____

FROM:

Mrs. Mary Greer
County Extension Agent
Young County
Box 133
Graham, TX 76046
(817) 549-0737

APPENDIX E
CONFIRMATION OF ORDER FORM

CONFIRMATION OF ORDER
EARTH INTEGRATED HOUSING PROGRAM
"Staying On Top By Going Underground"

Thank you for requesting the use of this program on _____ . It will be mailed to you on _____ and must be returned by _____. You will receive a publicity packet, which will include a news release and radio announcement, four weeks prior to your scheduled program date. The packet can be localized by adding the time, date, place, etc. of your program, and will give some information about earth integrated housing as well as an invitation to attend the program.

Attached is a list of information sources that will help in your program preparation. The first part lists those sources that have been copied and are enclosed. The second part lists sources where you may obtain copies by writing. These may either be used for handouts or for program preparation.

Sincerely yours,

Mary Greer
County Extension Agent
Young County

APPENDIX F
REFERENCE LIST ENCLOSED
WITH CONFIRMATION OF ORDER

INFORMATION ENCLOSED

1. Dombrowski, Madge. "Underground home wins over skeptic," news article.
2. Hupert, David. "Underground housing is coming on strong," Better Homes and Gardens, September, 1979.
3. Tollin, Gale. "Housing builders are going underground," The Dallas Morning News, February 10, 1980.
4. "Underground house best of both worlds," The Abilene Reporter-News, Abilene, July 20, 1980.
5. . "Going Underground," Consumer's Research Magazine, January, 1980.

INFORMATION TO ORDER

1. Haden, Gary. "Going underground," Wichita Eagle, July 16, 1978. Wichita Falls, Texas, Newspaper article.
2. Sterling, Ray. Earth Sheltered Housing: Code, Zoning, and Financing Issues, Government Printing Office Book Store, Majestic Building, 720 North Main, Pueblo, Colorado, 81009, Stock #323-000-00632-4, \$5.00.
3. Swayze, Jay. "Underground Gardens and Homes," pamphlet. Order from Jay Swayze Geobuild Systems, Box 1556, Hereford, Texas 79045.
4. Woods, Don. "Building home is dirty business," Big Spring Herald, March 16, 1980. Big Spring, Texas newspaper.

APPENDIX G

NEWSPAPER, RADIO RELEASE

STAYING ON TOP BY GOING UNDERGROUND

Earth Integrated Housing Program

NEWSPAPER, RADIO RELEASE

From: COUNTY EXTENSION AGENT

Are you tired of paying high home energy bills? Come and learn how to stay on top of energy costs by building your house underground. The _____ County Extension Office of the Texas Agricultural Extension Service is sponsoring an educational program on earth integrated housing called "Staying On Top By Going Underground" on _____, _____ at _____. It will be held at _____, according to _____, _____ County Extension Agent.

(county)
(day)
(month, date) (time)
(location) (name)

Earth integrated housing has many names. You may be more familiar with the terms of underground or earth sheltered homes. But whatever you may call it, this type shelter has been with us in some form since prehistoric times. Interest was revived in the late 1960's and 70's and now most counties in Texas have at least one underground house.

The most common reason given for building an earth integrated home is energy conservation, since home energy

bills are cut 50 to 75 percent. Sound interesting? Then come and learn about energy conservation and the many other advantages of going underground.

APPENDIX H
PROGRAM LESSON PLAN

LESSON PLAN

ENCLOSED IS YOUR PROGRAM PACKAGE ON EARTH INTEGRATED HOUSING. INSTRUCTIONS ARE INCLUDED IN YOUR LESSON PLAN. PLEASE RETURN NO LATER THAN _____ SO THAT THE NEXT PERSON WHO HAS THE PACKAGE RESERVED WILL NOT BE DISAPPOINTED.

NOTE TO AGENT

PLEASE REVIEW THE COMPLETE PACKAGE SINCE INSTRUCTIONS ARE GIVEN THROUGHOUT THE LESSON PLAN.

This program package provides all the information you should need for an interesting ninety minute program on earth integrated housing.

Please pay careful attention to the instructions on coding and administering the pretest and post-test. This must be done accurately or will not be usable for this research study.

Thank you for participating in this study. When all the programs have been completed, I will summarize information from all the questionnaires and send you the results. This will help you be a more informed educator concerning housing alternatives as well as help the public become better housing consumers.

Purposes of This Program:	To inform people about earth integrated housing. To gain information about consumers' knowledge and attitudes toward earth integrated housing.
Teaching Objectives:	Program participants will be presented facts concerning earth integrated housing. Participants gain knowledge about earth integrated housing.

C O N T E N T S O F T H I S
P A C K A G E

Content	Page Number
I. Welcome	2
II. Pretest	2
III. Introduction.	4
IV. Slide set presentation with tape. . . .	5
V. Discussion.	5
VI. Post test	6
VII. Review of test answers.	6
VIII. Request for results of study.	7
IX. Handout	7
X. Closing statements.	8
XI. Return of questionnaires and program package	8

EARTH INTEGRATED HOUSING PROGRAM PACKAGE

LESSON PLAN

"Staying On Top By Going Underground"

Materials in earth integrated housing lesson plan:

1. Welcome and explanation of program plans
2. Instructions for and administering pretest with numbers for coding tests
3. Introduction of earth integrated housing
4. Instructions for use of slide/tape set (outline of slide presentation attached)
5. Guide for discussion of earth integrated housing
6. Instructions for administering post-test questionnaire (copy of questionnaire attached)
7. Key to knowledge part of questionnaire and instructions for review of answers (key attached)
8. Explanation of sign up sheet for participants to request results of study.
9. Educational handout distribution instructions
10. Closing statements for program
11. Instructions for return of questionnaires and program package with folder for questionnaires

Additional supplies and equipment needed:

1. Slide projector equipped for cassette tape
2. Screen
3. Pencils
4. Facilities that provide participants' ease of writing for pretest and post-test

Program schedule:

- Welcome
- Explanation of pretest
- Assign participants a number
- Pretest
- Introduction of earth integrated housing
- Presentation of slide/tape set
- Discussion of earth integrated housing
- Explanation of questionnaire
- Questionnaire
- Review of answers to knowledge part of questionnaire
- Sign up participants wishing to receive results of study
- Distribution of additional sources of information handout

Sequence of Events:

<u>EVENT</u>	<u>MATERIALS NEEDED OTHER THAN LESSON PLAN</u>
1. Welcome	1. None
2. Pretest	2. Envelope with numbers and pretest copies
3. Introduction	3. None
4. Slide set presentation	4. Screen slide projector, and Wallensak
5. Discussion	5. Reference materials sent with order confirmation
6. Post-test	6. Post-test copies
7. Review of test	7. Key to test answers
8. Request for results	8. Sign-up sheet for program study results
9. Handout	9. Copies of resource list handout
10. Closing statements	10. None
11. Return of questionnaires	11. Paper clips and folder

W E L C O M EINSTRUCTIONS FOR AGENT

If a committee, such as the family living committee, is sponsoring this program, it would be appropriate for the committee chairman or member to welcome those present. Introduction of committee members and county extension agent could be made. Thank them for having an interest in conserving our natural resources and for taking time to come to the meeting. Describe briefly the agenda for the program. Explain that this program is part of a study concerning earth integrated housing and that a questionnaire and test will provide necessary information for the study, and for that reason a pretest will be given before earth integrated housing is discussed.

P R E T E S TINSTRUCTIONS FOR AGENT

In conducting this research, it is imperative that program participants remain anonymous. Their names should in no way appear on the pretest or post-test. Participant anonymity should not be violated by anyone including county agents, committee members, or researcher. To ensure this, participants will receive a number known only to themselves.

TO ASSIGN NUMBERS, FOLLOW THESE STEPS:

1. Take the envelope labeled "participant numbers" and pass it among all participants, asking them to draw a number from it. There are 100 numbers in the envelope. If you have more than 100 present, please put in additional needed numbers before starting so that everyone has a number that is different from everyone else's.
2. Ask participants to write this number in the upper right hand corner of their pretest and post-test as soon as they receive them. If corresponding numbers are not on each set of tests, the study will not be valid.

WHAT TO SAY

Before we give each of you a pretest that will determine how much you already know about earth integrated housing, everyone must receive a number. This number will assure you that your answers will remain absolutely anonymous. As I pass this envelope around the room, I want each of you to draw a number and keep it. (Begin the envelope around.) Please write your number down so you won't forget it.

I am also going to pass around a pretest. Will everyone please keep one and pass the rest to the next person? (Begin pretests around. If you have a large group, ask for assistance.)

Now that each of you has a number and a pretest, I want you to write your number in the upper right hand corner of the pretest. Keep your number--don't throw it away. You will need it again before the program is over.

When your number is on the test, please answer all of the questions the best that you can. Follow the instructions that are given and answer all the questions unless otherwise directed. (Give time for pretests to be completed.)

If everyone is through, will you pass the tests, face down, to the end of the row. (Collect questionnaires. Ask for assistance if you need it.) You will probably hear the correct answers during the program and we will review the answers later.

Thank you! Now let's get to the heart of today's program--some facts about earth integrated housing.

I N T R O D U C T I O N

WHAT TO SAY

You know, when earth integrated or earth sheltered or underground homes are mentioned, many times the first impulse thoughts are "dark, damp, musty, or cavelike." If you have been one of those who has had this reaction, I'm sure your ideas will change considerably before this program is over.

Did you know that the prehistoric caves of early man were not the only earth integrated shelters? One example is the village of Matmata in southern Tunisia where several thousand people live in caves that they tunneled themselves. Individual units are joined by means of courtyards which also provide community spaces for activities. These homes are covered by at least 30 feet of earth. The reason for these earth integrated dwellings is to escape the extreme heat and severe windstorms and for protection against hostile neighbors.

In northern and western China, some inhabitants farm the land and dig caves for their homes beneath their fields. Smoke shafts may go from the underground dwellings to their fields above and a passerby may only be able to see a smoking field.

There are not only several examples of earth sheltered housing, but also of urban underground developments. For example, in Japan, there are over twenty underground shopping towns. These have been developed by merchants and railway companies. One of these shopping areas contains 225 shops and is visited by more than 800,000 shoppers daily.

It seems that in the early 1960's, a concern with civil defense spread through the United States. This revived some interest in underground homes since they provided protection from nuclear attack. Mr. Jay Swayze was a pioneer of earth integrated homes in Texas. He built an underground home for his family in Hereford, Texas. His home contains 5500 square feet of living space, with four bedrooms, three baths, kitchen, den, formal living room, dining room and a patio, all of which are 13 feet below ground level. Above ground, there is a two car garage, kitchenette, sun room, bath, storate room, and a porch. As you can tell, this is quite an extravagant house. Since that time, many individuals have followed Mr. Swayze's example and built underground. Most counties in Texas today can claim one or several earth integrated homes. But the reason for building

underground has changed somewhat. While civil defense was the primary reason in the '60's, energy conservation seems to be the primary reason today.

Now that you have some background information about earth integrated housing, I want to show you a slide set that discusses the different types and designs of earth integrated housing, several advantages of them, a few problems and their solutions, and the importance of selecting a proper site. You will also see several examples of earth integrated housing that may pleasantly surprise you if you've never seen them before.

S L I D E P R E S E N T A T I O N

INSTRUCTIONS FOR AGENT

Show the slide/tape set. You do need a slide projector that also plays a cassette tape or your Wallensak, or even a plain tape player if you don't have either two of the previously mentioned.

D I S C U S S I O N

INSTRUCTIONS FOR AGENT

After the slide set has been shown, it might be possible that some questions have come to the minds of those in the audience. Begin the discussion with the following introduction then allow some time for discussion and sharing of ideas from your audience.

WHAT TO SAY

Were you surprised at the "appearance" of some of the examples of earth integrated homes? Many people are surprised at the amount of natural light and the fact that on the inside they really don't seem that much different from any other home.

