

POPULAR QUESTIONS ON EARTH-SHELTERED HOMES

By David M. Neust, Post WWII Architecture Dept. Question #1: Why are the earth-covered structures so popular?

Traditional patterns of building on top of the land are contributing to the problems of thermal pollution, erosion, and the consumption of valuable land. Land cheap to develop is normally land that is also desirable for the production of food and fiber. It is also land that is needed to support recreation, flood control, and industry. There are five primary reasons for building in the land rather than on top of the land. They are:

- 1. Multiple use of the land—whether on a flat site or a hillside, it is the possibility of using the roof, walls and surfaces for vegetation, for the production of food, for the collection of rain, and for recreation.
- 2. Independence from fossil fuel sources—studies have shown that carefully designed buildings can have a fuel savings of as much as 40 percent or more of a conventional above-grade structure. In some cases, it is possible to satisfactorily heat and ventilate a home with wood-burning stoves. It is also possible to supplement the wood-burning stoves with solar heating. At the present time, solar is expensive because the shells are rather inefficient and the heat losses are very great, but with a reduction of heat loss by a more efficient design of the shell, it is possible to be independent of conventional fossil fuel sources of heat. This is particularly important to survival, especially in areas where the climate is hostile in the winter as it is in parts of eastern Washington, in the Rocky Mountains, and in the Midwest.
- 3. Maintenance—conventional buildings are in a constant state of decay in areas where there are extreme climatic changes. Maintenance is a very important issue, and in a well-constructed, well-detailed earth-covered structure, the exterior shell is virtually non-existent because the materials are not exposed to the sun or the wind, and they are in a rather constant thermal and geological environment.
- 4. Acoustical—Psychological—structures in the soil rely on the mass of the soil to cut off the surrounding noise from the outside. Typical lightweight structures transmit external noises, and other forms of acoustical pollution. Below-grade houses are very quiet. In fact, sometimes so quiet that white noise, or low-level background noise, must be introduced to create a more normal environment.
- 5. Esthetics—Contemporary, earth-covered structures that man should dominate the land. We have built our dwellings to negate that we, in fact, control and dominate nature. Earth-covered structures work WITH the landscape. Earth-covered structures create a more harmonious relationship with the environment.

QUESTION #2: Should all housing of the future be built in the land?

No. Earth-covered structures are only one option available one that has not been available before. In the past we have not had the tools or the technology to build in the ground and yet have a small, light, well-ventilated, air-conditioned, shade-sheltered house in the ground. One may be forced to build on rock, perhaps in the valleys, we might think about building on the rock that forms by material erosion. It is the advantage of the insulation and the acoustical insulation of the earth.

QUESTION #3: If earth-covered buildings are so good, why haven't they been more popular in previous times?

The answer lies in our attitudes, our culture, and available technology. Earth-covered structures have not been socially acceptable as places to live, at least in our culture because we are prone to conquer and control nature. Also, until recently we have not had the necessary materials, construction techniques, or technology to build in the earth in such a way to provide well-lighted, well-ventilated, and thermally comfortable places to live and work.

We have lived in a time when we had extremely cheap energy in terms of hydroelectric energy, coal, and oil. The amount of these materials available was very high and the cost was low. Today that is not the case. The cost of fossil fuel is in-

creasing and is, in fact, limited. The cost of hydroelectric power is increasing and the sources for generating more power are limited. Therefore, there is a need to conserve energy, particularly in a related residential building. If we are to maintain a reasonable state of comfort. Already, many people involved in the industry of shelter, including government, banks, material suppliers, builders, architects, owners, and craftsmen, are beginning to change the way they think about earth-covered structures.

QUESTION #4: What are the psychological effects of using the earth as a place to live in rather than on?

Earth-covered homes built around an atrium, or with one or more sides, exposed, provide, with the short and long views that seem to be essential and desirable to accommodate people. Having adequate natural light is also important. Using and looking the sun is stimulating. Well-designed earth-covered homes give the occupants a sense of security, at the same time a sense of awe and a sense of privacy that is somewhat different from the traditional home. All the psychological needs, except those acquired and learned for status, can be met with earth-covered structures.

