PRIVATE RESIDENCE FOR MR. AND MRS. KEYES
IMI DEVELOPMENT
ANDERSON, INDIANA
SITE NUMBER 14

PROGRAM BY GLENN R. KEYES
11/16/92
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ABSTRACT

The Keyes Residence will serve a family of four and the related activities. The house needs to be an architectural statement in future earth sheltered design, while maintaining a warm, comfortable atmosphere. The house and site need to be as care free and natural as possible. Only a very small amount of the site will actually be lawn.

The program presented for the Keyes Residence is not intended to serve as a constraint on the designer, but it is intended to give the basic guidelines that need to be followed. In fact, the Keyes need to see a reduction in the gross square feet numbers. The net square feet needs to be around 2500, not including the garage, workshop and utility/storage room. This square footage needs to be reduced in a logical, sensitive manner. The concepts need to remain, and the square feet requirements are flexible. Some of the spaces may even be able to share common ground.

Housing needs to provide more than shelter. It needs to be a place of inspiration, discovery and family. Within the house come needs to fulfill privacy, sleep, bathing, eating, socializing, study and play. The Keyes have two daughters, the oldest being three years old. The children will develop different needs as they grow. The house needs to be flexible for these and other family changes.

The lake is a major focal point that needs careful integration into the house siting. The house also needs to be sited so any solar gain can be taken advantage of. Both active and passive solar will be utilized. The house is to be heated by radiant flooring and primarily cooled by natural ventilation.
INTRODUCTION

Earth sheltered housing has been a part of our history since the cave became shelter. The American Indians used a form of it, and cultures in China and Tunisia continue to use earth shelter as a form of housing. Although the American culture has largely denounced earth sheltered housing as a type, there are certain resurgences in its popularity.

Earth shelter provides a form of housing that is slow to change in temperature or humidity level. Because of this it has been used as a means of providing thermal comfort with a minimum of energy use. This type of housing is also very quiet, it blends in well with the landscape and it provides the possibility for freely formed spaces at minimal cost.

The Keyes are looking for a house that will provide the physical space and comfort needs of their family. Their previous housing was a contemporary 3700 square foot passive solar house set on 6 plus acres of land. Even though they loved the space in the house, parts of it were cooler than others. This meant raising the temperature during the cold days of winter and dressing warmer. The Keyes could have used more fuel to keep the house warmer, but they didn't want to face the expense. The Keyes want a house that can be warm during the winter and cool during the summer without costing their salaries. The Keyes also want a house that is distinctive aesthetically, something that speaks of their way of life.

The Keyes are like many families of four - they want to have time and the finances to enjoy their lives without being tied to the expense and maintenance of a conventional house. The Keyes would rather spend extra time and money with their family than on their house. They are interested in the quality of life as well as the quality of their environment. They feel strongly about recycling, reusing and conserving.
The Keyes like to have light-filled spaces. To them natural light is an
important part of the psychological life of the house. They would prefer to
see the outdoors from anywhere in the house. This opens up the possibility
to utilize solar for passive heat-perfect for the thermal mass capabilities of an
earth sheltered house. The Keyes would like to use solar heat for a radiant
floor, thus giving a very warm means of heating the house.

This house is sited on a small lake in Anderson, Indiana. The
orientation for the rear of the house is south to south-west. The slope of the
site is a drop of 45' from the street level to the beach. It will be very
important to take advantage of the views afforded by the lake. As a symbolic
gesture of the history of the site, the Keyes want to create a permanent fire pit
near the beach. This permanent fire pit will replace the one currently there
that the fishermen use. The Keyes like flowing spaces, an open plan and
soaring interior volumes. They also want the detailing to create a warm,
comfortable atmosphere.

The scope of this program is to provide the Keyes with a house that
will fulfill their needs for space, both public and private, while creating a
natural setting indoors and out. The house needs to use technology that is
most current, but not labor or cost intensive. Any technology used has to
enhance the personality of the house, not reduce or harden it. The
technology should include such 'forgotten' technology as cisterns for
collection of rain water and natural ventilation. This program defines the
spaces, relationships and minimum physical requirements of this project.

This program has been developed after many years of reading and
experimenting with different houses by the Keyes. Alfredo Missair and Dan
Woodfin have been individuals who have pointed out certain "required"
reading in the area of environmental architecture. Malcolm Wells has
provided a constant source of logic and clarity through his book Gentle
Architecture. Professor Andrew Seager has helped define this project's limit
and limitless boundaries. Many thanks are extended to them all.
SPACE REQUIREMENTS

**Name of Space:** Entry

**User:** Husband, wife, two daughters, family, friends, business associates, politicians, door-to-door sales, neighbors

**User Activities:** Entrance to house, place to talk, place to remove/put on coats, boots/rubbersplace of greeting/farewell, first impression of house and its owners

**Time of Use:** Normally from 6:00 a.m. to 11:00 p.m.

**Lighting:** Should receive high level of daylight with noneed for supplementary light during the day, during night conditions the space should be given a soft glow from primarily indirect light, not more than 25 foot candles. Accent light should be provided to emphasize the entrance itself, and any specific wall washing for artwork. Wall sconces should provide supplemental light.

**Acoustics:** This space should not echo and should provide isolation from exterior noises, such as traffic

**View:** Views should be allowed to the outside but be controlled with drapes or blinds for night time privacy

**Ceiling Height:** The ceiling height for the airlock should be between 7'-6" and 8'-0". The entry should have a ceiling height in line with the second floor height

**Temperature/Humidity:** The interior temperature should be capable of maintaining between 67 degrees and 72 degrees with a humidity level of between 30 to 45%.