One point that you might want to consider is that each type most likely lends itself better to certain locations such as rural or urban. For example, the true chambered underground or atrium design might look better in a rural area while the hillside or side wall penetrations would probably look at home with conventional type homes in town. Whatever design you may be most interested in, remember it should be placed appropriately on the site to take full advantage of passive energy. And what about landscaping? If you have a totally underground chamber home do you only

have soil on top? The answer is no--whatever covers the soil will affect the earth's temperature which will affect the temperature of the house. For example, a high heat absorbing surface such as black asphalt absorbs more heat than a lower heat absorbib surface such as ground cover. This means that the earth temperature changes more gradually when it is covered with some type ground cover.

What other questions have come to your minds as we've talked about earth integrated housing? (Give a little time for discussion of earth integrated housing.)

P O S T - T E S T

INSTRUCTIONS FOR AGENT

Now that you have presented the information on earth integrated housing, it is time for the post-test. This is being used to measure how much knowledge has been gained through the program and to measure the effects of this knowledge on participants' attitudes toward earth integrated housing. Distribute the post-test to the participants, requesting assistance if your audience is large and you need help. Remind your audience to put their number in the upper right hand corner of their test again. This is absolutely necessary since the answers for the two tests are being compared.

When all participants have completed the test, have them returned to you.

WHAT TO SAY

Since we have completed our discussion on earth integrated housing, it is time for the post-test. Some of the questions will be the same as the pretest that you took at the beginning of the program but the post-test will be shorter. (Distribute tests.)

As soon as you receive the post-test, put your number in the upper right hand corner again. Your pretest and post test must have the same numbers before they can be used in this study. When your number is on your test, go ahead and begin answering the questions the best that you can. Follow the directions that are given throughout the questionnaire. (Give time for participants to complete tests.) Would you all please pass your test to the end of the rows? (Take up tests.) Thank you.

T E S T A N S W E R SINSTRUCTIONS FOR AGENT

As a completion to the discussion of earth integrated housing and as a summary, the answers to the knowledge portion of the questionnaire will be reviewed. A copy of that portion of the test is attached with the correct answers marked. Please go over these answers with your audience. If you wish, you may want to make copies of it so that your program participants can take them home. If you do make copies, pass them out at this time.

WHAT TO SAY

As a completion to our discussion and also as a summary, I thought you would probably like to know the answers to the knowledge portion of the questionnaire that you have just completed. Let's go over them now--(Read questions and answers to each.) How do you think you scored?

R E S U L T S I G N - U P L I S TINSTRUCTIONS FOR AGENT

Some program participants or even yourself may be interested in receiving a copy of the results of this study. If they would, there is a sign up sheet provided for that purpose which is attached to the lesson plan. Please give those who are interested in receiving the results an opportunity to sign this sheet. You will keep this list. Since so many people across the state are participating in this program, I will not try to send results to everyone, but instead, will send a copy to each agent. Each agent may then duplicate the results and send it to those persons on their list.

WHAT TO SAY

If you will remember, at the beginning of today's program, I mentioned that this program is part of a study on earth integrated housing. Consumer attitudes toward earth integrated housing as a housing choice as it relates to consumer knowledge of earth integrated housing will be measured. Other relationships will also be investigated. If you would like to receive a copy of the results of this study when it is completed, please sign the sheet that I am about to pass around. In the fall, when I receive the

results, I will see that you get a copy. (Pass sign up sheet around that is attached.)

H A N D O U T

INSTRUCTIONS FOR AGENT

A handout has been prepared so that participants can learn more about earth integrated housing if they so desire. Please give this to your program participants at the close of your program. You may select to hand it out or have participants pick it up from some point in the room when the program is over, depending on your facilities and audience size.

WHAT TO SAY

I have a handout for you that contains additional sources of information about earth integrated housing. This list is by no means complete, but it does give some reliable books, some magazines, and some other sources. A few addresses and telephone numbers are given for your convenience. I think this will give you a good beginning if you plan to pursue further information on earth integrated housing. You may also want to check your local library.

C L O S I N G S T A T E M E N T S

INSTRUCTIONS FOR AGENT

If this program is being sponsored by a committee, this is another good place to use those committee members.

WHAT TO SAY

I want to thank each of you for coming to the program today. Whether you are interested in conserving natural resources or saving money, I think we can all agree that an earth integrated home can definitely do both. This housing alternative may or may not be the solution for you, but at least now you know the facts about earth integrated housing from which to either make a choice or formulate an attitude.

Good evening!

R E T U R N
OF QUESTIONNAIRES AND PROGRAM PACKAGE

INSTRUCTIONS FOR AGENT

After the conclusion of your program, take a few minutes to pair the pretests and post-tests. Be sure that each number in the upper right hand corner of the pretest has a mate on the post-test. Pair the two tests and paper clip them together. Place these into the brown folder that is labeled "Completed Questionnaires." It is behind your lesson plan.

Please return the folder containing the questionnaires, the lesson plan, extra copies of the questionnaire and handouts, and the slide/tape presentation set in the same box in which it was mailed to you. Mail by the return date given on your lesson plan cover page so that the next agent can receive it on time. Thank you again.

APPENDIX I
SLIDE OUTLINE AND SCRIPT

OUTLINE FOR SLIDE SET

- I. Introduction
 - A. Brief history of earth integrated housing
 - B. What is earth integrated housing
- II. Home designs--description and examples
 - A. Totally below grade level
 - B. Below grade level with open atrium
 - C. Hillside design
 - D. Side wall penetrational design
- III. Lighting
- IV. Advantages
 - A. Conserves dollars and natural resources
 - B. Protects against storms and vandalism
 - C. Provides
 - 1. Lower insurance rates
 - 2. Less noise
 - 3. Less maintenance
 - 4. More privacy
- V. Deterants
 - A. Moisture control
 - B. Building costs
 - C. Financial aid
 - D. Building costs
 - E. Competent builder

STAYING ON TOP BY GOING UNDERGROUND

Slide/Tape Presentation

Slide 1.....Staying On Top By Going Underground
Title slide

Slide 2.....When someone says "underground housing,"
what comes to your mind? A basement? A
cellar? A cave? Damp musty smelling air?
A shadowy, dreary atmosphere?

