Monolithic Domes

Monolithic Domes are reinforced concrete structures that can be built quickly and economically. They are used in a variety of residential, commercial and industrial projects. Due to their strength and durability, they can be used to store large amounts of various commodities such as cement, fertilizer, and agricultural products (corn, wheat, and other grains). Some can even be used as the containment buildings at nuclear power plants.

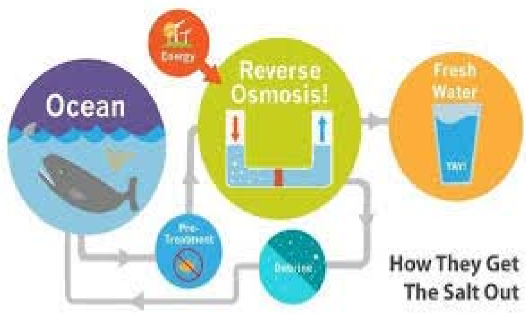
Many monolithic domes have been built to serve as community gymnasiums, like the one at Los Fresnos United, but they are designed to withstand damage from hurricanes, tornadoes, and earthquakes. In fact, monolithic domes are considered by the US Federal Emergency Management Agency (FEMA) to provide near-absolute protection from F5 tornadoes and Category 5 Hurricanes. Many communities in the Gulf Coast region, which experiences hurricanes annually, have built monolithic domes to serve as public storm shelters during severe weather and evacuation crises.

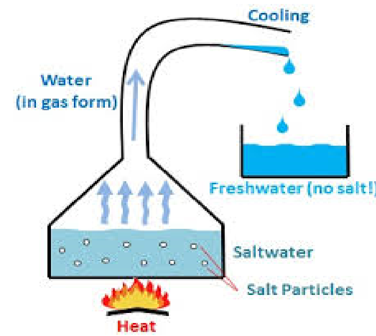
Recently, a number of monolithic domes have survived major disasters:

- Several monolithic domes in Florida survived direct hits by Hurricane Katrina in 2005.
- Many monolithic domes were in the path of the 2005 and 2006 wildfires in Oklahoma and Texas, and survived with only slight charring of the exterior foam insulation.
- In 2003, a monolithic dome government building in Iraq survived a direct hit by a 5,000 lb. bomb- the interior of the structure was totally destroyed, but the dome itself remained standing.

Monolithic domes can also very energy efficient. Domes have been built using nearly every common structural material, including air pressure supported fabric. The spherical sections of the dome offer minimal surface area for the volume they contain, so there is less surface for heat transfer with the outside air. By placing the insulating foam on the outside of the concrete shell, the concrete acts as a thermal mass inside the building, reducing interior temperature fluctuations far more than the traditional home's insulation inside of a brick or stone veneer. Many monolithic domes can be constructed in one piece, which eliminates many of the seams through which air can leak through; however, the addition of multiple doors and windows in residential domes cancels out this advantage.

Desalination





Humans cannot drink saline water, water that contains significant amounts (referred to as "concentrations") of dissolved salts. However, saline water can be made into freshwater through a process called desalination, and it is being used more and more around the world to provide people with needed freshwater. Most of the United States has, or can gain access to, ample supplies of fresh water for drinking purposes. But fresh water can be in short supply in some parts of the country (and world). As the population continues to grow, shortages of fresh water will occur more often, if only in certain locations. In some areas, salt water (from the ocean, for instance) is being turned into freshwater for drinking.

Desalination involves removing the salt from water to make it drinkable. There are several ways to do it, and it is not a new idea at all. Most of the world's 1,500 or so desalination plants use distillation as the process, and there are also flash evaporation and electrodialysis methods. All these methods are very expensive; however, an exploding world demand for potable water has led to a lot of research and development in this field and a new, cheaper process has been developed that involves heating sea water and forcing it through membranes to remove the salt from the water.

The scarcity of fresh water resources and the need for additional water supplies is already critical in many regions of the world and will be increasingly important in the future. Many arid areas simply do not have fresh water resources in the form of surface water such as rivers and lakes. They may have only limited underground water resources, some that are becoming more brackish as extraction of water from the aquifers continues. Today, desalination plants are used to convert sea water to drinking water in many arid regions of the world, and to treat water in other areas that is fouled by natural and unnatural contaminants.