**Thermal:** This entry should be designed as an airlock in order to minimize the change in temperature from doors opening and closing, and the heat loss of an exterior door. The entry itself should be kept at the interior temperature, but the transition space can be a transition in temperature as well

**Adjacent Spaces:** Entry should be adjacent to the Den, Dining Room, and Living Room

**Auxiliary Spaces:** The entry requires a closet that will contain winter coats for 25 guests, with their shoe coverings. A seat that 3 people minimum can use is also required

**Image:** This space is the first impression of the home and its owners and should evoke an image of warmth and welcome. The space should open itself to the public spaces, while allowing the private spaces their privacy

**Furniture/Equipment:** A seat for a minimum of 3 people

**Square Footage:** Sized for 6 people to put on or take off coats—approximately 175 sq. ft., air lock to be 78 sq. ft.

**Design Criteria:** The space should feel comfortable, finely crafted, and of quality (not expensive) materials. The ceiling should open up to expand the space. The floor should be a slip resistant quarry tile with a stain resistant grout.
SPACE REQUIREMENTS

Name of Space: Den
User: Husband, wife, two daughters, family, friends, business associates
User Activities: To be used primarily as a home office and personal library, will be used for business meetings, design, drafting, and various computer related tasks, as well as reading and research
Time of Use: Normally from 6:00 a.m. to 11:00 p.m.
Lighting: Should receive high level of daylight with little need for supplementary light during the day, during night conditions the space should be given a soft glow from primarily indirect light, not more than 25 foot candles. Task lights should be provided. Wall sconces should provide supplemental light.
Acoustics: This space should not echo and should provide isolation from exterior noises, such as traffic. Speech and sound privacy is mandatory.
View: Views should be allowed to the outside, but be controlled with drapes or blinds for night time privacy. There should be no view into any of the private spaces of the home.
Ceiling Height: The ceiling height should be between 7'-6" and 8'-6".
Temperature/Humidity: The interior temperature should be capable of maintaining between 67 degrees and 72 degrees with a humidity level of between 30 to 45%.
Adjacent Spaces: Den should be adjacent to the Entry, Powder Room
Auxiliary Spaces: The den needs to have a storage room that is about 8'x8'
Images: This space needs to feel comfortable, professional and private. It cannot be lavish or undersized. The den will need to be statement of the owners taste and sense of design-a professional calling card. The scale of the space needs to be more intimate.
Furniture / Equipment: Conference table for 4, 4 conference chairs, drawing board, stool, 2 desk chairs, 20' of full height bookcase, built in workstation for the computer, housing both a DOS and Macintosh system. The Macintosh will be used for CAD, while the DOS will be used for financial work. There will be one laser printer for the two machines. The workstation should have the equivalent of (4) 2 drawer files. A plotter, plan file, shelving and blueprint machine will be in the storage room.
Square Footage: The storage room shall be 60 sq. ft., and the den shall be 275 sq. ft.
Design Criteria: The space should feel comfortable, finely crafted, and of quality (not expensive) materials. The details will be very important in this space. Access to and from the den should not disrupt the normal family functions. The feel of the space should be well organized and functional. Instead of changes in ceiling height, a trim at the window heads or a decorative molding should be used. Flooring should be berber carpet, except under the desk chairs, which should be hardwood flooring finished to match the trim.
DEN

Possible Layout
SPACE REQUIREMENTS

**Name of Space:** Living Room  
**Use:** Husband, wife, two daughters, family, friends, business associates, neighbors  
**User Activities:** Social, more formal entertaining  
**Time of Use:** Normally from 6:00 a.m. to 11:00 p.m.  
**Lighting:** Should receive high level of daylight with little need for supplementary light during the day, during night conditions the space should be given a soft glow from primarily indirect light, not more than 25 foot candles. Accent light should be provided to emphasize any specific artwork. Wall sconces should provide supplemental light. The lighting should indeed set a mood.  
**Acoustics:** This space should not echo and should provide isolation from exterior noises, such as traffic  
**View:** Views should be allowed to the outside, but be controlled with drapes or blinds for night time privacy. View to the dining room and entry should also be possible.  
**Ceiling Height:** The ceiling height for the living room should be between 7'-6" and 8'-6".  
**Temperature/Humidity:** The interior temperature should be capable of maintaining between 67 degrees and 72 degrees with a humidity level of between 30 to 45%.  
**Adjacent Spaces:** Living room should be adjacent the Den, Powder Room, Dining Room, and Entry  
**Auxiliary Spaces:** None  
**Image:** Formal, in a relaxed sense. This room is intended to be used for guests and special occasions, so the room itself should have a special quality about it.  
**Furniture/Equipment:** 2 sofas, 2 chairs, coffee table, 2 end tables, sofa table, piano  
**Square Footage:** About 300 sq. ft.  
**Design Criteria:** The space should feel comfortable, finely crafted, and of quality (not expensive) materials. The ceiling should open up to expand the space. The atmosphere needs to be more formal than the family room, but not so formal as to be stuffy. The flooring should be carpet, with a hardwood border 2' wide around the perimeter of the room.
SPACE REQUIREMENTS

**Name of Space:** Dining Room

**Uses:** Husband, wife, two daughters, family, friends, neighbors

**Use Activities:** Dining, serving, talking, celebrating, cleaning

**Time of Use:** Normally from 6:00 a.m. to 11:00 p.m.

**Lighting:** Should receive high level of daylight with little need for supplementary light during the day. During night conditions the space should be given a soft glow from primarily indirect light, not more than 25 foot candles. Primary light should come from dimmable recessed cans located over the chairs, with atmosphere light coming from a ceiling hung chandelier.