Slide 3.....Well, this may have been true a long time
ago--for indeed--the first underground
dwellings were caves and dugouts.

Slide 4.....Man has lived underground at many times
and places throughout history. Even before
the times of Christ, people in Turkey lived
in towns that were sometimes eight stories
below ground for protection from enemies as
well as harsh variations of surface
temperatures.

Slide 5.....But times have changed, and so has under-
ground housing. Today the idea of using
earth as a protective component of the
family dwelling has become a sophisticated

concept and an understanding of several terms are needed to discuss this type housing.

Slide 6.....Some of the terms most frequently used are earth integrated, underground, earth sheltered, subterranean, terratecture, and earth architecture. All these terms simply describe where the earth is used as a protective element for either the walls, the roof, or both, for a house.

Slide 7.....Houses can be integrated with the earth in a variety of ways. We will explore the basic concepts and different variations.

Slide 8.....Two basic terms frequently used when discussing earth integrated housing are above grade and below grade. Contrary to the usual idea of earth integrated housing, a home may be built above grade and still benefit from earth protection by having earth pushed up against the exterior walls, referred to as berming, and/or placed on the roof of the house. Below grade earth integrated homes, of course, are just that--built below ground or the natural earth surface.

Slide 9.....Below grade structures may be termed

"chambered" if they are totally buried underground. This type of construction results in the structure actually being buried or chambered underground. The holes you see in this aerial slide are the entrances to chambered earth integrated homes and the buildings are barns for the livestock.

Slide 10.....Earth integrated homes can be built in different

styles just as conventional houses. Here are some of the ways that homes can be built to benefit from the protection of the earth using the earth as a protective element by either berming, which again is pushing earth up to the walls, or covering.

Slide 11.....The totally below grade level design features

total below grade living. This sketch illustrates the chambered below grade home,

Slide 12.....while this sketch shows the bermed, above

grade concept of the totally below grade design. Skylights allow natural lighting into the home.

Slide 13.....Factors such as level of water table, geo-

graphic area, lay of the land and type of

soil should be considered when deciding upon the specific type of earth integrated home you are going to build.

Slide 14.....However, the totally below grade design, such as this, is usually thought of as providing the most energy efficiency. The main point to remember is that the amount of earth covering the house--and the way it is constructed--are more critical in its energy conservation potential than whether it is above or below grade.

Slide 15.....The atrium or courtyard is another type of earth integrated housing design. This illustration depicts the bermed atrium design. Again, this is built above grade then earth is pushed to the sides and on top.

Slide 16.....This illustration is the chambered atrium design built below grade or underground with an opening in the center to allow natural light in the interior of the home.

Slide 17.....Here is an example of a home using the open atrium area. It provides a feeling of openness and is surrounded by earth covered rooms which face into the central open area.

The atrium can be either an open or covered area for activities such as gardening and entertaining. Obviously, this approach to earth integrated construction should dispel any ideas that this type of housing would be dark and dreary.

Slide 18.....This drawing illustrates the chambered hillside or elevational design,

Slide 19.....while this depicts the bermed hillside design. This design is just as its name indicates--it is set into the side of a hill.

Slide 20.....In a design such as this, where the home is built into a slope or hillside, one wall is frequently exposed, thus allowing for maximum use of light and solar energy.

Slide 21.....By having the front of the hillside design home exposed, the more conventional use of windows and entrances is possible.

Slide 22.....This last design has bermed sides and an earth covered roof. It exposes approximately 40 percent of the area normally exposed in a conventional home. This design allows the home to have windows and natural lighting since the earth may only be bermed to the bottom of the windows. So you see,

a home can be earth integrated but still not look dramatically different from a conventional home.

Slide 23.....The bermed sides, also called side wall penetration design, provides for fresh air, access, view, and the potential for expansion. It is best suited where rock or a high water level prevents digging. This is also a good design for a typical conventional neighborhood within any size city.

Slide 24.....Since the first thought that may pop into an individual's mind when earth integrated homes are mentioned is dark and dreary, let's take a quick look at how earth integrated designs provide for lighting and ventilation through open atriums, exposed wall areas, or special lighting techniques such as a snorkel shaped light scoop to direct sunlight into the back of the house or a series of mirrors and prisms.

Slide 25.....This example shows that lighting is not a problem with earth integrated home. In fact, because of better planning, some are better lighted than conventional homes.

Slide 26.....There are many advantages to owning an earth integrated home. These advantages fit into categories that involve money, time, ecology, safety, and privacy.

Slide 27.....Saving on energy bills is the first advantage that comes to mind. In a study recently conducted in Oklahoma, reduced heating and cooling costs were listed by persons living in earth integrated homes as the primary reasons for their housing choices. Not only savings in dollars but also an ecological savings of our natural resources is of importance to many people.

Slide 28.....Available results indicate a 50 to 75 percent reduction in energy costs in an earth integrated home. Of course, the more earth coverage the home has, the greater the energy savings.

Slide 29.....Less maintenance is required for an earth integrated home. This results in a savings of both time and money. The life expectancy of an earth integrated home can range from 100 to 300 years depending upon the quality and type of construction with very little

maintenance necessary on the roof and other outside surfaces.

Slide 30.....Earth integrated homes are virtually safe from natural disasters such as tornadoes, electrical storms, and earth quakes.

Slide 31.....Many people also feel more protected from vandalism since less of the building is exposed. A good indication of the reduced risks is that insurance rates are reduced. Earth integrated housing rates are about one-fourth less than the rates for a similar above ground conventional home.

Slide 32.....Many residents value the personal privacy gained through earth integrated housing, as well as environmental noise reduction such as noise from airplanes, thunderstorms, and traffic.

Slide 33.....So, as you can see, the advantages are well worth considering. The happy earth integrated home owner can enjoy benefits of reduced heating and cooling bills, conservation of natural resources,

Slide 34.....protection from storms and vandalism,

Slide 35.....less maintenance in terms of time used and money spent, lower insurance rates,

increased personal privacy, and reduced environmental noise.

