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Various Types of Earth Buildings

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Abstract

Earth architecture is a vernacular architecture. Earth architecture is included various types of buildings. This paper is described various types of earth buildings in the world. Rammed earth buildings, Cob, Adobe, Wattle and Daub, Poured earth are various types of earth buildings. The paper has shown the significant of earth buildings and earth architecture in vernacular architecture. Earth Architecture is a study devoted to the architectural uses of earth in shaping the environment of humankind, a subject closely related to human ecology. Earth Architecture includes contemporary as well as historical and vernacular examples drawn from many cultures and periods. Structural built of earth presently house an estimated 1.5 billion people about 30 percent of the world's population (Keefe 2005). Archaeologists have found evidence of mud brick buildings constructed as early as ten thousand years ago in the Middle East and North Africa, where impressive buildings up to ten stories high have been recorded in an unbroken architectural tradition that continuous today.

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1. Adobe Brick Building

For wall construction, there has always been a comparison between adobe bricks and rammed earth. One of the major requirements for adobe bricks is climate. Some regular periods of dry weather is essential for the could to dry and the bricks to be structured firmly. This supports the common belief that adobe bricks are limited to arid lands only; however, this is not correct. Any area where climate supports a full week without rain is suitable. Adobe bricks (Figure 1) have also offered simple structural solutions for structures such as vaults, arches and domes, which are impossible to construct with rammed earth. A variety of soil can be used to manufacture adobe bricks. Based on the quality of bricks needed and the capital available for investment in the manufacturing tools, the manufacturing operation is established with different levels. Stabilizing agents such as bricks, mud and mortar are used for manufacturing adobe bricks. The factors on which the type of stabilizing agent is decided are cost and effectiveness. Other additives like asphalt emulsion, lime and Portland cement have also been used in mud bricks and walls. Vernacular builders in some cultures have also used many organic compounds that involve manure, straw, blood and plant juices. The number of advantages in using adobe brick walls is far more than the number of disadvantages associated with it. Some major advantages are low sound-transmission levels

through walls, solidity and security. Such walls are also considered in selecting the heating, ventilating and cooling systems. Adobe bricks are found to be fireproof and the investment of energy in basic materials is also very low. The major disadvantage of using adobe bricks; however, is their extra wall thickness that considerably decreases the ratio between the total building space and the usable interior space.

2. Rammed Earth Building

The man-made equivalent for sedimentary rocks is rammed earth. For more than many thousand years, builders are making use of simple tools to compact soil in order to produce rock-hard structures. This has created some very beautiful and well-known wonders in the construction industry. Examples of such great architectures include the Alhambra in Spain, the great Kasbahs of Morocco and the long stretches of the Great Wall of China. China has evidences of some of the most previous works built from rammed earth, where archaeologists discovered walls made of rammed earth back from the Longshan Culture of the Late Neolithic period (between 2600 and 1900 B.C.E), the period between the Stone Age and the Bronze Age, a period when many cities in China were established. This technology of building structures using rammed earth later spread throughout the Middle East. The Phoenician trading empire was the one that introduced the technology in Europe and helped in laying the foundations of the rammed earth city of Carthage. A famous Roman historian called Gaius Plinius Secundus stated that Carthaginians taught this technology to Romans, and Romans disseminated the technology throughout other territories. He also provided evidences of a fortification built out of rammed earth by Hannibal 250 years ago and also mentioned rammed earth walls in Spain in his studies. The Romans spread the technology to southern France through the Rhone River valley, where they built the capital city, Gaul, which is called Lyon today. In the city of Lyon, substantial evidences of agricultural buildings and houses made of rammed earth are still visible today. Native Americans were practicing the technology much before the arrival of Europeans in America. Another notable rammed earth structure that began construction in 100 C.E., in Teotihuacan, Mexico, is the famous Pyramid of the Sun. This structure was built using 2 million tons of rammed earth along with stone and rises to an impressive height of 207 feet. The first time rammed earth European traditions arrived in Americas was from Spain. The oldest remains of a European structure in America are a restructured earth house belonging to the first formal European settlement and the city of La Isabella in the Dominican Republic. Christopher Columbus founded this on his second voyage to America in the year 1493. The technology of rammed earth further spread into the southern United States and South America with the Spanish conquest. In the mid-19th century, Chinese immigrants that had arrived to participate in the gold rush in California brought this technology to the western coast of the United States. In Dutch flat in California, a small store that was constructed of rammed earth in the year 1877 by Chinese immigrants still remains. During the same time as the gold rush was raging in the West, French immigrants that arrived in the southern United States were constructing plantation houses, churches, slave quarters and schools out of rammed earth. Other notable examples of rammed earth construction are the historic campus of the Southwest School of Art and Craft in Sumter, South Carolina built in 1850. While rammed earth was building its emphasis in the United States, Australians, on the other hand, were beginning to establish towns by compacting the soil of the Central Australian desert. Many French-making countries renamed rammed earth walls "Pise". Although when the rammed earth technology began is still not clear, researches conclude that it evolved from "puffed" mud wall construction. This is defined as a prehistoric mud type wall that was developed separately worldwide but is still currently used. Rammed earth walls that are placed with forms are similar to the construction using adobe bricks; however, the concept is totally different.

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