**Acoustics:** This space should not echo and should provide isolation from exterior noises, such as traffic.

**View:** Views should be allowed to the outside, but be controlled with drapes or blinds for night time privacy. Limited view to the kitchen and living room is desired.

**Ceiling Height:** The ceiling height for the dining room should be from 7'-6" at the lowest, to 8'-6" at the highest level.

**Temperature/Humidity:** The interior temperature should be capable of maintaining between 67 degrees and 72 degrees with a humidity level of between 30 to 45%.

**Adjacent Spaces:** Dining room should be adjacent the Entry, Kitchen, and Living Room.

**Auxiliary Spaces:** None

**Image:** This room is the most formal in the entire house. The walls should have a chair rail, with a decorative molding at the ceiling plane. The space should not feel stuffy or uncomfortable.

**Furniture / Equipment:** Dining room table and seating for 10-12, buffet server, corner cupboard

**Square Footage:** The room needs to be 14' x 16', or 224 sq. ft.

**Design Criteria:** The space should feel comfortable, finely crafted and of quality (not expensive) materials. The ceiling should open up to expand the space. The traditional details of chair rail and crown molding shall be used in a more contemporary manner. The dining room needs to feel comfortably formal. The flooring should be carpet with a 2' border of hardwood flooring around the perimeter.
SPACE REQUIREMENTS

Name of Space: Kitchen

User: Husband, wife, two daughters, family, friends

User Activity: Food preparation, dish washing, cooking, snack preparation, food, dish, glass, pots, pans and appliance storage, beverage preparation, serving, socializing

Time of Use: Normally from 6:00 a.m. to 11:00 p.m.

Lighting: Should receive a high level of daylight with no need for supplementary light during the day. During night conditions the space will be given a soft glow from primarily indirect light, not more than 25 foot candles. Accent light should be provided to emphasize the work surfaces and any specific wall washing for artwork

Acoustics: This space should be well isolated from noise of bathrooms, laundry

View: A view to the exterior is mandatory, as is view to the family room space and dining room

Ceiling Height: It is preferred that the ceiling height be 9'-0", but 8'-6" would be acceptable. In order to provide the indirect light requested, it is expected that the ceiling will be stepped at least once to allow space for the light fixtures and access to them

Temperature/Humidity: The interior temperature should be capable of maintaining between 67 and 72 degrees with a humidity level of between 30 to 45%.

Thermal: The temperature of the kitchen should take into consideration the heat gained from cooking and baking activities, as well as heat lost from venting to the outside. The temperature should be maintained between 65 and 75 degrees.

Adjacent Spaces: The kitchen should be adjacent to the pantry, breakfast area, dining room, family room, garage entrance and near the main entry

Auxiliary Spaces: The kitchen requires storage space for brooms, mops and a vacuum cleaner, a 42" desk area and a pantry

Image: The kitchen is the work and often social activity center of the home. The space needs to be easily cleaned and warm feeling, simple to get organized and comfortable, have plenty of work space and have a short travel distance between legs of the 'work triangle'

Furniture/Equipment: A 36" double door refrigerator/freezer, a 36" range top, microwave, double oven, dishwasher, double bowl sink with garbage disposal, salad sink with disposal, desk chair, 4 seats at the counter, 24" of counter space, and a range hood vented to the outside.

Square Footage: The kitchen should have approximately 190 sq. ft., the pantry should have 60 sq. ft., and the storage area in the kitchen should be 4' wide by a minimum of 16" deep

Design Criteria: The space should feel comfortable, finely crafted, and of quality (not expensive) materials. The kitchen first needs to be functional and well lit, with flexible storage in the cabinets. Secondly, the kitchen needs to be a place for gathering and talking during meal preparation and clean-up. Sight lines need to take in as much of the breakfast and family room areas as possible. This space needs to be durable, easily cleaned and warm feeling. It should not appear to be purely functional. Flooring to be quarry tile with stain resistant grout.
SPACE REQUIREMENTS

**Name of Space:** Breakfast Area  
**Users:** Husband, wife, two daughters, family, friends, neighbors  
**User Activities:** Eating, serving, talking, celebrating, cleaning, working, playing  
**Time of Use:** Normally from 6:00 a.m. to 11:00 p.m.  
**Lighting:** Should receive high level of daylight with little need for supplementary light during the day. During night conditions the space should be given a soft glow from primarily indirect light, not more than 25 foot candles. Primary light should come from dimmable ceiling hung fixture  
**Acoustics:** This space should not echo and should provide isolation from exterior noises, such as traffic  
**View:** Views should be allowed to the outside, but be controlled with drapes or blinds for night time privacy. View to the kitchen, family room and outside is desired  
**Ceiling Height:** The ceiling height for the breakfast area should be from 8'-6" at the lowest, to 12'-6" at the highest level  
**Temperature/Humidity:** The interior temperature should be capable of maintaining between 67 degrees and 72 degrees with a humidity level of between 30 to 45%.  
**Adjacent Spaces:** Breakfast area should be adjacent the Entry, Kitchen, and Family Room  
**Auxiliary Spaces:** Exterior deck  
**Image:** This room is the least formal in the entire house. The walls should have a chair rail. The space should not feel stuffy or uncomfortable. This should be a very comfortable space. It will be one of the most active in the entire house.  
**Furniture / Equipment:** Dining room table and seating for 6-8, sofa table  
**Square Footage:** The room needs to be 12' x 12', or 144 sq. ft.  
**Design Criteria:** The space should feel comfortable, finely crafted, and of quality (not expensive) materials. The ceiling should open up to expand the space. This space needs to be a space of common ground between the kitchen and family room. This space is the connector between the other rooms. It is also the drop off point for school books, briefcases, etc. The flooring will be quarry tile with stain resistant grout, to match the kitchen.
BREAKFAST AREA

