Issued by
The British Stone Federation
70 Victoria Street S.W.1
Telephone VICtoria 6018/9

Architectural Engineering Monumental

STONE

information on current stone practice. No.1: May, 1954

DESPITE the diversity and ever-widening range of new building materials, it is becoming more and more evident that the traditional materials have an important and valuable part to play in contemporary design, particularly so in modern British architecture which is making an international name for itself.

I therefore welcome the introduction of information sheets on Stone by the British Stone Federation. These will make available to architects and students data enabling them to make the best use of this "King of building materials".

THE PRESIDENT, ROYAL INSTITUTE OF BRITISH ARCHITECTS

R.I.B.A. HEADQUARTERS (PORTLAND STONE) ARCHITECT: GEORGE GREY WORNUM, F.R.I.B.A.

The material of great architecture

IT IS BECOMING INCREASINGLY EVIDENT TODAY that, with the freedom which has so recently been given to the building industry, there is promise of a new era for the use of stone.

No building material has so great a tradition as stone, for it is in stone that the great architecture of almost all civilizations has been built. Wherever men have built for the future, and not for the moment, and have aimed at giving aesthetic pleasure as well as serving a functional purpose, they have used stone. In Britain we are particularly fortunate in having stone of excellent quality in considerable variety, and ample reserves of these stones are available.

In the rebuilding of such blitzed city centres as London, Coventry and Southampton, stone is again being widely used; and the well-known post-war housing programmes which have been successfully carried out in local stone by councils in the Cotswolds and in Derbyshire, are but two instances where the return to stone has met with outstanding success. It has proved that the use of stone need not be confined to special occasions any more today than it used to be, and that stone, as ever, lends itself to grace and beauty in harmony with rural backgrounds and city surroundings.

The use of stone is not a question of suitability to any particular architectural style, because the intrinsic beauty of the material has, since early times, played an equally important part in buildings of totally different character and structure.

A record of the supreme works of architecture in Western culture is largely a history of building in stone. The massive temples of Egypt were built mainly of the limestone from the Mokattan hills in the north, and the sandstone of the central area and the granite from the south. Although the great Assyrian palaces were built of brick, they were faced externally and internally with slabs of limestone and alabaster—much of it covered with low-relief carving which is among the most magnificent of its kind. The temples of Greece were built mainly of white marble (a recrystallized limestone) from Mount Pentelicus and the island of Paros, and permitted that precision, refinement and delicacy of detail which has ever since been the admiration of the world. The Romans used a variety of building materials—principally brick, terra-cotta, concrete and stone—but it is in stone that the most memorable architecture remains.

The first entirely Renaissance building in London—Inigo Jones' Banqueting Hall at Whitehall Palace—was built of oolitic limestone, which ever since has been the most favoured material for public and office buildings in London and elsewhere.

In modern building, a revolution has taken place: the structural walls of solid masonry have been changed for buildings of any size to a steel or reinforced-concrete frame with non-supporting screens between. Stone has become mainly a facing material, as when it faced the brick walls of Assyrian palaces or was used as marble incrustation in buildings of the Italian Renaissance.

Colour, tone, variety of texture, weathering qualities—these are some of the characteristics that make stone the perfect building material.

Although in modern architecture the emphasis is on the relation of large plain masses, these masses are interesting and effective by their texture, tone and colour qualities in which stone is pre-eminent. And the value of sculpture is being realized again, not as in the past, but for decorative focal points that arouse interest. For the architecture of the future, stone can hold a beauty different from—but maybe as great as—that of the past.

R.A.F. PAVILION AT BROOKWOOD CEMETARY (PORTLAND STONE) ARCHITECT: SIR EDWARD MAUFE, R.A., F.R.I.B.A.

Location of principal quarries throughout England, Scotland & Wales

1 Portland Stone

SOURCE Isle of Portland, Dorset.

GEOLOGICAL Limestone. Upper Oolite series of the Jurassic System. (Approximate age: 145 million years.)

COLOUR Generally creamy white.

PRINCIPAL BEDS AND CHARACTERISTICS *Whitbed.* Fairly even textured and close grained. Contains a proportion of shell distributed throughout the mass and also in thin layers. Works relatively easily—will take and hold sharp arrises, and is suitable for all classes of plain and moulded work and for carving.

Roach. Shelly and cellular, ranging from coarse to fairly fine shell-formation. Somewhat harder than Whitbed, but can be worked in similar manner. Can be polished and is suitable for internal-wall linings, as well as for general building and engineering work.

Basebed. Fine-grained, even-textured, comparatively free from shell. Free working and eminently suitable for internal use and for highly decorative work.

AVAILABILITY Unlimited supplies. Output of quarries in excess of one million cubic feet a year.

SIZES Although blocks 15 ft. long can be specially quarried, the normal commercial length averages 7-8 ft.