Slide 36.....Now that you have seen these advantages you probably wonder why everyone hasn't rushed out and built an earth integrated home. Let's look at some of the reasons. Some deterrents include a possible need for moisture control, building codes, financial aid, building costs, and finding competent builders.

Slide 37.....The most commonly mentioned problem is moisture control. Proper ventilation or a dehumidifier will normally control any extra humidity. Special sealants can be used in the building process, so that leaks rarely occur. Therefore, moisture should not be a problem if properly controlled.

Slide 38.....Many people question whether building codes will prevent the building of earth integrated homes in residential areas. The answer is no. You can build an underground house and at the same time comply with local building codes. But one who is planning to build any type home must be familiar with

building codes and zoning for their particular location and make plans for complying with these codes.

Slide 39.....Since earth integrated housing is a newly revived concept to the modern day housing industry, loans are not always the easiest to obtain. If you approach the problem with thoroughly developed plans, financing should not be too difficult. You should have your building plans, costs for completion, expected completion date, and any extra details the lender might be interested in. These items are necessary for getting a loan on any type home, not just earth integrated.

Slide 40.....Initial building costs will be approximately 10 to 30 percent higher than for a conventional home. These higher costs related to the strength and durability of materials necessary in the walls and roof. These costs should be recouped through savings on energy consumption and outside maintenance within a relatively short time period.

Slide 41.....Building an earth integrated home does require special knowledge. Experts in this

area are not always readily available and must be sought out.

Slide 42.....They need experience and special skills in the designing and building concepts unique to building earth integrated structures.

Slide 43.....Now you have the facts and know that an earth integrated home can be as varied and unique as any conventional home,

Slide 44.....the choice is yours!

APPENDIX J

PRETEST

PRETEST

CONSUMER ATTITUDES TOWARD EARTH INTEGRATED HOUSING

The purpose of this questionnaire is to gain information about an individual's knowledge of and their attitude toward earth integrated housing. You can help us get this information by completing this questionnaire. Thank you for your assistance in this study.

Please answer the following questions about yourself by placing a check in the appropriate spaces.

1. SEX:
☐ male
☐ female
2. HIGHEST LEVEL OF EDUCATION ATTAINED:
☐ less than 12 years
☐ high school graduate
☐ associate degree
☐ bachelor's degree
☐ master's degree
☐ doctoral degree
3. WHICH BEST DESCRIBES YOUR PRESENT TYPE OF EMPLOYMENT?
☐ professional
☐ technical and kindred
☐ manager and administrator
☐ sales worker
☐ clerical and kindred
☐ craftsman and kindred
☐ transport equipment operator
☐ other operator
☐ farm worker
☐ other laborer
☐ service worker
☐ homemaker
4. WHAT IS YOUR OCCUPATIONAL STATUS?
☐ full-time
☐ part-time
☐ retired
☐ unemployed

In compliance with the Human Subjects Review Committee at Texas Woman's University the following statements are required: I UNDERSTAND THAT THE RETURN OF MY QUESTIONNAIRE CONSTITUTES MY INFORMED CONSENT TO ACT AS A SUBJECT IN THIS RESEARCH. No medical service or compensation is provided to subjects by the University as a result of injury from participation in research.

5. **ARE YOU SELF-EMPLOYED?**☐ yes☐ no6. **WHICH OF THE FOLLOWING CATEGORIES DESCRIBES YOUR TOTAL FAMILY INCOME BEFORE TAXES IN 1980?**☐ less than \$10,000 ☐ \$40,001 to \$50,000☐ \$10,001 to \$20,000 ☐ \$50,001 to \$60,000☐ \$20,001 to \$30,000 ☐ \$60,001 to \$70,000☐ \$30,001 to \$40,000 ☐ more than \$70,0007. **LIST EACH PERSON IN YOUR HOUSEHOLD BY GIVING THEIR AGE AND SEX.**

	Age in Years	Sex
Adults	1. <input type="text"/>	<input type="text"/>
	2. <input type="text"/>	<input type="text"/>
	3. <input type="text"/>	<input type="text"/>
Children	1. <input type="text"/>	<input type="text"/>
	2. <input type="text"/>	<input type="text"/>
	3. <input type="text"/>	<input type="text"/>
	4. <input type="text"/>	<input type="text"/>
	5. <input type="text"/>	<input type="text"/>
	6. <input type="text"/>	<input type="text"/>

Describe your present housing by checking the appropriate spaces.8. **DO YOU:**☐ rent/lease☐ own9. **IT IS A:**☐ single family dwelling☐ mobile home☐ apartment☐ duplex☐ condominium or townhouse10. **FOR HOW LONG?**☐ less than 6 months☐ 6 months to 3 years☐ 4 to 6 years☐ 7 to 10 years☐ more than 10 years11. **CONDITION OF HOUSE:**☐ excellent☐ good☐ fair☐ poor12. **LOCATION:**☐ rural (open country)☐ town (less than 10,000)☐ city (10,000 to 50,000)☐ suburb (outlying part
of city)☐ central city (over 50,000)

13. **SIZE:**

<input type="checkbox"/> less than 500 square feet	<input type="checkbox"/> 1501 to 2000 square feet
<input type="checkbox"/> 500 to 1000 square feet	<input type="checkbox"/> 2001 to 3000 square feet
<input type="checkbox"/> 1001 to 1500 square feet	<input type="checkbox"/> more than 3000 square feet

14. **CURRENT MARKET VALUE:**

<input type="checkbox"/> less than \$20,000	<input type="checkbox"/> \$60,000 to \$79,999
<input type="checkbox"/> \$20,000 to \$39,999	<input type="checkbox"/> more than \$80,000
<input type="checkbox"/> \$40,000 to \$59,999	

15. **MAINTENANCE OR REPAIR TIME SPENT PER MONTH:**

<input type="checkbox"/> 0 to 10 hours	<input type="checkbox"/> 31 to 40 hours
<input type="checkbox"/> 11 to 20 hours	<input type="checkbox"/> 41 to 50 hours
<input type="checkbox"/> 21 to 30 hours	<input type="checkbox"/> more than 50 hours