Possible Layout
SPACE REQUIREMENTS

**Name of Spaces:** Powder Room  
**User:** Family, friends, business associates  
**User Activities:** Miscellaneous bathroom activities  
**Time of Use:** Normally from 6:00 a.m. to 11:00 p.m.  
**Lighting:** Task light will be required for make-up activities  
**Acoustics:** This space should not echo and should provide isolation from exterior noises, such as traffic. This space should also be isolated from other spaces  
**View:** Views of or from this space are not recommended  
**Ceiling Height:** The ceiling height for the space should be between 7'-6" and 8'-0".  
**Temperature/Humidity:** The interior temperature should be capable of maintaining between 67 degrees and 72 degrees with a humidity level of between 30 to 45%. A fan should be provided to exhaust higher humidity air to the exterior  
**Adjacent Spaces:** Should be adjacent to den, garage, dining room, living room, family room, kitchen  
**Auxiliary Spaces:** None  
**Image:** This space needs to feel warm, cheerful and comfortable. The powder room must be easy to keep dry, clean and pleasant smelling.  
**Furniture/Equipment:** The powder room shall have a water closet, a 4' vanity with a single bowl sink, full width and height mirror  
**Square Footage:** The powder room shall be 35 sq. ft.  
**Design Criteria:** The space should feel comfortable, finely crafted, and of quality (not expensive) materials. These spaces need to feel warm, well organized, bright and clean. It has to be a space that is enjoyable to enter. The flooring will be quarry tile with stain resistant grout.
POWDER ROOM

Possible Layout
SPACE REQUIREMENTS

Name of Space: Laundry Room
User: Husband, wife, two daughters
User Activities: Sorting, washing, drying, ironing, hanging; possible control location for security system
Time of Use: Normally from 6:00 a.m. to 11:00 p.m.
Lighting: Should have natural light, but not mandatory. Lighting level needs to be sufficient for color recognition between black and dark blue. Area over washer and dryer need primary focus of light, while general lighting is required
Acoustics: This space should not echo and should be isolated from all other interior spaces
View: View from this space should include an outside area, but it is not necessary
Ceiling Height: The ceiling height for the dining room should be 7'-6" to 8'-0"
Temperature/Humidity: The interior temperature should be capable of maintaining between 67 degrees and 72 degrees with a humidity level of between 30 to 45%.
Adjacent Spaces: Laundry room should be adjacent the Kitchen and Family Room
Auxiliary Spaces: none
Image: This room should be functional above all else. It should be designed to make the task of doing laundry as easy as possible.
Furniture/Equipment: Washer, dryer, 8' of upper cabinet, 4' of counter (minimum), hanging rod—two levels, about 12'-15' in length total, fold down ironing center
Square Footage: The room needs to be 60-75 sq. ft.
Design Criteria: The space should feel functional, organized and clean. It is important that this room be simple to work in, possibly for two or more people. Upper cabinet space will be used for storage of some seldom used items, so the cabinets can be to the ceiling in height. The flooring will be quarry tile with stain resistant grout.
LAUNDRY ROOM

Possible Layout
SPACE REQUIREMENTS

**Name of Space:** Family Room

**User:** Husband, wife, two daughters, family, friends, neighbors

**User Activities:** Hanging out, reading, listening to the stereo, watching the TV, or videos, snacking, drinking, playing games, playing with toys, socializing

**Time of Use:** Normally from 8:00 a.m. to 11:00 p.m.

**Lighting:** Should receive high level of daylight with little need for supplementary light during the day. During night conditions the space should be given a soft glow from primarily indirect light, not more than 25 foot candles. Wall sconces should provide supplemental light. Task lighting will be required to provide reading level light at chairs and sofas.

**Acoustics:** This space should not echo and should provide isolation from exterior noises, such as traffic.

**View:** Views should be allowed to the outside, but be controlled with drapes or blinds for night time privacy. Easy viewing of the breakfast area and kitchen should also be allowed.

**Ceiling Height:** The ceiling height should be between 7'-6" and 12'-0". The family room should have a gabled ceiling with skylights, to open the space up, while allowing more natural light.

**Temperature/Humidity:** The interior temperature should be capable of maintaining between 67 degrees and 72 degrees with a humidity level of between 30 to 45%.

**Adjacent Spaces:** Breakfast area, kitchen, exterior deck

**Auxiliary Spaces:** A room for the storage of games, records, tapes and cd's, along with the location for the audio/visual equipment.

**Image:** This is the relaxation space for the family. It will also be the primary gathering space for family, friends and neighbors. This space needs to be comfortable.