The average maximum height is 4 ft. 6 in.

FINISH Normally fine-rubbed, but practically any type of finish can be given.

PHYSICAL PROPERTIES Density 133 lb. per cu. ft.

Porosity 12%

Water Absorption 3.7%

Failing stress 204.7 tons per sq. ft.

(The above figures are typical for Whitbed.)

WHERE USED Portland stone has been so widely used in this country, that no purpose would be served by listing even the more important jobs. Examples of its use can be found in most towns and cities. Since the war, it has been exported in considerable quantities, and has been used in U.S.A., Belgium and Holland.

THE FINAL CHOICE OF A STONE MUST DEPEND on several factors—type of building, architectural style, surrounding architecture and conditions, location of building, availability of stone within economic transport-range, and so on. These factors are, of course, largely a matter for the architect to assess, but the following notes may prove helpful.

On choosing stone

SUITABILITY

Selection of a stone for a particular project can depend, broadly, on the following points:
(a) Physical structure; (b) chemical composition; (c) whether available in sufficient quantity; (d) sizes of blocks procurable; (e) colour; (f) finish.

Physical structure is important. The crushing-strength should be adequate for the purpose in view. A distinctly laminated stone should not be used for slab-facings, because of the tensional stresses it is likely to undergo. Such stones are, however, quite suitable for block masonry. Stone having a high coefficient of saturation should be avoided for thin external facings, especially in exposed positions. The general texture of a stone should be such that it will meet the needs of the design of the building. For instance, some stones are so dense and difficult to mason that the cost of conversion into elaborate design on complex ornament is almost prohibitive, while others are either too coarse-grained or too shelly to permit of sharp arrises and clean detailing for elaborate work. The texture can also determine the extent to which machine work can be employed, although with modern machinery most stones are economically dealt with, and it is more a question whether the design permits of machine dressing.

Chemical composition does not, as a rule, have much bearing on selection, beyond determining whether a limestone, sandstone or granite is to be used. It could influence selection for particular purposes such as certain engineering projects and specific industrial uses.

Quantities available. Normally, most quarries are able to meet reasonable demands, but for large projects it may be desirable to order supplies well in advance of requirements, so that stocks may be piled. Another factor to consider is maintenance of supply during winter months. Heavy rains and frosts can bring quarrying operations to a standstill for many weeks on end. Forward planning in the ordering of supplies will minimize delays on the building site.

Sizes of blocks vary from quarry to quarry. Usually the limiting factor is height in the bed, but excessively long stones are often difficult to secure in any quantity. Liaison between architect and quarry will ensure that design does not have to be modified at a late stage to suit the limitations of the stone.

Colour. It is possible to achieve a pleasant harmony of colour by the use of different stones or, indeed, by the use of the same stone but from different beds. Where different stones are used, it is necessary to make sure chemical reaction does not take place. Generally, limestones can be used with limestones, and sandstones with sandstones. Granites can be used with either limestone or sandstone.

Finish. There is a wide range of surface-finishes that can be given to stone, and the design and architectural treatment will decide which is most appropriate. The softer limestones and the sandstones do not normally take a polished face.

PROBLEMS OF WEATHERING

Stone, being a product of nature, will not resist indefinitely the action of atmosphere and other causes of deterioration; but, by avoiding the known causes and by regular attention and maintenance, it can have a far longer life than that of most other materials. Changes in the exposed surfaces due to natural weathering are not in themselves detrimental—they add charm and character to stone.

All facing-materials are affected by carbon-dioxide and acid sulphur compounds, present in the atmosphere of large cities and industrial areas. There is as yet no known means of halting the ravages of these, but if stone has been wisely chosen and used, a long time must elapse before any serious deterioration occurs. Such deterioration can be considerably delayed by the periodical washing of the stonework with clean water, and this is strongly recommended.

A firm belief exists that stone weathers best in its own local atmosphere, but there is no evidence to support it: limestones may be safely used in sandstone districts, and vice versa. Granite will withstand almost any atmosphere, and is possibly the most impervious building material known.

Limestones or magnesian limestones should not be used in juxtaposition with sandstones, as calcium sulphate from the limestone causes decay in sandstone. Similarly, limestones will decay if used in conjunction with magnesian limestone, due to the absorption of magnesium sulphate.

ADVISORY SERVICE

The British Stone Federation has made a close study of all the problems relating to the use of stone, and has set up an advisory panel, which is freely at the service of architects and others, to give advice and help on stone matters. Inquiries should be addressed to the Secretary, The British Stone Federation, 70 Victoria Street, S.W.1.

In future issues of these information sheets it is hoped to deal in detail with a variety of topics affecting the use of stone.

PRINTED BY KENNERLEY PRESS LTD., LONDON, N.1—9316