It is estimated that some 30% of the world's irrigated areas suffer from salinity problems and remediation is seen to be very costly. In 2002 there were about 12,500 desalination plants around the world in 120 countries. They produce some 14 million cubic meters/day of freshwater, which is less than 1% of total world consumption.

The most important users of desalinated water are in the Middle East, (mainly Saudi Arabia, Kuwait, the United Arab Emirates, Qatar and Bahrain), which uses about 70% of worldwide capacity; and in North Africa (mainly Libya and Algeria), which uses about 6% of worldwide capacity. Among industrialized countries, the United States is one of the most important users of desalinated water, especially in California and parts of Florida.

Aqueducts

An aqueduct is a watercourse constructed to carry water from a source to a distribution point far away. In modern engineering, the term aqueduct is used for any system of pipes, ditches, canals, tunnels, and other structures used for this purpose. In modern times, the largest aqueducts of all have been built in the United States to supply the country's biggest cities. Aqueducts sometimes run for some or all of their path through tunnels constructed underground. Modern aqueducts may also use pipelines.

Historically, agricultural societies have constructed aqueducts to irrigate crops and supply large cities with drinking water. Aqueducts were used by the ancient Greeks, Romans, and the Harrapans in India as part of sophisticated irrigation systems, but the Romans are considered to have mastered the technique. Roman piping systems carried water from sources to the city for dozens of miles. The route had to gently slope to allow gravity to carry the water to its destination. Engineers followed the land's natural grade wherever possible, building channels underground—even if that meant having to make long detours. Only when they had no other choice—when they had to cross a valley or avoid a sudden drop—did they build spectacular archways, some several stories tall. Aqueducts dating back to the Roman Empire still supply water to Rome, Italy, in the present day.

Aqueducts can be constructed in a variety of ways. The simplest aqueducts are small *ditches* cut into the earth. Much larger channels may be used in modern aqueducts; for instance, the Central Arizona Project uses 24-foot wide channels. An artificial *rill* is a small canal of stone, brick, concrete, or other lining material used for water transportation from a source such as a river, creek, spring, or reservoir. Rills are distinguished from a 'water ditch' by being lined to reduce absorption losses and to increase durability. Aqueducts can also sometimes run for some or all of their path through tunnels constructed underground, called a *qanat*.

Modern aqueducts may also make extensive use of pipelines. Pipelines are useful for transporting water over long distances when it needs to move over hills, or where open channels are poor choices due to considerations of evaporation, freezing, pollution, or environmental impact. They can also be used to carry treated water.

Polders in the Netherlands

Land reclamation along the margins of the shallow North Sea began more than 2,000 years ago. By the 13th century, windmills were used to pump water out of the areas below sea level, creating the Netherlands' famous polders. A polder is a large tract of low-lying wetland or former sea floor partially or wholly encircled by dikes and drained mostly with pumps. Poldering is so important the Netherlands would barely exist without it. The problem with poldering is that, because the polders lie below the surrounding water levels, water invariably seeps back under the dikes. As a result, the water must be pumped by windmill or electricity more or less continuously into canals, which are found throughout poldered areas. The canals collect the water, which then flows or is pumped away to the sea.

The land of the Netherlands, however, is affected by other variables unrelated to global warming. The sea walls, drainage canals, levees and dikes themselves have impacted the country. River deltas in general tend to subside, or sink, naturally, increasing the impact of a rise in sea level. The Netherlands' engineering projects also have limited the ability of streams to naturally add new sediments to the deltas.

One example is the Biesbosch, a small inland delta and national park, where the Dutch government has breached some dikes originally built to protect farmland and dug additional drainage channels. No longer will the water be held captive by tightly constricted river and canal channels. Instead, big floods are allowed to spread across the Biesbosch delta to serve as a temporary reservoir. This tends to reduce the threat of water spilling over the top of levees that guard densely populated cities downstream. Other ideas are to place newly built homes on stilts or design them to float. In the future entire villages might be built to float in place, linked by buoyant sidewalks and roads.