**Furniture/Equipment:** Bookcases, fireplace, coffee table, sofa, love seat, 2 chairs and ottomans, built-in entertainment center, 2 end tables

**Square Footage:** About 300 sq. ft. plus about 60 sq. ft. for the storage area

**Design Criteria:** The space should feel comfortable, finely crafted, and of quality (not expensive) materials. The ceiling should open up to expand the space. This is the space in the house that has to say relax, get comfortable and let's talk. This will be the daily place for the family to play together, talk and catch up on the day's activities. The fireplace needs to be casual, as does the total design of the family room. The flooring will be carpet.
FAMILY ROOM

Possible Layout
SPACE REQUIREMENTS

**Name of Space:** Garage

**Users:** Husband, wife, two daughters

**Uses Activities:** Parking cars, storing lawn mower, lawn tools, furniture, paints, sprays, lumber, etc., servicing cars, car building

**Time of Use:** Normally from 6:00 a.m. to 11:00 p.m.

**Lighting:** Should have plenty of natural light. Task lighting of 125 foot candles is required for working on cars. General lighting of 35 foot candles will be adequate.

**Acoustics:** This space should not echo and should be isolated from all other interior spaces.

**View:** View from this space should include an outside area.

**Ceiling Height:** The ceiling height for the dining room should be 7'-6" to 8'-0"

**Temperature/Humidity:** The interior temperature should be capable of maintaining between 57 degrees and 82 degrees.

**Adjacent Spaces:** Garage should be adjacent to the kitchen, basement and workshop.

**Auxiliary Spaces:** Stairway to basement

**Image:** This room should be functional above all else. It should be designed to be easy to clean, organize and park 3 cars.

**Furniture / Equipment:** 12' of cabinetry (upper and lower), counter, 12' of shelving, wall hanging system for yard tools, garbage cans, automatic garage door openers.

**Square Footage:** The garage needs to be 350 sq. ft.

**Design Criteria:** The space should feel functional, organized and clean. It is important that this room be simple to work in. Upper cabinet space will be used for storage of some seldom used items, so the cabinets can be to the ceiling in height. The walls need to be finished in a durable, water resistant material. The floor will be an epoxy coated concrete. The floor will have drains under each car.

**Electrical:** There will be a 4 gang electrical box located on the wall at the center of each car. Receptacles will be provided for automatic garage door openers.
Possible Layout
SPACE REQUIREMENTS

**Name of Space:** Master Bedroom

**User:** Husband, wife

**Use Activities:** Sleeping, reading, drinking tea, coffee or hot water, dressing, primping, clothing and jewelry storage

**Time of Use:** Normally from 9:00 p.m. to 6:00 a.m.

**Lighting:** Should receive a high level of daylight with no need for supplementary light during the day. During night conditions the space should be given a soft glow from primarily indirect light, not more than 25 foot candles. Accent light should be provided to emphasize the reading, dressing, primping and clothing and jewelry storage areas and any specific wall washing for artwork.

**Acoustics:** This space should be well isolated from noise of bathrooms, and any other rooms in the house.

**View:** A view to the exterior is mandatory. Viewing areas should be from the reading and bedroom spaces to the exterior. A view to the dressing area is also preferred.

**Ceiling Height:** The height should be at minimum 7'-6" and at maximum 9'-6".

**Thermal:** The temperature should be maintained between 65 and 75 degrees, within 3 degrees plus or minus of the thermostat setting.

**Adjacent Spaces:** The Master Bedroom should be adjacent to the master bath, dressing area and walk in closet. It should also be close to bedrooms 2 and 3.

**Auxiliary Spaces:** It would be beneficial to locate a small refrigerator and microwave in a small area within the bedroom area.

**Image:** The Master Bedroom is the adult retreat of the house. A place to rest and relax away from the normal activity of the home. It should appear comfortable, warm and relaxed.

**Furniture / Equipment:** The furniture will include a king size bed, 2 night stands, a dresser, a triple dresser, a blanket chest, a bookcase, 2 chairs with ottomans, a 21" television with VCR, and an armoire to store the TV and VCR in.

**Square Footage:** The Master Bedroom should have approximately 275 sq. ft.

**Design Criteria:** The space should feel comfortable, finely crafted, and of quality (not expensive) materials. The Master Bedroom should have a peaceful feeling immediately upon entry. It should have a change in ceiling height for spatial purposes and as a place to integrate the lighting. The Master Bedroom is a retreat for the parents within the house. It should be an easy place to relax, read and meditate. The flooring will be carpet.
SPACE REQUIREMENTS

**Name of Space:** Master Bathroom, Dressing Area

**User:** Husband, wife

**User Activities:** Bathing, dressing, drying, pruning, clothes and towel/supply storage

**Time of Use:** Normally from 6:00 a.m. to 11:00 p.m.

**Lighting:** Should receive high level of daylight with little need for supplementary light during the day. During night conditions the space should be given a soft glow from primarily indirect light, not more than 25 foot candles. Wall sconces should provide supplemental light. Task light will be required in the dressing area for shaving and make-up activities.

**Acoustics:** This space should not echo and should provide isolation from exterior noises, such as traffic. This space should also be isolated from other spaces

**View:** Views should be allowed to the outside, but be controlled with drapes or blinds for night time privacy.

**Ceiling Height:** The ceiling height for the space should be between 7'-6" and 8'-0".

**Temperature/Humidity:** The interior temperature should be capable of maintaining between 67 degrees and 72 degrees with a humidity level of between 30 to 45%. A fan should be provided to exhaust higher humidity air to the exterior.

**Adjacent Spaces:** Should be adjacent to the Master Bedroom

**Auxiliary Spaces:** Linen closet, walk-in-closet

**Image:** This space needs to feel warm, cheerful and comfortable. The closets need to have sufficient shelving, hanging and storage capabilities to be well organized. The dressing area needs to be roomy and bright. The bath must be easy to keep dry, clean and pleasant smelling.

