

DIOCESE OF CHELMSFORD
DIOCESAN ADVISORY COMMITTEE

**STONE CONSERVATION AND
RENEWAL**

ASHLAR AND RUBBLE MASONRY

GUIDELINES TO ASSIST PARISHES

Issued March 2003

ASHLAR AND RUBBLE MASONRY. STONE CONSERVATION AND RENEWAL

INTRODUCTION

- 1.1** Essex has few naturally occurring building stones, and very few stone buildings apart from churches. There is no active tradition of building in stone, and many stones used in the past are no longer available. The result has been a tendency to adopt the easiest solutions when building in stone or repairing masonry: rubble stonework may have been executed without reference to existing work or past practice, and ashlar repaired with those types of stone most easily come by whether they match or not. Such practice is unacceptable: this document sets out the requirements of the Chelmsford Diocesan Advisory Committee and gives advice on methods and sources of materials.

ASHLAR MASONRY

- 2.1** Ashlar is dressed and squared stone, ideally a freestone, i.e. a stone which can readily be cut in any direction. Medieval Essex churches were generally rubble built, ashlar being used for the dressings, i.e. corner stones, window and door surrounds and window tracery.

Is stone replacement necessary?

- 3.1** First, consider whether stone replacement is absolutely necessary, particularly if it is difficult to obtain matching stone. If stonework in a window or door is 500 years old or more and preserves its structural integrity, then there is little benefit to replacing it. If the window or door is substantially original, or if it is one of the last original parts of a feature which has already been extensively restored, then there is a good case for conserving it. It might be appropriate to use the lime method. Whatever

the case, it will probably be a good idea to obtain a report from a specialist stone conservator.

The lime method

- 4.1** This technique, pioneered at Wells cathedral, involves trying to consolidate the stone by applying about 40 coats of lime water, and then protecting it with a shelter coat. Although there are doubts as to the efficacy of lime water in consolidating the surface of the stone, the method involves low level intervention, is relatively cheap, and the shelter coat will protect the stone. The shelter coat, however, does require care in preparation to achieve a good colour match and is sacrificial, requiring renewal perhaps every five years. Although technically only suitable for limestones, this technique has been used satisfactorily on Reigate stone.

The problem of restoring Reigate and Kentish Rag Masonry

- 5.1** These stones (which are described in the Appendix below) are probably those which were most extensively used for dressings (i.e. windows, doors, quoins etc.) in Essex churches from the 12th to the 19th centuries. Reigate is unavailable; Ragstone only in small quantities from limited sources. Nevertheless, there is no excuse for not using Ragstone to replace or repair Ragstone: it only involves planning ahead and ordering materials in advance of the work to be carried out. The use of different stones that do not match will not be countenanced by the DAC. Obtaining stone suitable for carving tracery may be a problem, in which case the stones suggested for replacing Reigate may be suitable.

If work is contemplated to Reigate masonry, first ask whether it needs replacement or whether it can be left for

longer or treated by the lime method (see above). Acrylic consolidants have also been used on Reigate with apparent success. If these questions are unclear, then seek the advice of a stone conservator. If there is no option to replacement, consider the following stones:

Chilmark

The stone of which Salisbury cathedral is built, obtained from quarries in the Tisbury and Teffont area. A sandy limestone, it is greenish in colour and has been used by the National Trust and Historic Royal Palaces as a replacement for Reigate. There are two sources at present, the Teffont mine and the Chicks Grove quarry. The mine produces blocks of limited size from three beds, the Pinney bed being the best match for Reigate. The quarry has large blocks of stone from as many as 17 beds, the A bed being said to be the best match for Reigate.

Clunch

This hard chalk, especially that from Totternhoe, can be a fair match for Reigate in colour, and also in texture and hardness.

RUBBLE AND FLINT MASONRY

Most medieval Essex churches have their walls built of flint mixed with stones of various types collected from the fields. In older buildings, the flints are generally rounded. In 14th – 16th century work, however, the flints may be cut or knapped, either to make them appear black and glossy or to square them up to a particular size. Such work is typical of East Anglia and may be inset with dressed stone to form traceried patterns in what is known as flushwork.

Assessing the Character of the Masonry

- 6.1** An essential preliminary to the repair of flint masonry is an assessment of the existing walling. Are the flints used

in it rounded or are they knapped with glossy black faces? Are they well sorted and uniform in size? Are they laid in precise or approximate courses? New flintwork should harmonise with the old. In particular, because medieval flint walls were raised in lifts which could be as little as 150-230mm high, the flints were set in courses. These horizontal courses impose a visual logic on the character of the masonry which is satisfying and natural to the eye. In modern times, much stonework is only a cladding on brickwork or blockwork and there is a tendency for it to be applied as crazy paving which looks unattractive and ugly. Care should be taken to avoid this.