16. **AVERAGE MONTHLY COSTS:**

Mortgage payment	<input type="checkbox"/> less than \$100	<input type="checkbox"/> \$501-\$600
or Rent (Including	<input type="checkbox"/> \$100-\$200	<input type="checkbox"/> \$601-\$700
taxes, interest,	<input type="checkbox"/> \$201-\$300	<input type="checkbox"/> \$701-\$800
and insurance)	<input type="checkbox"/> \$301-\$400	<input type="checkbox"/> \$801-\$900
	<input type="checkbox"/> \$401-\$500	<input type="checkbox"/> more than \$900

Utilities	<input type="checkbox"/> less than \$100	<input type="checkbox"/> \$201-\$250
	<input type="checkbox"/> \$100-\$150	<input type="checkbox"/> \$251-\$300
	<input type="checkbox"/> \$151-\$200	<input type="checkbox"/> more than \$300

Maintenance and	<input type="checkbox"/> less than \$100	<input type="checkbox"/> \$201-\$250
Repairs	<input type="checkbox"/> \$100-\$150	<input type="checkbox"/> \$251-\$300
	<input type="checkbox"/> \$151-\$200	<input type="checkbox"/> more than \$300

17. **MAJOR CHANGES MADE TO YOUR PRESENT HOUSING WITHIN THE LAST THREE YEARS:**

Changes for: ☐ energy conservation ☐ recreation
☐ external appearance ☐ additional space ☐ remodeling

Approximate Total Cost:

<input type="checkbox"/> less than \$1000	<input type="checkbox"/> \$901-\$11000
<input type="checkbox"/> \$1000-\$3000	<input type="checkbox"/> \$11001-\$13000
<input type="checkbox"/> \$3001-\$5000	<input type="checkbox"/> \$13001-\$15000
<input type="checkbox"/> \$5001-\$7000	<input type="checkbox"/> \$15001-\$17000
<input type="checkbox"/> \$7001-\$9000	<input type="checkbox"/> over \$17000

18. **WHAT IS YOUR OVERALL SATISFACTION WITH YOUR PRESENT HOUSING?**

<input type="checkbox"/> extremely satisfied	<input type="checkbox"/> somewhat dissatisfied
<input type="checkbox"/> somewhat satisfied	<input type="checkbox"/> extremely dissatisfied
<input type="checkbox"/> satisfied	

19. RATE THE IMPORTANCE OF THE FOLLOWING TO YOU by circling the appropriate number.

	Very Imp.	Mod. Imp.	Impor- tant	Slightly Imp.	Not Imp.
1. Privacy from neighbors	1	2	3	4	5
2. Natural light	1	2	3	4	5
3. Little maintenance	1	2	3	4	5
4. Peer approval	1	2	3	4	5
5. Energy efficiency	1	2	3	4	5
6. Storm protection	1	2	3	4	5

20. PLEASE RANK THE FOLLOWING ITEMS WITHIN EACH GROUP from 1 to 4 IN ORDER OF THEIR IMPORTANCE TO YOU: 1 = most important;

4 = least important

___ A large home

___ An energy efficient home

___ A beautifully landscaped home

___ Low house payments

___ Color coordinated living area

___ Large, spacious rooms

___ Appliances with lowest energy consumption ratings

___ Conserving natural resources for future generations

___ Beautiful exterior of home

___ Well insulated home

___ Nice paintings

___ Ceiling fans

___ Good neighborhood

___ Storm windows

___ Fabric covered walls

___ Yark sprinkler system

___ Housing

___ Savings

___ Being out of debt

___ Education for children

What do you know about earth integrated housing? Test your knowledge by checking the best answer from the choices below.

21. AN EARTH INTEGRATED HOUSE IS HOW MUCH MORE ENERGY EFFICIENT THAN A CONVENTIONAL HOUSE?

___ 0 - 25%

___ 50 - 75%

___ 25 - 50%

___ 75 - 100%

22. COMPARED TO CONVENTIONAL HOUSING CONSTRUCTION COSTS, EARTH INTEGRATED HOUSING COSTS ARE:
☐ 10-30% less than conventional.
☐ the same as conventional.
☐ 10-30% more than conventional.
☐ 40-50% more than conventional.
23. COMPARED TO CONVENTIONAL HOUSING INSURANCE RATES, EARTH INTEGRATED RATES ARE:
☐ lower than conventional rates.
☐ the same as conventional rates.
☐ somewhat higher than conventional rates.
☐ extremely higher than conventional rates.
24. WHICH PHRASE BEST DESCRIBES THE LIGHTING IN AN EARTH INTEGRATED HOUSE?
☐ dark and difficult to light adequately.
☐ no problem with some natural light and special means.
☐ somewhat difficult to control.
☐ the biggest problem of earth integrated housing.
25. WHICH OF THE FOLLOWING STATEMENTS BEST DESCRIBES EARTH INTEGRATED HOUSING?
☐ less personal privacy and less noise pollution.
☐ less noise pollution and more personal privacy.
☐ less personal privacy and more noise pollution.
☐ more noise pollution and more personal privacy.
26. WHICH WORD BEST DESCRIBES THE AMOUNT OF OUTSIDE MAINTENANCE REQUIRED ON AN EARTH INTEGRATED HOUSE?
☐ much
☐ some
☐ little
☐ none
27. EARTH INTEGRATED HOMES ARE BEST PROTECTED FROM WHICH TWO OF THE FOLLOWING NATURAL DISASTERS?
☐ earthquakes
☐ floods
☐ hurricanes
☐ tornadoes
28. THE APPROPRIATE MEANS OF CONTROLLING MOISTURE IN EARTH INTEGRATED HOUSING IS THAT:
☐ concrete outer walls and roof
☐ drainage tunnels and water pumps
☐ proper construction and ventilation
☐ water pumps and ventilation

29. BOTH AN ECOLOGICAL AND ECONOMICAL ADVANTAGE OF EARTH INTEGRATED HOUSING IS THAT:

☐ fewer materials are used in construction.
☐ less energy is consumed.
☐ less landscaping is required.
☐ less water is consumed.