**Furniture / Equipment:** The master bath shall have a 4'x4' shower with glass surround, a water closet in a private space with a pedestal sink, a 6'-6"x4'-0" whirlpool and a linen closet. The dressing area shall have a vanity of at least 6'-0" length, a single bowl sink, a full height and width mirror, and a walk-in-closet that is 6'-0" wide by 10'-0" long. This closet shall have double height rod and shelf for 60% of the total. There will be built-in drawer storage as part of the closet system for storage of sweaters, shoes, ties and other articles. The vanity will have a 4 gang receptacle at each end.

**Square Footage:** The bath shall be 84 sq. ft., the dressing area shall be 36 sq. ft., the linen closet is 8 sq. ft., and the walk-in-closet is 66 sq. ft.

**Design Criteria:** The space should feel comfortable, finely crafted, and of quality (not expensive) materials. These spaces need to feel warm, well organized, bright and clean. It has to be a space that is enjoyable to enter first thing every morning of the week. The husband and wife like to be together, but do not like to be constantly fighting for the same space. Privacy is an important issue in the bathroom, with the wife requiring a higher degree of privacy. Flooring in the bath and dressing area will be tile. The walk-in-closet will be carpeted.
MASTER BATH, DRESSING AREA

Possible Layout
SPACE REQUIREMENTS

Name of Space: Bedrooms 2 & 3
User: Two daughters
Uses Activities: Sleeping, studying, playing, hanging around
Time of Use: Normally from 6:00 a.m. to 11:00 p.m.

Lighting: Should receive high level of daylight with no need for supplementary light during the day. During the night, the space should be given a soft glow from primarily indirect light, not more than 25 foot candles. Task lighting is required for the desk and bed areas.

Acoustics: This space should not echo and should provide isolation from exterior noises, such as traffic.

View: Views should be allowed to the outside, but be controlled with drapes or blinds for night time privacy.

Ceiling Height: The ceiling height for the bedrooms should be between 7'-6" and 10'-0".

Temperature/Humidity: The interior temperature should be capable of maintaining between 67 degrees and 72 degrees with a humidity level of between 30 to 45%.

Adjacent Spaces: Bedrooms 2 & 3 should be near the bath for the two girls, the master bedroom.

Auxiliary Spaces: none

Image: These rooms will be the primary space in the house for the girls to express their own identities. Even though the rooms will be essentially identical to each other, each will be allowed to make their own statements within them.

Furniture / Equipment: Double bed, nightstand, dresser, desk, bookcase, desk chair and lounge chair (each)

Square Footage: Each bedroom shall be 150 sq. ft.

Design Criteria: The space should feel comfortable, finely crafted, and of quality (not expensive) materials. The ceiling should open up to expand the space. These bedrooms should allow personalization, privacy and solitude. They should be bright, cheerful and comfortable. The flooring will be carpet.
BEDROOMS 2 & 3

Possible Layout
SPACE REQUIREMENTS

Name of Space: Bath for two girls
User: Two daughters
User Activities: Bathing, dressing, drying, primping, clothes and towel/supply storage
Time of Use: Normally from 6:00 a.m. to 11:00 p.m.
Lighting: Should receive high level of daylight with little need for supplementary light during the day. During night conditions the space should be given a soft glow from primarily indirect light, not more than 25 foot candles. Task light will be required in the dressing area for make-up activities
Acoustics: This space should not echo and should provide isolation from exterior noises, such as traffic. This space should also be isolated from other spaces
View: Views should be allowed to the outside, but be controlled with drapes or blinds for night time privacy
Ceiling Height: The ceiling height for the space should be between 7'-6" and 8'-0".
Temperature/Humidity: The interior temperature should be capable of maintaining between 67 degrees and 72 degrees with a humidity level of between 30 to 45%. A fan should be provided to exhaust higher humidity air to the exterior
Adjacent Spaces: Should be adjacent to Bedrooms 2 & 3
Auxiliary Spaces: Linen closet, walk-in-closet, individual dressing areas
Image: This space needs to feel warm, cheerful and comfortable. The closets need to have sufficient shelving, hanging and storage capabilities to be well organized. The dressing area needs to be roomy and bright. The bath must be easy to keep dry, clean and pleasant smelling.
Furniture / Equipment: The bath shall have a 2'-6" x 5'-0" tub/shower with glass surround, a water closet in a private space with a pedestal sink, and a linen closet. The dressing area shall have a vanity of at least 4'-0" length, a single bowl sink, a full height and width mirror, and a walk-in-closet that is 6'-0" wide by 5' long. This closet shall have double height rod and shelf for 60% of the total. There will be built-in drawer storage as part of the closet system for storage of sweaters, shoes, and other articles.
Space Footage: The bath shall be 45 sq. ft., the dressing areas shall be 20 sq. ft. each., the linen closet 4 sq. ft., and the walk-in closet 33 sq. ft. each.
Design Criteria: The space should feel comfortable, finely crafted, and of quality (not expensive) materials. These spaces need to feel warm, well organized, bright and clean. It has to be a space that is enjoyable to enter first thing every morning of the week. The flooring for these areas will be tile.
BATH for TWO GIRLS

