The colour has a considerable bearing upon the selection of a stone, but this, although a very important matter, must give way before the question of durability. In large towns and manufacturing districts this is most emphatically the case, for within a few years of erection the exterior of a building in such districts is disguised under a coating of soot and grime.

Should the stone contain iron, especially in the form of “pyrites," there is a great likelihood of its being stained more or less badly by iron “ rust.” If the metal is distributed evenly in small particles throughout the mass the rusting may do no more barm than merely deepen the tone of the stone, but if present in large pieces the stain may be so serious as to spoil the appearance entirely.

When the durability of stone has not been tried over some con­siderable period in a building actually erected, the most careful physical and chemical tests should be made. , If the stone passes the following tests, satisfactorily it may safely be assumed to be of good quality and likely to prove durable: (1) Resistance to crushing; (2) acid test; (3) absorption test; (4) microscopical examination.

The resistance to crushing varies to an enormous extent with the different kinds of stone, from a little over 60 tons per square foot, which is the limit for a weak limestone, up to a load of over 1300 tons necessary to crush the hardest granites. In general practice the load placed upon stone should not exceed one-tenth, of the crushing weight as found by testing typical specimens. A six- inch cube is a convenient size often adopted for the blocks to which the crushing test is to be applied.

The effect produced by soaking pieces of stone for some days in a I % solution of sulphuric and hydrochloric acids will decide roughly whether it will be durable in a city atmosphere. The vessel containing the test should be agitated twice a day; the action of the acid is to dissolve any portions of the stone that would be decomposed by the action of smoke and acid fumes.,

A block of the stone under consideration should be dried thoroughly in a warm kiln or oven and carefully weighed before it has time to absorb moisture from the air. It must then be placed, to soak in clean water for twenty-four hours and after removal again weighed. The difference between the weights registered will give the weight of water absorbed, and this should not be more than 10% of the weight of the dry block. There are, however, exceptions to this test, some very porous stones being capable of taking up a large quantity of water and at the same time proving durable in use. But such material is liable to, allow damp to penetrate through it to the interior of the building in which it is employed.

The microscope is the best means of determining the structure of a stone, and of recognizing the presence of matter likely to affect its usefulness adversely. Should iron pyrites be discovered in any quantity the stone should be rejected,, as this impurity easily decomposes on exposure, and badly stains and sometimes splits the stone.

The hardest, least absorbent, and most compact and uniform stones are of ancient geological formation, and with time and in­crease of superimposed pressure have become dense and very hard. The softer stones are of later formation, and are usually lighter in weight and more porous. A good stone should ring clearly when struck with steel, and a fresh fracture should on examination be bright, clean and sharp in texture and free from loose grains. A dull earthy appearance indicates an inferior stone.

A simple test for determining whether a stone contains much earthy matter is this: Some small chippings from the stone are placed in a vessel with sufficient water to cover the pieces, and are eft undisturbed for about three-quarters of an hour. The water is then gently agitated. With stone of a highly crystalline nature, having its particles well cemented together, the water will remain clear, but stone containing earth and clay will cause the water to become thick and cloudy in appearance.

The action of the air of certain districts has been shown to be prejudicial to the durability of many stones. A striking instance of this peculiarity is afforded by Cleopatra’s Needle on the Thames Embankment. This is an Egyptian monument of carved granite which undoubtedly stood for some thousands of years with, little deterioration on the spot from which it was removed. But since its erection in London it has been, found necessary to coat it periodically with a preservative solution in order to check the rapid decay set up by the impurities of the London atmosphere. Similarly the Egyptian obelisk in Central Park, New York, U.S.A., has for the same reason been coated with a preparation of paraffin containing creosote dissolved in turpentine. The surface of the stone was heated by means of lamps and charcoal stoves, and the compound applied hot. .

