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Passive Solar Building Design

It recent years, the threat of consequences posed by our massive energy consumption has started to loom more heavily. Some individuals and businesses are beginning to look at other alternative energy to sources to help assist in combating this global issue. One of the prevalent energy impacts is the vast amount needed to heat and cool homes and buildings. In fact, The Department of Energy states that 48% of the energy used in a typical home, in the United States, can be attributed to heating or cooling (Heating). Changing the way people are able to manage the temperature in their houses and other buildings can definitely influence energy consumption in a positive way. There are many different methods to lessen one's energy needs in the home, but one trending idea is the concept of passive solar building design. There are many types of ideas to decreasing energy consumption with solar energy, but passive solar building design is currently looking extremely promising for our future. This is the process of creating buildings and homes where "windows, walls, and floors are made to collect, store, and distribute solar energy in the form of heat in the winter and reject solar heat in the summer without involving the use of mechanical and electrical devices unlike active solar heating systems" (Gencoglu). This is still a growing concept, but it has

been effectively used in many buildings and shows great promise to perhaps alter the way the average person chooses to heat and cool their in home in the future. In strive towards clean energy it should be strongly recommended that we consider investing time and resources into building homes with passive solar design in mind. This would cut our energy use and energy cost drastically and will, in turn, be beneficial to our society as a whole. We can no longer trust solely on nonrenewable energy sources to operate our daily living needs. Passive solar energy design exhibits one way that we are able to lessen our impact on our environment. As a society we should begin to start implementing these alternative energy sources on a global scale before it is too late.

To understand why passive solar building design is so beneficial, it is important to first understand what exactly it is, how it works, and why we need it. The basic idea is intergrading a combination of building designs with the fundamental goal to reduce and ideally diminish any need for mechanical systems (Gencoglu). Passive solar energy is the contrast of active solar energy. Active solar more so works on adding additional features to provide solar energy to a building – such as solar panels. This isn't a negative idea, but it does require excess material to complete. On the other hand, passive solar design is more valuable because it does not rely only on the sun actually being present to produce its desired effects of providing energy in means of heating and cooling. Passive solar building design looks solely at the

construction of the building. Passive solar building design is not a new concept. In fact, it began gaining notoriety in the early 1980s during an oil crisis – this enabled people's interest to look for alternative energy sources (O'Brien). More recently, it has begun to increase further popularity with hopes of implementing this design in most of our future buildings. Builders and designers focus on three major areas when constructing these buildings: collection, storage, and distribution. The main goal is to have a building that is capable to "capture the sun's heat within the building's elements while maintaining a comfortable room temperature, and to release that heat during periods when the sun is absent" (Ziabakhsh). With each unique climate conditions, passive solar building design takes special consideration on how to best heat and cool homes without needing the use of fuels. Although, different climates does not drastically change how the houses are to be built. One key thing that builders need to focus on while designing houses and buildings is the orientation of the structure. Ideally, it is optimal to have the longest side of the building facing the south. Windows should also be oriented in the same direction and each window should have an overhang to reduce heat invasion (Phelps). This is because windows often contribute to a major loss of heat in buildings. The use of smaller windows that face towards the south and have overhang can significantly reduce this problem. The heat that enters can be absorbed into dark floors – this is because dark colors retain and attract more heat that light colors. Two-story houses are still an option when it comes to passive solar design, but it is far more effective to build down instead of up. If

land slopes to the south, it is also a possibility to build a daylight basement. Ventilation is also emphasis when constructing houses, because the movement of air throughout a building is essential to keeping and maintaining a desired temperature throughout the structure. To put it as simply as possible, passive solar building design entails creating structures that are air-tight, well-insulated, and take in consideration direction and orientation of walls and windows to best capture and decrease the amount of heat and cold that enter and exits the building. It all involves using solar gains and solar loses to your benefit when building a structure. Building with this design is becoming more and more important, because as our population is growing so is our need for buildings to accommodate that ever increasing number. Considering that buildings are currently taking 68% of all energy produced (Syed), this is very valid subject manner to look into when trying to find ways to lower energy needs. Currently, our means of energy use and energy cost in homes and buildings is simply not sustainable for long term. This is why concepts like passive solar building design are so incredibly imperative.