Possible Layout
SPACE REQUIREMENTS

Name of Space: Bedroom 4
Use: Family, friends
Use Activities: Sleeping, studying, reading, dressing
Time of Use: Normally from 6:00 a.m. to 11:00 p.m.
Lighting: Should receive high level of daylight with little need for supplementary light during the day. During night conditions the space should be given a soft glow from primarily indirect light, not more than 25 foot candles. Task lighting is required for the bed area.
Acoustics: This space should not echo and should provide isolation from exterior noises, such as traffic.
View: Views should be allowed to the outside, but be controlled with drapes or blinds for night time privacy.
Ceiling Height: The ceiling height for the bedrooms should be between 7'-6" and 10'-0".
Temperature/Humidity: The interior temperature should be capable of maintaining between 67 degrees and 72 degrees with a humidity level of between 30 to 45%.
Adjacent Spaces: Bedroom 4 should be near the guest bath.
Auxiliary Spaces: Closet
Image: This room will be the guest bedroom, it needs to be comfortable for a couple to stay for a night or 3. This room needs to be comfortable, bright and cheerful.
Furniture / Equipment: Double bed, nightstand, dresser, chair
Square Footage: Bedroom shall be 150 sq. ft., the closet 10 sq. ft.
Design Criteria: The space should feel comfortable, finely crafted, and of quality (not expensive) materials. The ceiling should open up to expand the space. This bedroom should allow for privacy and solitude. It should be bright, cheerful and comfortable. The flooring will be carpet.
BEDROOM 4

Possible Layout
**SPACE REQUIREMENTS**

**Name of Space:** Guest Bath  
**User:** Family, friends  
**User Activities:** Bathing, dressing, drying, primping, clothes and towel/supply storage  
**Time of Use:** Normally from 6:00 a.m. to 11:00 p.m.  
**Lighting:** Should receive high level of daylight with little need for supplementary light during the day. During night conditions the space should be given a soft glow from primarily indirect light, not more than 25 foot candles. Task light will be required in the vanity area for shaving or make-up activities.  
**Acoustics:** This space should not echo and should provide isolation from exterior noises, such as traffic. This space should also be isolated from other spaces.  
**View:** Views should be allowed to the outside, but be controlled with drapes or blinds for night time privacy.  
**Ceiling Height:** The ceiling height for the space should be between 7'-6" and 8'-0".  
**Temperature/Humidity:** The interior temperature should be capable of maintaining between 67 degrees and 72 degrees with a humidity level of between 30 to 45%. A fan should be provided to exhaust higher humidity air to the exterior.  
**Adjacent Spaces:** Should be adjacent to Bedroom 4  
**Auxiliary Spaces:** Linen closet  
**Image:** This space needs to feel warm, cheerful and comfortable. The bath must be easy to keep dry, clean and pleasant smelling.  
**Furniture/Equipment:** The bath shall have a 2'-6"x 5'-0" tub/shower with glass surround, a water closet, a 4' vanity with a single bowl sink, full width and height mirror and a linen closet.  
**Square Footage:** The bath shall be 50 sq. ft., the linen closet 4 sq. ft.  
**Design Criteria:** The space should feel comfortable, finely crafted, and of quality (not expensive) materials. These spaces need to feel warm, well organized, bright and clean. It has to be a space that is enjoyable to enter first thing every morning of the week. The flooring will be tile.
GUEST BATH

Possible Layout
SPACE REQUIREMENTS

Name of Space: Workshop
User: Husband, wife, two daughters
User Activities: Woodworking, finishing, material storage, crafts
Time of Use: Normally from 6:00 a.m. to 11:00 p.m.
Lighting: Should have plenty of natural light. Task lighting of 125 foot candles is required for work areas. General lighting of 75 foot candles will be adequate.
Acoustics: This space should not echo and should be isolated from all other interior spaces
View: View from this space should include an outside area, but it is not necessary
Ceiling Height: The ceiling height for the dining room should be 7'-6" to 8'-0"
Temperature/Humidity: The interior temperature should be capable of maintaining between 67 degrees and 72 degrees.
Adjacent Spaces: Workshop should be adjacent the garage
Auxiliary Spaces: Stairway to garage and house
Image: This room should be functional above all else. It should be designed to be easy to clean, organize and work on woodworking equipment.
Furniture / Equipment: 12' of cabinet (upper and lower), counter, 12' of shelving, wall hanging system for shop tools, garbage cans, shop dust collection system with exterior venting
Square Footage: The garage needs to be 450 sq. ft.
Design Criteria: The space should feel functional, organized and clean. It is important that this room be simple to work in. Upper cabinet space will be used for storage of some seldom used items, so the cabinets can be to the ceiling in height. The walls need to be finished in a durable, resistant material.
Power: 220v power for equipment is required, as is 120v convenience power. This service should be separate from the house power to minimize 'noise' and interference from the equipment operation
SPACE REQUIREMENTS

Name of Space: Utility Room / Storage

Users: Husband, wife, two daughters

User Activities: Mechanical equipment maintenance, storage of seasonal items

Time of Use: Normally from 6:00 a.m. to 11:00 p.m.

Lighting: General lighting of 75 footcandles will be adequate.

Acoustics: N/A

View: N/A

Ceiling Height: The ceiling height for the utility room should be 7'-6" to 8'-0"

Temperature/Humidity: The interior temperature should be capable of maintaining between 67 degrees and 72 degrees.

Adjacent Spaces: Utility room should be adjacent the garage and basement

Auxiliary Spaces: N/A

Image: This room should be functional above all else. It should be designed to be easy to clean, organize and work on mechanical equipment.

Furniture / Equipment: 12' of shelving, outside ventilation

Square Footage: The utility room / storage area needs to be 150 sq. ft.

