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Prevention Plan to Save Human Life, by Building Safe Monolithic Dome or EcoShell Structures

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Abstract

The purpose of our study is to evaluate, monolithic houses that were popular thirty and forty years ago. The world as a whole understands the use of Monolithic Domes and EcoShells. According to a non-profit group Domes for the World Foundation whose mission is for helping people to help themselves by building safe Monolithic Dome or EcoShell structures. Dome structures are being built around the world in much needed areas. They save lives everywhere and can save human life in the United States. Every few months, news brings another tornado that destroyed property or took away human life. In 2012, a Christmas day tornado struck Mobile, Alabama. Tornados are not a seasonal event so buildings and structures for tomorrow need a prevention plan to save life and housing destruction.

It is time to examine a monolithic dome structure which meets the prevention plan from storm and tornado destruction. Today, we know much more about tornados. Almost every large tornado near a city has a good chance of being filmed. Thirty and forty years ago, very little coverage was filmed until after the storm when everyone was picking up the pieces. Today, more people have dash cams and cell phones that can record video. The 21st century brought technology to almost everyone and it is possible to see filmed video of a tornado shortly after it strikes.

Keywords: EcoShell structures; Monolithic dome; Tornado; Concrete structures

Introduction

A monolithic dome home can offer occupants increased protection from fire, high wind, tornado, and earthquake disasters. Today, we have many reasons to build a monolithic dome structure. The best cost effective solution to providing the needs of safe environment from tornado and hurricane force winds is the use of concrete monolithic dome structure. In most cases, the cost to build is the same. No other structure has been made to date that will provide for the protection needed for the EF5 tornado. They are the rarest and most dangerous of tornadoes and research shows Kansas has more of them than any other state for a total 14. The EF5 tornado is at the top of the Fujita Scale, according to data compiled by severe-weather-research meteorologist Jon Davies of Kansas City. Texas and Iowa share second place at 10 on the list, which dates back to 1880. A statement from Mike Smith, president of Weather Data, a Wichita-based subsidiary of Accu Weather "People do not realize how statistically rare EF4s and EF5s are with every 1,000 tornadoes, roughly 50 are EF4, and two or three are EF5" [1]. A powerful and extraordinary large (EF5 level), and devastating tornado struck the rural Kansas community of Greensburg on May 4, 2007. Eleven (11) residents died and many more injured in the storm, and an estimated 95 percent of the small, rural city was estimated to have been destroyed and rendering approximately all of 1400 residents homeless. Immediately, following the storm, the City started the process of recovery and redevelopment with Federal and State assistance. Reinventing itself, Greensburg became a national and international model as a “green community”. A series of “Eco-Homes” were built. These homes are strong and sturdy with energy-efficient feature. The Silo-shaped Eco-Homes made mostly of steel-reinforced concrete and expected to be 70 percent more energy efficient than average standard homes. Six-inch thick concrete walls that can withstand the high winds of a tornado with green features in the home showcases both established and cutting edge techniques for sustainable living.

On May 22, 2011 an EF5 went through Joplin, Missouri, destroying one-third of the town. This tornado devastated the city of 50,000, killing 161 and injuring more than 1,000. The Joplin tornado was the first single tornado in the U.S. to result in more than 100 fatalities since a tornado struck Flint, Mich., in 1953. It also ranks as the seventh deadliest in U.S. history and the deadliest since 1947. Additionally, the Joplin tornado was also one of the most expensive tornadoes on record, having caused direct insured losses of $1.9 billion. Joplin is being rebuilt at this time using state, and federal and insurance claims funds [2]. Many of the survivors are opting to remain and rebuild. They have an opportunity to do so, in ways that can dramatically reduce deaths and injuries in the future. In Joplin, the rocky soil underneath isn't ideal for building basements, so many are now turning to so-called "safe rooms" fortified rooms built to withstand a tornado’s worst winds [3]. A tornado can strike any time day or night with getting to the safe room on a limited time window. In day time, your instincts will guide you to your Safe Room. It will be more of a problem, if disaster occurs in the middle of night without warning. Safe rooms can be installed in new and existing homes.

