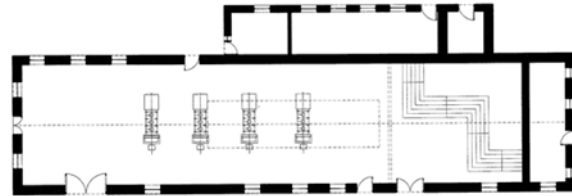


The Stone Masonry Contribution in Greek Industrial Buildings' Typology and Construction Durability (Late 19th to Early 20th Century)

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Figures 1,2. Power Plant building in Larisa, Greece (1913).

1 Introduction

Stone masonry is the oldest form of construction in the world until the beginning of the 20th century. The first stone walls were constructed by farmers and primitive people by piling loose field stones into a dry stone wall. Later, mortar and plaster were used, especially in the construction of city walls, castles, and other fortifications before and during the Middle Ages. These stone walls are spread throughout the world in different forms.

Usually, stone masonry is a traditional form of construction practiced for centuries in the regions where stone is locally available. It is still found in old historic centers, often in buildings of cultural and historical significance, and in developing countries where it represents affordable and cost-effective housing construction. This construction type is present in earthquake-prone regions of the world, such as Mediterranean Europe and North Africa, the Middle East, India, Nepal, and other parts of Asia.

Stone walls are usually made of local materials varying from limestone and flint to granite and sandstone. However, the quality of building stone varies greatly, both in its endurance to weathering, resistance to water penetration and in its ability to be worked into regular shapes before construction.

Stonework is the most common type of masonry in Greek traditional architecture due to the abundance of stone in most of Greece. The highest level of masonry was achieved by the

creators of the marble buildings of the Athenian Acropolis, where the carving perfection was such that the stones were so well fitted together that no mortar was needed and their interconnection to the metal interiors was accomplished.

Also, the majority of buildings in Greece at the end of 19th century up to the use of concrete in constructions are load-bearing stone masonry structures. Moreover, research show that it is the most widely construction material in industrial buildings, that era. As it is known, stone masonry has high compressive strength under vertical loads but has low tensile strength (against twisting or stretching) unless reinforced, while the tensile strength of masonry walls can be increased by thickening the wall.

Until World War I, the typology of industrial buildings in Greece was the same as in Europe. The architectural volumes of these buildings were adapted to the shape and size of the mechanical equipment, as well as to the needs of the production cycle, unlike to other private and public buildings of that era, in which the shape, size, and layout were following strictly by the stereotypes, dictated by neoclassicism.

In general, industrial buildings have particularities in their typology because they were directly dependent on their mechanical equipment and production line. The aim of this study is to investigate the contribution of stone masonry as a construction material in the typology of industrial buildings.

The proprieties of stones which are important for stone masonry are strength and durability, while economy and appearance are additional requirements. The main considerations for durability are the lasting qualities of the stone itself and the locality where it is to be used. Porous stones are unsuitable for areas prone to heavy rainfall and frost. Stones, e.g. marbles having low porosity and low coefficients of expansion and contraction should be used in areas subjected to large variations in rainfall and temperatures. Generally lime and cement mortars are used for stone masonry. Their function is to provide a workable matrix and ultimately a hard building material, which renders masonry into a monolithic unit.

Concluding, the typology of traditional industrial buildings is characterized by the elongated rectangular shape of the ground plan, which contained the mechanical equipment for the production of the products. This elongated rectangular shape proves that the layout of the machines was not random, but was arranged in a linear layout to facilitate the production line.

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