

**Pliny the elder (23-79 AD) The Complete Works of Gaius Plinius Secundus Delphi Classics ebook (2015) Hastings. Delphi Classics Publishing**

BOOK XXXV

Chapter 48 (14)

...Have we not in Africa and Spain walls of earth, known as 'formaeoan' walls, from the fact that they are moulded, rather than built, by enclosing earth within a frame of boards, constructed on either side. These walls will last for centuries, are proof against rain, wind and fire, and are superior in solidity to any cement...what person, too, is unacquainted with the fact that partition walls are made of hurdles coated with clay and that walls are constructed of unbaked bricks?

Chapter 49

Walls of Brick, the Method of Making Bricks

Earth for making bricks should never be extracted from a sandy or a gravelly soil, and still less from one that is stony; but from a stratum that is white and cretaceous, or else impregnated with red earth. If a sandy soil must be employed for the purpose, it should at least be male sand, and no other. The spring is the best season for making bricks, as at midsummer they are apt to crack. For building, bricks that are two years old are the only ones that are approved of; and wrought material of them should be well macerated before they are made.

There are three different kinds of bricks; the Lydian, which is in use with us, a foot-and-a-half in length by a foot in breadth; the tetradon and the pentadon...These last two kinds...are named respectively from their being four and five palms in length, the breadth being the same. The smaller kind is used in Greece for private buildings, the larger for the construction of public edifices....the Greeks have always preferred walls of brick, except in those cases where they could find silicious stone for...building, for walls of this nature will last forever....At Rome there are no buildings of this description, because a wall only a foot-and-a-half in thickness would not support more than a single-story; and by public ordinance it has been enacted that no partition should exceed that thickness...

**BOOK XXXVI The Natural History of Stones**

Chapter 52 Cisterns

Cisterns should be made of **five parts of pure, gravelly sand, two of the very strongest quicklime**, and fragments of silex not exceeding a pound each in weight; when thus incorporated, the bottom and sides should be well beaten with iron rammers...

Chapter 53 Quick-lime

Cato the Censor disapproves of lime prepared from stones of various colours: that made of white stone is the best. Lime prepared from hard stone is the best for building purposes, and that from porous stone for coats of plaster. For both these purposes, lime made from silex is equally rejected (hydraulic lime?). Stone that has been extracted

from quarries furnishes a better lime than that collected from the beds of rivers; but the best of all is the lime that is obtained from the molar-stone, that being of a more unctuous nature than the others. It is something truly marvellous, that quicklime, after the stone has been subjected to fire, should ignite on the application of water!

#### Chapter 54 The Various kinds of sand, the combinations of sand with lime

There are three kinds of sand: fossil sand, to which one-fourth part of lime should be added; river sand; and sea-sand; to both of which last, one third of lime should be added. If, too, one third of the mortar is composed of bruised earthenware, it will be all the better....

#### Chapter 55 Defects in Building. Plaster for Walls.

The great cause of the fall of so many buildings in our City is that through a fraudulent abstraction of the lime, the rough work is laid without anything to hold it together. The older, too, the mortar is, the better it is in quality. **In the ancient laws for the regulation of building, no contractor was to use mortar less than three months old; hence it is that no cracks have disfigured the plaster coatings of their walls.** These stuccos will never present a sufficiently bright surface, unless there have been three layers of sanded mortar, and two of marbled mortar upon that. In damp localities and places subjected to exhalations from the sea, it is the best plan to substitute ground earthenware mortar for sanded mortar. In Greece, it is the practice, first to pound the lime and sand used for plastering, with wooden pestles in a large trough. The test by which it is known that marbled mortar has been properly blended, is its not adhering to the trowel; whereas, if it is only wanted for white-washing, the lime, after being well-slaked with water, should stick like glue. For this last purpose, however, the lime should only be slaked in lumps.

At Elis, there is a Temple of Minerva, which was pargetted, they say, by Panaenus, the brother of Phidias, with a mortar that was blended with milk and saffron: hence it is, that, even at the present day, when rubbed with spittle on the finger, it yields the smell and flavour of saffron.

#### Chapter 58 Maltha

Maltha is a cement prepared from fresh lime; lumps of which are **quenched in wine**, and then pounded with hogs' lard and figs, both of them mollifying substances. It is the most tenacious of all cements, and surpasses stone in hardness. Before applying the maltha, the substance upon which it is used must be well rubbed with oil.

#### Chapter 59 Gypsum

Gypsum has a close affinity with limestone, and there are numerous varieties of it. One kind is prepared from calcined stone, as in Syria...for example....In Syria they select the hardest stones for the purpose, and calcine them with cow-dung, to accelerate the process...Gypsum when moistened must be used immediately, as it hardens with the greatest rapidity...It is very useful for pargetting, and has a pleasing effect when used for ornamental figures and wreaths in buildings....

#### Chapter 62 Terrace-Roof Pavements

The Greeks have also invented terrace-roof pavements...In making these...the proper plan is to begin with two layers of boards, running different ways, and nailed at the extremities, to prevent them from warping. Upon this planking a rough-work must be laid, one-fourth of which consists of pounded pottery; and upon this, another bed of rough-work, two-fifths composed of lime, a foot in thickness, and well beaten down with the rammer. The nucleus is then laid down, a bed six fingers in depth, and upon that, large square stones, not less than a couple of fingers in thickness, an inclination being carefully observed, of an inch and a half to every ten feet. This done, the surface is well rubbed down with a polishing stone....Wheat-ear tessellated pavements are laid down in a similar manner.

#### Chapter 63 Graecian Pavements

The ground is well rammed down, and a bed of rough work, or else broken pottery, is then laid upon it. Upon the top of this, a layer of charcoal is placed, well trodden down with a mixture of sand, lime and ashes; care being taken with line and rule to give it a uniform thickness of half a foot. The surface then presents the ordinary appearance of the ground; but if it is well rubbed with the polishing stone, it will have all the appearance of a black pavement.