Mortar and Pointing

- 7.1 There is often debate as to the appropriate finish to pointing of rubble walling. There is no real historical precedent for this as such walls were plastered. It is usual to leave the stones slightly proud of the mortar which is brushed back to expose the aggregate; there seems no reason to modify this practice. Modern mortars should be regarded as conservation mortars which cannot hope to replicate those used in medieval masonry. This is because the latter used materials often little better than sandy earths dug out of local pits. Modern limes and sands are too refined and purified to reproduce these originals. However, mortar analysis can furnish useful historical and archaeological data, can indicate the original proportions and size of aggregate, and also identify any less usual constituents such as shell or crushed brick which may be making a contribution to the character of the matrix. Repair mortars should be expected to succeed in matching the colour and general appearance of the original.
- 7.2 A sample panel of mortar and stonework should be approved by the architect and the DAC before work commences.

LIME MORTAR

- 8.1** The use of an appropriate bonding and pointing material is essential to the durability and preservation of ashlar and masonry walling. Lime mortar is made with limestone burnt to drive off the water and carbon dioxide, and so convert it to quicklime or what is sometimes known as lump lime. This is then slaked by mixing it with water, a process which produces lime putty. This is a jelly-like substance to which aggregate (sand etc.) can be added, usually in a 3:1 mix, to make mortar. Unlike cement, lime mortar does not have a chemical set in the presence of water. Instead it hardens or cures gradually through taking up carbon dioxide in the air, which converts it back to calcium carbonate.
- 8.2** The advantage of lime mortar is that it has a physical structure which allows moisture to pass through it so that it can breathe. In a stone building bonded with lime mortar, excess moisture is given off through the joints between the stones. If the mortar is harder than the stones, as is often the case with cement, then moisture will be forced out through the stones, breaking up their surface and causing them to spall and disintegrate. Even when a wall is built of a very hard stone, such as flint, it is preferable to use a lime mortar as should damp penetrate the wall, as often happens at joints or cracks, then it will breathe rather than having the moisture try and force its way out through weak points such as window openings made with a softer stone.

APPENDIX

AN ACCOUNT OF BUILDING STONES WHICH HAVE BEEN USED IN ESSEX

STONES OCCURRING IN ESSEX WHICH HAVE BEEN USED FOR BUILDING IN THE PAST

Note that most medieval masonry in Essex churches, whether rubble or squared stone, was originally protected by external plaster. This sometimes included freestone inside the church as well.

Sarsens

A silcrete from old land surfaces which have been broken up and moved around by glacial action. Boulders are sometimes found in foundations. Often thought to signify a pre-Christian presence at a site.

Flint

Nodules of silica formed in chalk, usually obtained in a rounded state from a secondary deposit. May have the face removed to produce a glossy finish, or be knapped into a squared shape.

Conglomerate

Also known as ironstone, ferricrete and puddingstone. A concretion formed by iron panning in gravel deposits. Blocks were usually roughly squared for building purposes. Common in 12th century work. Little used after c.1200. Fairly durable but today blocks are often in a poor condition. Not generally available though deposits are accessible.

Septaria

Hardened calcareous nodules, sometimes very large blocks in which case they are usually roughly squared, generally recovered from cliffs or the shoreline (in which case they

are rounded and barnacles may be attached to them). Extensive deposits at Harwich were used for making Roman cement. Although dense and hard, it weathers badly. Available from the Orwell estuary in Suffolk. Usually present in churches relatively near the coast.

Chalk

Presumably obtained from the now exhausted quarries in Thurrock, chalk can be found used in foundations and for the cores and inside faces of walls of churches in south and east Essex.

Tufa

A calcareous concretion found in river valleys. An excellent off-white durable freestone with a cellular texture, the best of the local building stones. Not used after c.1200. Deposits exist in, for instance, the valley of the river Brain (it is extensively used in Faulkbourne church) but it is unavailable today.

Bunter quartzite

Well rounded pebbles and cobbles of a reddish sandstone cemented by more silica, and brought from the Midlands by glacial action.

NON-LOCAL STONES USED FOR BUILDING IN ESSEX IN THE MIDDLE AGES

Good freestones became increasingly readily available during the Middle Ages, superseding Roman brick and tufa for window and door surrounds by the end of the 12th century.