30. WHAT IS THE PRIMARY CHARACTERISTIC OF EARTH THAT MAKES IT AN ENERGY EFFICIENT ENVIRONMENT FOR HOUSING?

☐ an excellent insulator
☐ a poor insulator
☐ a poor thermal moderator
☐ an excellent thermal moderator

31. AT TWELVE FEET BELOW THE EARTH'S SURFACE, THE TEMPERATURE REMAINS FAIRLY CONSTANT AND WILL AVERAGE:

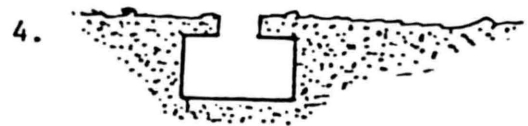
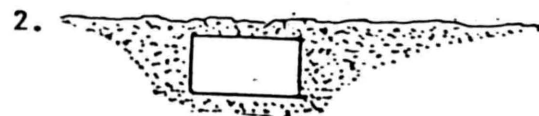
☐ 40 to 55°
☐ 50 to 65°
☐ 60 to 75°
☐ 70 to 85°

32. PUT THE DESIGN NUMBERS BY THE CORRECT DESIGN NAME.

Design names:

☐ atrium ☐ bermed sides and earth covered roof
☐ hillside ☐ totally below grade

Design sketches:



33. PLACE DEFINITION NUMBER IN SPACE BEFORE CORRECT TERM.

Terms:

☐ atrium ☐ totally below grade design
☐ berming ☐ hillside design
☐ chambered

Definitions:

1. Below grade structure
2. Design with open center surrounded by earth covered rooms
3. Home that is set into the side of a hill
4. Most energy efficient design
5. To push the earth against

34. TWO BASIC BUILDING CONCEPTS RELATED TO EARTH INTEGRATED HOUSING ARE:

- ☐ above grade and below grade
☐ atrium and bermed sides
☐ elevational and hillside
☐ hillside and atrium

How do you feel about earth integrated housing?

35. IF YOU WERE TO BUY A HOME IN THE NEAR FUTURE, WOULD YOU:

- ☐ strongly prefer earth integrated
☐ somewhat prefer earth integrated
☐ no preference
☐ somewhat prefer conventional
☐ strongly prefer conventional

36. DO YOU PLAN TO MOVE IN THE NEXT FIVE YEARS?

- ☐ yes
☐ no

37. PLEASE CIRCLE THE NUMBER BESIDE EACH QUESTION THAT BEST DESCRIBES YOUR ANSWER.

Ext. Liked	Liked	Neu- tral	Dis- liked	Ext. Disliked
---------------	-------	--------------	---------------	------------------

If you have visited an earth integrated house, rate your like or dislike for it.

1	2	3	4	5
---	---	---	---	---

If you have lived in an earth integrated house, but do not presently, rate your like or dislike for it.

1	2	3	4	5
---	---	---	---	---

If you presently live in an earth integrated house, rate your like or dislike for it.

1	2	3	4	5
---	---	---	---	---

THANKS AGAIN!

APPENDIX K

POST TEST

POST TEST

CONSUMER ATTITUDES TOWARD EARTH INTEGRATED HOUSING

The purpose of this questionnaire is to gain information about an individual's knowledge of and their attitude toward earth integrated housing. You can help us get this information by completing this questionnaire. Thank you for your assistance in this study.

Correct answers are indicated by an asterisk or parenthesis.

What do you know about earth integrated housing? Test your knowledge by checking the best answer from the choices below.

1. AN EARTH INTEGRATED HOUSE IS HOW MUCH MORE ENERGY EFFICIENT THAN A CONVENTIONAL HOUSE?
☐ 0 - 25%
☐ 25 - 50%
☒ 50 - 75%
☐ 75 - 100%
2. COMPARED TO CONVENTIONAL HOUSING CONSTRUCTION COSTS, EARTH INTEGRATED HOUSING COSTS ARE:
☐ 10-30% less than conventional.
☐ the same as conventional.
☒ 10-30% more than conventional.
☐ 40-50% more than conventional.
3. COMPARED TO CONVENTIONAL HOUSING INSURANCE RATES, EARTH INTEGRATED RATES ARE:
☒ lower than conventional rates.
☐ the same as conventional rates.
☐ somewhat higher than conventional rates.
☐ extremely higher than conventional rates.
4. WHICH PHRASE BEST DESCRIBES THE LIGHTING IN AN EARTH INTEGRATED HOUSE?
☐ dark and difficult to light adequately
☒ no problem with some natural light and special means
☐ somewhat difficult to control
☐ the biggest problem of earth integrated housing

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5. WHICH OF THE FOLLOWING STATEMENTS BEST DESCRIBES EARTH INTEGRATED HOUSING?
☐ less personal privacy and less noise pollution
☒ less noise pollution and more personal privacy
☐ less personal privacy and more noise pollution
☐ more noise pollution and more personal privacy
6. WHICH WORD BEST DESCRIBES THE AMOUNT OF OUTSIDE MAINTENANCE REQUIRED ON AN EARTH INTEGRATED HOUSE?
☐ much
☐ some
☒ little
☐ none
7. EARTH INTEGRATED HOMES ARE BEST PROTECTED FROM WHICH TWO OF THE FOLLOWING NATURAL DISASTERS?
☒ earthquakes
☐ floods
☐ hurricanes
☒ tornadoes
8. THE APPROPRIATE MEANS OF CONTROLLING MOISTURE IN EARTH INTEGRATED HOUSING ARE:
☐ concrete outer walls and roof
☐ drainage tunnels and water pumps
☒ proper construction and ventilation
☐ water pumps and ventilation
9. BOTH AN ECOLOGICAL AND ECONOMICAL ADVANTAGE OF EARTH INTEGRATED HOUSING IS THAT:
☐ fewer materials are used in construction.
☒ less energy is consumed.
☐ less landscaping is required.
☐ less water is consumed.
10. WHAT IS THE PRIMARY CHARACTERISTIC OF EARTH THAT MAKES IT AN ENERGY EFFICIENT ENVIRONMENT FOR HOUSING?
☐ an excellent insulator
☐ a poor insulator
☐ a poor thermal moderator
☒ an excellent thermal moderator
11. AT TWELVE FEET BELOW THE EARTH'S SURFACE, THE TEMPERATURE REMAINS FAIRLY CONSTANT AND WILL AVERAGE:
☐ 40 to 55°
☒ 50 to 65°
☐ 60 to 75°
☐ 70 to 85°