There would be no point in investigating this kind of alternative energy source if it was not efficient, but according to our most recent observation and research the idea of passive solar building design is looking exceptionally promising. Especially with our hunger for energy growing more, it is becoming additionally significant to discover ways to lower the amount and

rate of energy we are presently using. As expressed earlier, the majority of energy currently being used is being funneled into the narrow category of heating/cooling building structures. The effectiveness of this passive solar building design has been shown through observing the effects after construction, it concluded that "energy savings of about 50 percent more than a code-built home" (Phelps). Building future homes with this particular design will assist in making a dramatic decrease the amount of energy people use on average. It is extremely essential to explore alternative energy sources before we run dry of our current methods. In fact, if a passive solar designed building is built perfectly to code there should be absolutely no need for any additional kind of mechanical heating or cooling system. It is for all purposes eliminating the problem all together. Of course, there is always area for improvement so as our research advances we may find other options to make this method even more effective, but as for now it is looking like an extraordinary bright idea. With all this information we understand about the benefits of passive solar energy design it can be difficult to grasp why it has not become a more popular or trending idea when constructing most modern buildings. This is likely because there is not enough education in this field of building and construction. To improve this problem we should begin to invest in educating constructors of this concept. This could be exceptionally beneficial in places of rapidly growing residential communities.

Not only does the idea of passive solar building design seem promising, the cost impacts are also looking bright. Building a home with passive solar design is not any more expensive than any other structure building. Since they use many of the same materials – the main difference is how everything is positioned. These specific design choices usually do not make any significant cost changes while building homes (Phelps). That is one reason individuals might be unsure about perusing passive solar design when building their homes, because they may fear the cost would be too high without researching in depth that is actually is shown to have more of a cost benefit in the long run. So far passive solar building design has proven to be very cost efficient. In a study about the effectiveness of passive solar building design, it was shown that the cost of living in such a home was lower than the average home. The passive solar house "resulted in a final price of $1062/m ($99/ft) of finished floor area, while a similar house in the same city would cost approximately $1345 to $1507/m ($125 to $140/ft)" (Mathias). So after the initial costs of building these homes with passive solar design, the cost analysis is shown to save money in the long run; mainly because the decrease in energy used decreases the monthly energy bill drastically. The only problem is considering the passive solar building design relies on a particular design elements it would not be possible to alter most preexisting homes and buildings through this method. This concept would more entail the building of future structures. Although, reconstructing parts of existing builds may be viable options in certain cases. Cost efficiency seems to be beneficial to the

average person. Another issue that can be faced while implementing this idea, is that large energy businesses whose profit is solely based on the distribution of energy. These are the kind of players that will try to knock these innovative ideas at every turn to ensure it never catches onto any real momentum. Energy distributors will not find this to be an economical market and would not be in favor of losing such an energy consuming aspect – as previously mentioned most of the energy used in the average household goes to mechanical heating and cooling.

In conclusion, it is clear to see that passive solar building design is incredibly effective and cost efficient. The only reason that we are not investing in these ideas is because we are not taking the time to educate people and builders about this kind of alternative energy source nor are the energy companies interested in people requiring less energy. Unfortunately, in our society pushing innovative ideas about conservation of energy can be like trudging through deep mud. It can be a very slow moving process, but that does not mean it is impossible either. We should always invest in alternative energy sources whether they by solar, wind, hydro, and whatever else our research brings us. Our current way of life is simply not sustainable and will only lead us down a negative path. We should not wait until last minute to make significant changes – we need to do it now. We are already entering a point of no return. We already have more than enough research and information to move further with the option of passive solar energy designed building, so it is about time we start implementing these idea

everywhere. For example, it would be beneficial to find budding residential communities, and builders can start expanding on the building by adding elements of passive solar design to future houses. We can examine other existing structures and determine if it would be possible to implement some or all aspects of passive solar energy design through altercations. Buildings that are unable to be changed enough by passive solar energy design could perhaps benefit instead from active solar energy aspects instead. Businesses can also start doing the same with buildings under the same standards. With these aspects we are able to decrease our energy-dependency. We have already been seeing an increased interest in "green" buildings, so we should start making these passions a reality. These are the changes we need today if we ever want to see a brighter tomorrow.

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