Design Criteria: The space should feel functional, organized and clean. It is important that this room be simple to work in.
UTILITY ROOM /
STORAGE AREA

Possible Layout
**SPACE SUMMARY**

**SPACE**

<table>
<thead>
<tr>
<th>PUBLIC SPACES</th>
<th>SQUARE FOOTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry/Airlock</td>
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</tr>
<tr>
<td>Dining Room</td>
<td>300</td>
</tr>
<tr>
<td>Living Room</td>
<td>300</td>
</tr>
<tr>
<td>Den</td>
<td>340</td>
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<tr>
<td>Powder Room</td>
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<tr>
<td>Screen Room</td>
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<td><strong>Sub-total Public Spaces</strong></td>
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<table>
<thead>
<tr>
<th>PRIVATE SPACES</th>
<th>SQUARE FOOTAGE</th>
</tr>
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<tbody>
<tr>
<td>Family Room</td>
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<tr>
<td>Breakfast Area</td>
<td>144</td>
</tr>
<tr>
<td>Kitchen</td>
<td>250</td>
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<tr>
<td>Laundry</td>
<td>75</td>
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<tr>
<td>Pantry</td>
<td>60</td>
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<tr>
<td>Master Bedroom</td>
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<tr>
<td>Master Bath/Dressing Area</td>
<td>200</td>
</tr>
<tr>
<td>Bedroom 2</td>
<td>150</td>
</tr>
<tr>
<td>Bedroom 3</td>
<td>150</td>
</tr>
<tr>
<td>Bath for Two Girls</td>
<td>155</td>
</tr>
<tr>
<td>Bedroom 4</td>
<td>150</td>
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<tr>
<td>Guest Bath</td>
<td>55</td>
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<tr>
<td>Workshop</td>
<td>650</td>
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<tr>
<td>Garage</td>
<td>850</td>
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<tr>
<td>Utility Room/Storage</td>
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<tr>
<td><strong>Sub-total private spaces</strong></td>
<td><strong>3650</strong></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5050</strong></td>
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</table>
BUILDING CRITERIA

INTERIOR CRITERIA
The major criteria for this house is to create an earth sheltered home that gives none of the expected underground clues. There is to be no musty odors or dampness. The humidity levels are to be kept at 30 to 45%. The interior spaces need to bright and cheerful, comfortable. If anything, this house should contain more natural light than one could afford to do with a conventional house. The ceiling levels should be determined by the room, to create the proper mood or setting. Even though this will have high tech features and systems, the goal is to obtain high touch with low tech in feel. Life safety concerns and handicap accessibility will also be concerns of this design. From the very moment a guest enters the entry, this house needs to send the feeling of comfort, and of a relaxed attitude. Even the formal zones of the house will not be stuffy or stiff. The zones will help to give privacy where needed, while giving access to the parts of the house that are public oriented.

EXTERIOR CRITERIA
The exterior needs to be as natural and as maintenance free as possible. The driveway and walkways are to be porous materials so absorption can occur. There will be only enough lawn mowed to provide picnic and play space, the rest of the yard will be wild flowers and a combination of trees and shrubs. While it is important for the house to appear as landscape, the entry needs to be obvious for even the first visitor. The garage should be positioned so the entrance to the garage is secluded from the first view of the house. The roof will be earth covered, as will the majority of the side walls.
SITE DATA

The site is a former gravel pit owned and developed by IMI Corporation in Anderson, Indiana. There are five lakes of various sizes. The lake that is located on is the largest. Nature has begun to reclaim the site—wild grasses have sprouted up, trees are starting to develop. The site slopes steeply toward the lake. The exposure is primarily south, southwest, good for solar possibilities and major sunsets. Because of the primarily gravel soil, drainage should be excellent. The house will be able to be built into the side of the hill quite easily. The views and access to the lake will be easy and beautiful. Because there is a 45° drop in elevation from the street level to the beach level, the house will need to be carefully evaluated regarding interior elevation changes. The siting of the house will need to be done so it places emphasis on the entry and entry sequence, not the garage and garage entry sequence.

There is a fire pit on the site that is used by fishermen. This fire pit should become a permanent part of the site design. Access from the house should be direct and easily seen. The site needs to provide a small area of grass lawn for playing and picnicking. The rest of the site should be left for wild flowers, meadow grass, shrubs and trees.
## COST ANALYSIS

<table>
<thead>
<tr>
<th>Item</th>
<th>Calculation</th>
<th>$ sub-total</th>
<th>$ total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Cost</td>
<td>[6793 \times $30 / sf]</td>
<td>202,000</td>
<td></td>
</tr>
<tr>
<td>Fixed Equipment</td>
<td>[17% of Building Cost]</td>
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<tr>
<td>Site Development</td>
<td>[12% of Building Cost]</td>
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<tr>
<td><strong>Total Construction Cost</strong></td>
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<td>$260,580</td>
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<tr>
<td>Site Acquisition Cost</td>
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<tr>
<td>Professional Fees</td>
<td>[7% of Total Construction Cost]</td>
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<tr>
<td>Contingencies</td>
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<tr>
<td>Administrative Costs</td>
<td>[2% of Total Construction Cost]</td>
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</tr>
<tr>
<td><strong>Total Budget</strong>*</td>
<td></td>
<td></td>
<td>$370,080</td>
</tr>
</tbody>
</table>

*Estimated cost is in November 1992 dollars
APPENDIX

It is highly recommended that the designer read Malcolm Wells book *Gentle Architecture*. This book defines many of the general feelings about earth sheltered architecture that the Keyes have developed. It is also a good primer on how we as designers need to be sensitive to our environment.

This house has to be warm all winter long, even on the coldest days. It also needs to be consistently warm throughout the entire house. Cold spots will not be tolerated. Radiant flooring will supply an even heat source that will warm the space and the bodies better. Solar heat will provide as much benefit here as possible.