Americans are being plagued by natural disasters. One area particularly hard hit is the State of Kansas and Oklahoma. The last few years, a rise in tornadoes and widespread damage have created a never ending cycle to increasing home and auto insurance costs. The payoff

costs from the claims get passed on to the consumers. The concept for the future may be building more tornado resistant homes in areas of need. If this is a success, other areas of the county with high probabilities for tornado activity would benefit.

The citizens of the United States get tax credits for energy efficient improvements to their homes. Why can't the same people benefit with tax credits for a safe home built of concrete. If the people could urge the government for some kind of tax credit for a safer home, a project of this scale could become a reality instead of a pipedream. Starting a project in a needed area that is highly prone to tornado or high winds with a start of 10,000 homes would be ideal.

Tax credits to build would be a first step. Further credits could be achieved at a State Level. Some people who live in manufactured homes would be the best suited to benefit from low cost mass produced concrete homes. Back in 2009, the U.S. launched a cash-for-clunkers car campaign to get buyers in the market in a new fuel efficient vehicle. Now the same approach can be implemented to get people into a safer home. Homes that do not have basements or manufactured homes are not safe places to be in during any type of inclement weather.

Problem

The typical stick frame house will not hold up during a tornado. Brick homes are better choice but will not withstand the power of an EF4 or EF5 tornado ranked on the Enhanced Fujita Scale. An EF5 tornado will cause strong frame houses being lifted off foundations and carried considerable distances to disintegrate; automobile-sized missiles fly through the air in excess of 100 yards; trees debarked; steel reinforced concrete structures badly damaged. The world needs a stronger home that can withstand tornado forces. A large tornado can strike anyplace. Six states compromise tornado alley which are Texas, Oklahoma, Kansas, Nebraska, South Dakota and Iowa, and Also parts of Colorado and Missouri. It would be a good idea to build monolithic dome homes spread out across a state that has a high occurrence of EF5 tornados. The state of Kansas has the most recorded tornadoes of massive power. Mass producing the monolithic home and waiting until a tornado comes in the future. This will provide a good study and benefit the population with saving human life in the future.

Lots of places around the world have concrete home or dome communities. If government incentives will not help, another avenue would be working with the private sector. Sooner or later it is time to retire. If no one in America wants to live in a dome home community, why not go after the retirees. They live in mobile home communities in search of low cost housing. The Monolithic dome home would provide safe low cost housing. People who are retired just want to be safe and secure. It is easy to sell mobile homes to retired people who want to be grouped together with people their own age. A monolithic dome is a much better alternative than unsafe mobile and stick framing homes. Most retirees are on a fixed income, so lower utility costs will help sales. To reduce cost, the proposed Monolithic dome home could be built without the lower level. For the garage, a separate smaller dome attached. Around the world, the dome home is being used. In Japan, there is a place called Aso Village. The Aso Farm Land resort village in Kyushu uses about 480 Styrofoam domes as lodging, recreational facilities and retail shops. Made with 7-inch-thick 100% expanded polystyrene foam modules, the company says that they don't have the maintenance problems of wood or metal structures, and they are "highly resistant" to earthquakes, fires, and typhoons. Still, the domes at Aso Farm Land resort village in Kyushu look like a suburban community [4]. In Los Angeles, California, a village of 20 fiberglass igloo-like domes was established in 1993 on a lot west of the Harbor Freeway between 8th and 9th streets as an experimental shelter and social service program for a trial group of 24 homeless people [5].

College students from Utah built a few dome structures in Guaymas, Mexico. With a reusable air-form donated by Idaho-based Dome Technology, the crew built three dome houses in a week. The houses replaced the existing ones that were partially destroyed during Hurricane Jimena [6]. Every day, more monolithic domes are being built. In some other parts of the world, they are built, because of low finished building costs.

Solution

A monolithic dome is a great asset for the environment and considered a green building. The domes have been recognized by FEMA as "near-absolute protection" providing a potential storm shelter for its tenants. Domes are eligible for FEMA grants because of their nature as a storm shelter. The aggregates used in concrete are often obtained locally meaning less energy spent on transportation (FEMA). Once constructed, the concrete shell requires minimal maintenance and upkeep. In rural Missouri, a school won a FEMA Grant for a Monolithic Dome. The Niangua school district successfully won a competition that netted a FEMA grant to cover 90% of the cost of a Monolithic Dome disaster shelter [7]. Without the grant, Niangua would have not had a shelter for protection. They had to prove qualification by showing this city is in a disaster-prone area and that it is a small, impoverished community." The grant was approved and structure built.