Terrace Farming

Terrace farming is commonly found through Asia, and is used when the terrain is particularly hilly or steep. Terraces are made using low walls of Earth up the side of the hills, these allow the farmers to make flat areas for planting their crops.

The terraces are used in several ways, but they are mostly used for allowing the soil to remain in place and water to flow down the hill through natural gravity. The terraces are extremely efficient at conserving scarce water from rain or irrigation canals. Water can then be moved and channeled through the terrace set up using a system of small openings and gates to allow different areas to be dry or wet at any one time. The stone retaining walls heat up during the day and slowly release that heat to the soil as temperatures plunge at night, keeping sensitive plant roots warm during the sometimes frosty nights and expanding the growing season.

While terraced farming is a great way to make use out of your surroundings, there are some negative effects that can happen if the terraces are not maintained. Terracing requires huge inputs of labor to construct and maintain, and when not properly maintained, the effects can be catastrophic. Unmaintained terraces can lead to mudslides, the creation of deep gulleys and increased soil erosion, particularly in sandy soils or on extremely steep terrains.

Terraces have been used for farming for centuries in many different areas of the world. The Inca carved terraces into the steep Andes Mountains of Chile, and these farming techniques are still in use today. Terraces are also often seen in the rice-growing areas of sour-east Asia, such as Indonesia, the Philippines, Vietnam, and so on. The Indonesian island of Bali is particularly well-known for large areas of rice terraces, but at higher altitudes the crops in the terraces will be replaced by different crops as rice cannot grow too high.

Dams



A dam is a structure built across a stream, river, or estuary to store water. Humans construct dams to drain swamps, prevent floods, provide water for human consumption, irrigate land, or for use in industrial processes. Dams can also be used for generating hydroelectric power, to reduce peak discharge of floodwater created by large storms or heavy snowmelt, or to increase the depth of water in a river in order to improve navigation and allow barges and ships to travel more easily.

Hoover Dam, on the border of Nevada and Arizona, backs up the waters of the Colorado River to form Lake Mead, the largest man-made lake (reservoir) in the United States. This water is stored behind Hoover Dam and is an important source of water to seven western states - Colorado, Wyoming, New Mexico, Utah, Arizona, Nevada, and California, as well as a portion of Mexico. Along the way it is used for irrigation, domestic water, recreation, and hydroelectric power production. The dam also acts as flood control, water storage, and helps reduce the amount of sediment and silt sent down the river.

The Aswan High Dam in Egypt was constructed in 1970 to develop hydroelectric power; today, it generates an enormous amount of electricity. Hydroelectric power, a self-sustaining, renewable, clean energy resource, has helped Egypt develop new industries and contribute to the growth of cities. Aswan High Dam also holds back floodwater. In the past, the Nile floods brought benefits to Egypt, but they also destroyed villages along the river. Some years, rainfall in the mountains was light and the floods didn't occur. In those years, Egypt lacked water. Now, water is released in a more steady flow from Lake Nasser. In this way, the dam provides a reliable, year-round supply of water for Egyptian farms and cities. Lake Nasser now supplies water for a large system of perennial irrigation. With this water, farmers have been able to increase the amount of land under cultivation. As a result, Egyptian harvests have grown. Cotton, in particular is a major export crop.

China's Three Gorges Dam is the largest hydroelectric dam in the world. It is located on the Yangtze River, where the three main tributaries of the river meet. The project was approved by the Chinese government in 1992 and is scheduled to be completed by 2009. The $25 billion project is being internationally funded by companies from Canada, Switzerland, Germany, France, Sweden, and Brazil. Controversy surrounding the dam include human rights issues (as many as 1.3-1.9 million people have been forced to relocate) and environmental impacts. Estimates suggest that 140 cities, about 1,000 villages, two cities, and 100,000 acres of fertile farmland will be flooded by the reservoir. The Chinese government plans to develop the economy and related infrastructure in the area around the reservoir to guarantee that the employment rates and living standards are sufficient. Ways to assure this is to open new land for agriculture, improve the quality of existing land, and to establish new business opportunities in the area. However, since the number of people being relocated is so high, the odds that the peoples' livelihoods can be reestablished is low.