Today people drive small cars that are more energy efficient, not only to save money, but to demonstrate to their neighbors that they are trying to contribute to energy conservation. The earth-covered structures. Dwellings, and buildings, are a status symbol. The other can be said to be a status symbol. The other can be said to be a status symbol. The other can be said to be a status symbol.

QUESTION #5: Can any residential contractor readily build an earth-covered structure?

While the changes from conventional construction to earth-covered construction are minor, it would be advisable for any contractor or owner who plans to build an earth-covered structure to consult with an architect or an engineer or architect or contractor who has had experience in the field.

QUESTION #6: Do earth-covered structures require mechanical ventilation?

Most earth-covered dwellings will not have the natural cross-ventilation or the other wind-related advantages of above-grade structures. Mechanical ventilation will be needed to provide good distribution of warm air, ventilation from areas that produce moisture, such as the bathroom and kitchen, and to adjust for air required to keep the room fresh for human occupancy.

QUESTION #7: Do earth-covered buildings cost more or less than conventional buildings?

Earth-covered buildings require a re-allocation of total building budget. More capital is needed for excavation and fill, landscape development, and the structure, particularly the roof. On the other hand, less capital is needed for exterior finishing materials, as well as for equipment for heating, cooling, and lighting. The economic trade-offs between below-grade moisture proofing vs. above-grade roofing costs can go either way. How these budget changes work out depends on the design of the building and the site. One cannot flatly state whether earth-covered buildings cost more or less to build than other alternatives. However, the long-term costs are almost certainly less for earth-covered buildings. How much less

depends on the character and quality of the design. In some cases, maintenance costs of an earth-covered home are 20-30% less than a conventional structure.

QUESTION #8: How much earth cover does the average building need?

One has to be done at least ten feet in an area such as Spokane County before you reach a rather stable year-round thermal environment. Successful homes, however, have been built with as little as two feet.

QUESTION #9: Can underground basements only be built of concrete?

Under certain ground conditions it is possible to build earth-covered structures out of wood, concrete block, or of concrete cast in place, or precast concrete. What you are dependent on is the character of the soil, quality of the drainage of the soil, and the skill of the people who are doing the design and build your home.

QUESTION #10: Why is it necessary to have a thermal break between the soil and the structure?

Earth is a poor insulator. It absorbs a great deal of heat from a heated space. Therefore, it is absolutely essential that there be a thermal break between the shell of your earth-covered structure and the ground. There are two reasons for attempting to heat the ground. Our goal is to take advantage of the rather constant and more stable ground temperature than the widely varying air temperature of an above-ground structure.

QUESTION #11: Are earth-covered structures an advantage or a disadvantage in an earth quake?

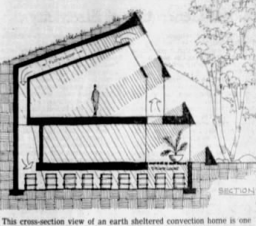
If a building is buried, it would move with the earth and the earth would surround it and support it. Buried columns would be supported in the same direction and the structure on top of it tends to stay where it is. The only damage that would occur in an earth-covered structure would occur in a building that was directly on a fault and there was a radical shear of the ground at that point. In tunnels, burrows, pits, no stairs, and other surface hazards, the underground home has the advantage.

QUESTION #12: Are earth-covered structures contrary to building codes?

Yes. However, building codes normally follow the practice, and current building codes do not always cover the issues related to earth-covered structures. Because of the lack of experience in these areas, if you consider building an earth-covered structure you would consult not only your local building officials, but also a local architect, engineer, or builder who has had some experience in the field.

HOMEWORK IMPORTANT

If you're buying an existing home, you might miss a large bill at the beginning of and of the season. You can get the bills from the seller or directly from the utility company, upon written request, not just for the heating, or air-conditioning, or water.



This cross-section view of an earth-sheltered convention home is one of many concepts available thru Stephens, a Spokane Terratch.

Solar System — An Energy Saver

Spokane Solar, which has been in business since January 1979, has sold fifty solar heating water. Spokane Solar had estimated a 60% savings on energy over the use of natural gas. The system cost \$3,300.00 to install and Mr. Evans received a 40% tax credit resulting in a five year pay-off on the purchase price of the equipment.

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