Mass production of nearly anything brings the cost down. Making tornado resistant homes with a 10,000 homes would be ideal. With time, these homes will go through storms and tornados, and then the public will view the dome home differently. Less damage means lower insurance premiums and minimum loss of life. Today the public views the comparison between living in a traditional home made of brick to a manufactured home. The loss of life occurs in manufactured homes which have proven over time to be very unsafe when disaster occurs. They are made of such lightweight materials and will not hold up. While the manufactured housing industry is building homes to better withstand fierce storms, wind experts say they remain vulnerable. Almost 40 percent of those killed in tornadoes nationwide, more than 640 victims since 1975, were in mobile homes. Residents are up to 20 times more likely to die in tornadoes [8]. How to Tornado-Proof Your Mobile Home. It's best to flee if at all possible. On average, the National Weather Service can alert residents about 18 minutes before an anticipated tornado strikes. That gives mobile-home owners time to evacuate to a shelter or a sturdier house nearby [9]. It would make the greatest benefit of helping the population to abandon manufactured homes. Tax credits would benefit the manufactured home users first by switching to a much safer home. The monolithic dome home costs more to build and the price could be very close with tax credits. Manufactured homes do not have a long life span, so owners of older housing units could avoid the repairs and improvements and apply it toward a safer structure. Mobile homes may not attract tornadoes but they are scientifically proven to be tornado deathtraps. This might be why we always see the television crews reporting from a "former" mobile home park after tornadoes.

The future is shown with the concept monolithic dome home which is shown in (Figures 1-3). This 50' diameter concrete monolithic home would provide for safe environment. A basement and a garage on the lower level for two cars are considered. The main entry of the house can be accessed on the first level from covered concrete stairs. Inside includes 3 bedrooms and 2 baths with each of the bedrooms large enough to accommodate an extra bed. Dormers over each of the windows will provide shade. The concept home will have an area of approximately 1800 square feet on main level and same on lower level. The lower level will be combined with a garage. It is proposed that the stairway from the lower to upper floor be on the outside of the building. Most US homes are 3 bedrooms and 2 baths, just like the concept home. This level does not have any glass, making it safe. On the main level, the closet in the master bedroom is the safest area on this level. The low profile spherical shape of dome home can protect its occupants from storms and tornado wind. Tornado proof windows, entry and garage doors can be installed. It is an added cost, but costs go down with mass production. This is an efficient building and mass production of this home will bring cost down further. It would be best to build two monolithic homes as a tour home. Put one in Joplin, Missouri and the other in Greensburg, Kansas, the locations of recent tornadoes. The cost will go down substantially by mass producing 10,000 homes. The cost will drop and the savings could be the turning point from the population saying maybe I will buy a monolithic home. Additional construction savings can be gained with tax credits. This structure is very energy efficient and safe. Most dome structures are at least 50 percent more energy efficient.

Some of the research and ideas for future homes that are tornado proof include having a retractable house anchored on a huge arm that would lower the house to underground level. That type of structure would be out of reach for nearly everyone but the wealthy [10]. It would be a better solution, because the house is underground. Another available way to make a concrete home is the use of concrete cloth. This is a cement-impregnated fabric that works like a plaster cast, but on a larger scale. Giant rolls of the material spool the fabric out across uneven ground of hastily constructed frames. Spraying the material with water begins a chemical reaction that, after some drying, results in a low-profile structure strong enough to resist a tornado [11]. Pyramid structures are more common in wood, and not concrete. There are not many examples because the cost is higher than the monolithic dome home. Even with mass production, a concrete pyramid home would not have any cost advantages.