12. PUT THE DESIGN NUMBERS BY THE CORRECT DESIGN NAME.

Design names:

☐ atrium (4)☐ hillside (3)☐ bermed sides and earth covered roof (1)☐ totally below grade (2)

Design sketches:



13. PLACE DEFINITION NUMBER IN SPACE BEFORE CORRECT TERM.

Terms:

☐ atrium (2)☐ berming (5)☐ chambered (1)☐ totally below grade design (4)☐ hillside design (3)

Definitions:

1. Below grade structure

2. Design with open center surrounded by earth covered rooms

3. Home that is set into the side of a hill

4. Most energy efficient design

5. To push the earth against

14. TWO BASIC BUILDING CONCEPTS RELATED TO EARTH INTEGRATED HOUSING ARE:

☒ above grade and below grade☐ atrium and bermed sides☐ elevational and hillside☐ hillside and atriumHow do you feel about earth integrated housing?

15. IF YOU WERE TO BUY A HOME IN THE NEAR FUTURE, WOULD YOU:

☐ strongly prefer earth integrated☐ somewhat prefer earth integrated☐ no preference☐ somewhat prefer conventional☐ strongly prefer conventional

16. DO YOU PLAN TO MOVE IN THE NEXT FIVE YEARS?

____yes

____no

17. PLEASE CIRCLE THE NUMBER BESIDE EACH QUESTION THAT BEST DESCRIBES YOUR ANSWER.

	Ext. Liked	Liked	Neu- tral	Dis- Liked	Ext. Disliked
If you have visited an earth integrated house, rate your like or dislike for it.	1	2	3	4	5
If you have lived in an earth integrated house, but do not presently, rate your like or dislike for it.	1	2	3	4	5
If you presently live in an earth integrated house, rate your like or dislike for it.	1	2	3	4	5

THANKS AGAIN!

APPENDIX L
ADDITIONAL SOURCES OF INFORMATION
HANDOUT

ADDITIONAL SOURCES OF INFORMATION
ABOUT EARTH INTEGRATED HOMES

If you would like more information about earth integrated housing, the following sources have various types of information available.

BOOKS

- | | |
|---|---|
| 1. <u>Earth Sheltered Designs</u> | Underground Space Center
Room 11, Mines & Metallurgy Bldg.
221 Church Street Southeast
Minneapolis, MN 55455
612/376-5341 |
| 2. <u>Underground Designs</u>
by Malcolm Wells | Mother Earth News, Inc.
Hendersonville, NC
704/693-0211 |
| 3. <u>Plans For the Future</u> | Underground Homes
700 Mosonic Building
P. O. Box 1346
Portsmouth, OH 45662
614/354-3652 |
| 4. <u>Primer to Earth Sheltered Living</u> | Underground Homes |
| 5. <u>Underground Homes Information Manual</u> | Underground Homes |
| 6. <u>Alternatives in Energy Conservation: The Use of Earth Covered Buildings</u> | Superintendent of Documents
U.S. Govt. Printing Office
Washington, DC 20402
Stock #038-000-00286-4 |
| 7. <u>Underground Plans Book 1</u>
by Malcolm Wells and
Sam Glenn-Wells | Earth Shelter Resource Center
1701 East Cope
St. Paul, MN 55109 |
| 8. <u>Underground Houses</u>
by Robert Roy | Earth Shelter Resource Center |
| 9. <u>Passive and Earthshelter Home Plan Book</u>
by Joe Hylton | Earth Shelter Resource Center |

10. Homes In the Earth
by J. Jones and J. Chalmers

Earth Shelter Resource Center

GENERAL INFORMATION

- | | |
|---|---|
| 1. "Earth Shelter Digest 1"
Architectural Extension
Oklahoma State University
Stillwater, Oklahoma
405/624-6266 | |
| 2. "Underground Gardens and Homes"
by Jay Swayze
pamphlet | Geobuilding Systems, Inc.
Box 1556
Hereford, Texas 79045
806/364-0241 |
| 3. "Earth Shelter Bookstore"
pamphlet | Underground Homes |
| 4. "Earth Sheltered Building.
A Brief Bibliography"
pamphlet | U.S. Department of Energy
Washington, D.C. 20585 |
| 5. "The Earth Sheltered Home:
FABCON Makes it Practical"
pamphlet | Fabcon, Incorporated
6111 West Highway 13
Savage, Minnesota 55378
800/328-2970 |
| 6. <u>27 Reasons</u> -"Why You Should
Consider Earth Sheltered
Living" | 27 Reasons
1980 Underground Homes
Portsmouth, Ohio |
| 7. Earth Shelter Digest and
Energy Report
1701 East Cope
St. Paul, Minnesota 55109 | |

MAGAZINES--that have featured stories on underground living

- | | |
|------------------------------------|----------------------------------|
| 1. Mother Earth News | 7. Better Homes and Gardens |
| 2. Popular Mechanics | 8. Underground Space |
| 3. Popular Science | 9. Progressive Architecture |
| 4. Alternative Sources of Energy | 10. Consumer's Research Magazine |
| 5. Earth Shelter and Energy Digest | 11. Country Gentleman |
| 6. Smithsonian | 12. Work Bench |

APPENDIX M
LETTER OF APPRECIATION

Box 133
Graham, Texas 76046

Dear

Thank you for participating in the statewide study on consumer attitudes toward earth integrated housing. I am glad that I was able to provide this program for you. Through your assistance, housing consumers learned about earth integrated housing as a possible housing choice. This study has also helped me gather information that will eventually help consumers as we teach them more about the energy efficient choice of earth integrated housing.

Your time and assistance in this project are greatly appreciated. I will send the results of the study to you as soon as they are available. Please remember to share them with the program participants from your county.

Sincerely yours,

Mary Greer
County Extension Agent
Young County

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REFERENCES

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