The most usual method adopted for preserving stonework is to paint the exposed surfaces with ordinary’ oil colour. This fills the pores of the stone and forms a coat which, though weather-proof, completely hides the natural beauty of the stone. The paint­ing must be redone every four or five years. *Boiled linseed oil* is sometimes used on stonework, one or more coats being well brushed in after cleaning it Its use deepens the colour of the stone, and unless very carefully done the work is apt to appear patchy,. A large number of processes consist of coating the stonework with a solution of soluble silica. In *Kuhlmann's process* a solution of silicate of potash or soda is brushed into the stone and, aided by the carbonic acid in the air, acts upon some of the constituents of the stone and forms a hard surface which is not liable to decay. In *Ransome's process,* a solution of silicate of soda is applied until the surface of the stone has become saturated. This is allowed to dry and a solution of chloride of calcium is then applied in a similar manner. The two solutions act together and by decomposition produce an insoluble silicate of lime which fills the pores of the stone and binds its par­ticles together, thereby checking decay. *Baryta water* will, when applied to limestone that has decayed owing to the action of sul­phurous fumes, penetrate into and solidify tne crumbling portions, with the result that the stone is reconstituted and becomes hard and quite solid. Professor A. H. Church employed this method in arresting the decay of the frescoes in the Houses of Parliament and the stonework of the chapter house at Westminster was also treated by him in the same manner. *Fluate* is the name given to a siliceous preservative specially recommended for use upon the limestones from the,Bath district. It may also be applied to other limestones, and to bricks, tiles, terra-cotta, &c. It does not materially change the appearance of the stone but enters the pores and prevents decay. Stonework that is much decayed may be restored by Tabard’s Metallic Stone, which is a natural stone of trachyte origin reduced to powder. The stone is restored to its original condition by mixing the powder with an acid which softens and reunites the molecules without decomposition. The invention is of French origin and has been used for much important work on the continent of Europe and in England.

The natural bed of a stone is that surface on which it was originally deposited. But volcanic and other disturbances may have occurred since that time and completely altered its “lie”; and therefore it frequently happens that a horizontal line does not coincide with the natural bed of stone as it rests in the quarry. Care must be taken, however, before using the stone in a building, to find the proper bed and to set all stones with their laminae quite level. Exceptions to this rule occur in the projecting stones of cornices and string courses, especially those with undercut members which would be likely to drop off were the natural bed level ; in these cases the stones should be placed on edge with the laminae vertical, except of course at the angles of the building where the stone must be specially selected and laid on its natural bed. Limestones and sandstones which are granular in structure and are found with wide planes of cleavage, giving deep beds which can be quarried in large blocks having no tendency to split in any particular direction, are known as freestone.

Stone fresh from the quarry is found to contain a quantity of moisture called “ quarry sap,” on account of which all stones (even granite) are comparatively soft when first quarried. This water gradually evaporates, and after some months’ exposure stones that were quite soft and weak when quarried acquire hardness and strength. For these reasons it is desirable from an economical point of view to “ work ” the stone to its desired shape and mould and carve it when soft and easily workable. By adopting this method a considerable saving in carriage will be effected, and the durability of the stone is enhanced, for the quarry sap on drying out leaves a hard outer crust or protective skin which would be removed if the working of the stone were left until it had become seasoned. It is an interesting fact that Sir Christopher Wren directed that the stones used in the erection of St PauΓs Cathedral should be seasoned for three years on the sea beach.

Building-stones are divided into several groups; limestones and sandstones are classified as aqueous or stratified rock, granite being the principal igneous or unstratified stone.

*Limestones* consist chiefly of calcium carbonate with small ρro- portions of other substances. They are often classified under four *: Compact* limestones consist of carbonate of lime, either pure or in combination with clay and sand. *Granular* or *oolitic* limestones consist of grains of carbonate of lime cemented together by the same substance or mixed with sand and clay. The grains are egg-shaped (hence the name “ oolite ”) and vary in size from tiny particles to grains as large as peas. *Shelly* limestones consist almost entirely of small shells, cemented together by carbonate of lime. *Magnesian* limestones are composed of carbonates of lime and magnesia in varying proportions, and usually also contain small quantities of silica, iron and alumina. Stones having less than 15% of magnesia are not classed under this head. *Dolomites* are limestones containing equal proportions of carbonate of lime and carbonate of magnesia. Many of the finest building-stones are limestones. In England typical examples are the Bath stones, Portland stone and Kentish ragstone, and in America those from the states of New York, Indiana (Bedford quarry, light brown stone), Illinois (Grafton and Chester quarries) and Kentucky (Bowling Green stone, light grey, similar to Portland). Notable French limestones are obtained from the quarries at Peuren (cream), Château-Gaillard (white), Abrots, Normandoux (white), and Villars (light brown). The hardest and closest grained of these are capable of taking a fine polish. Limestones should be used with care as they are uncertain in their behaviour and usually more difficult tα work than sandstones, and as a general rule they do not stand the