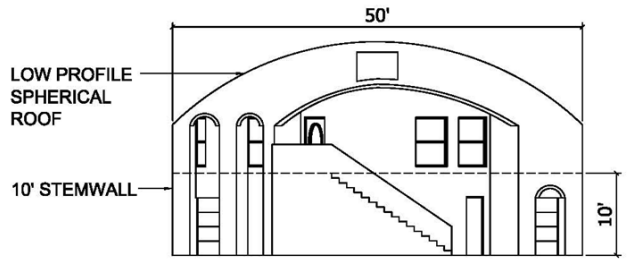

Figure 1: Elevation

Since the monolithic dome was first build, advances for safety such as adding tornado-resistant windows to meet criteria stipulated by FEMA 361 Design and Construction Guidelines and have passed air pressure and tornado missile impact tests. These new windows can withstand tornadoes of up to 250 mph, and that's virtually as bad as a tornado gets [12].

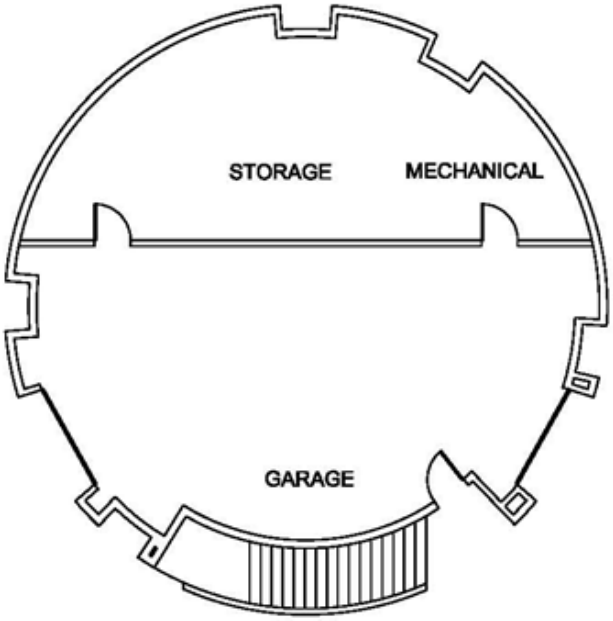

Figure 2: Lower Level

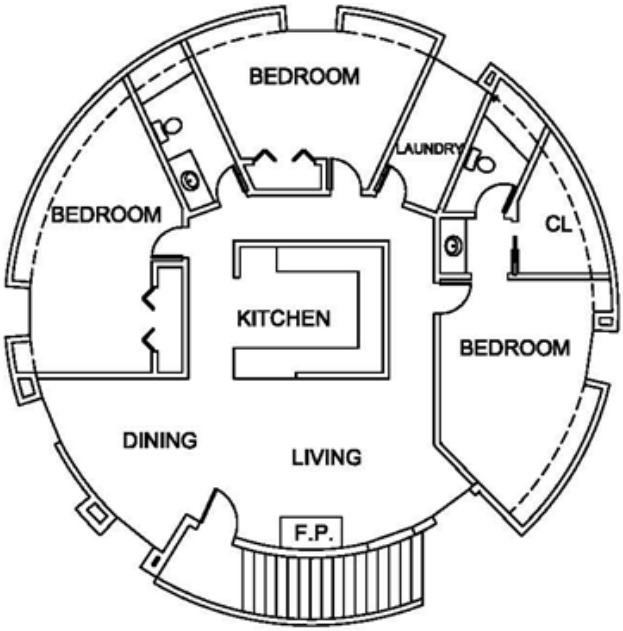

Figure 3: Main Level

Conclusion

It is time to stop the cycle of insurance costs going up higher than inflation. If nothing is done, the insurance industry will keep passing the costs on the consumer. The Federal Emergency Management

Agency or better known as FEMA provides federal funding for all types of natural disasters [13]. Building a safer home can reduce loss of life plus lower insurance costs and reduce the reliance on federal funding when disaster occurs. An informed consumer will see that another option is available with the use of the monolithic dome home. The building of 10,000 homes in one state or multiple states in the next few years could change the way we live. It will provide savings with much lower insurance and energy costs. This type of structure can be built for almost the same cost as a traditional stick frame house. FEMA will not have to spend as much if another disaster takes place. Public buildings and institutions such as schools and nursing homes would benefit from the monolithic dome after homes are built in the same community. That would create a community that would have safe shelter at all hours day and night. The future is now, and there are no advantages on waiting for a new structure type to be built. A prevention plan is now available for continued destruction from tornado (Figures 1-3) are Simple designed by Pars Consulting Engineers, Leawood, Kansas, USA.

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