Reigate

A calcareous fine-grained sandstone from the Upper Greensand, from the Reigate area of the North Downs. Colour can be variable but usually has a distinctive

greenish hue, though it turns greyer as it ages. Soft and easy to work, much used for dressings and tracery; where used externally it is in poor condition today. Probably used from before the Norman Conquest until the 19th century. Unavailable (though it is said that Westminster Abbey is considering re-opening a mine).

Caen

A pale creamy yellow stone from Normandy which has been used in England from the 11th century to the present day. It does not weather well. Wren described it as 'more beautiful than durable'. Matching stones are available from France, whence they are supplied to Canterbury cathedral. Canterbury uses Lapine which comes in two qualities, fine and shelly. The Cathedral may be able to assist with obtaining a supply of this stone.

Kentish ragstone

A sandy limestone from the Lower Greensand, from the Hythe Beds which extend from the coast through Ashford up as far as Maidstone and Sevenoaks. Typically grey or greenish grey in colour. Commonest in those parts of the county nearer London. The term rag implies it is not a freestone and it was extensively used for walling, often only roughly squared, from the 12th to the 19th centuries when it was popular with Victorian architects. However, there were about 50 known quarries and different beds are variable: more tractable types were used for dressings and tracery, especially in the 15th century. Only available in limited quantities today.

Clunch

A term applied to hard beds of chalk which are useful as building stones. That which has been used in Essex came from two main sources, Cambridgeshire and Totternhoe in Bedfordshire. Totternhoe is sandier and grittier than normal clunch, and it can have a greenish-grey

appearance. Mainly to be found in the north and west of the county. Although soft, it should be borne in mind that weathered stonework is 500 years old or more. Available from both sources today.

Oolitic limestones

Jurassic rocks present from Lincolnshire through Huntingdonshire and Cambridgeshire, Northamptonshire and Oxfordshire down into the west to Dorset. They consist of ooliths, spheres of lime which have precipitated out in the seas in which they were formed. Excellent durable freestones, of many different types, usually brown to yellow in colour. Historically the type most used in Essex, where it occurs mainly in the north of the county, comes from the Barnack quarries (originally in Northamptonshire, now in Cambridgeshire) and is rather shelly. Although Barnack itself is not readily available, other types are, notably Clipsham and Ketton.

Purbeck marble

This oolite is characterised by the presence of freshwater snails and is famous for being able to take a polish. Rarely used as a building stone in Essex churches, but common in monuments and in the form of reused stones from monuments, altars etc. Readily available today.

Portland

A hard very durable white fine-textured oolite, which became available from the end of the 17th century with improved transport and power sawing. Mainly used for churchyard monuments, but sometimes in the fabric of churches and sometimes for repair work. Readily available.

From Tudor times, an increased range of stones became available for use in Essex. Such stones which have only occur occasionally may be difficult to identify. For

instance, Beer stone from Devon is documented at Old Thorndon Hall built by Sir John Petre in the 1570s and 1580s. Ketton from Lincolnshire was used at Audley End.

BUILDING STONES COMMONLY USED IN ESSEX IN THE 19TH AND 20TH CENTURIES

Victorian restorations often involved extensive replacement of stonework in doors and windows, a process that has continued since so that today it is often uncertain what type of stone was used in the various phases of a church's construction. Bath stone, often now a rather strong yellow brown in colour, was widely used in 19th-century work, though in the north of the county stone from the Northamptonshire and Lincolnshire areas was much used. Today it is these stone types which are most readily available and which for that reason figure most prominently in restoration proposals. They are oolites, predominantly yellowish or brownish in colour, and although excellent stones, they are not a good match for many of the stones that have traditionally been used in Essex in terms of colour, texture or hardness.

Bath stone

This belongs to the Great Oolite group. Its use became widespread with the construction of Bath and the development of better transport with the Kennet and Avon Canal and the Great Western Railway. The best stone is the Box Ground Stone from the lowest bed, the Combe Down Oolite. The next bed up, the Bath Oolite, produces the Ground Stones which are pure oolites and softer. Working quarries are at Westwood, Monk's Park and Limpley Stoke. The most commonly used stones today in Essex are Stoke Ground and Stoke Bed.

GLOSSARY

Ashlar

Squared stone, stone which has been precisely cut to form rectangular blocks.

Freestone

Stone which can be freely cut in any direction, typically to make ashlar.

Ragstone

Stone which cannot be readily dressed and carved with precision.

Sheltercoat

Protective coating usually made from a mixture of lime and casein, and coloured to match the stonework.

Silcrete

A silicified rock.

BIBLIOGRAPHY

Ashurst, J. and Dimes, F.G. 1998 *Conservation of building and decorative stone*, Oxford: Butterworth-Heinemann.

Clifton-Taylor, A. 1987 *The pattern of English buildings*, London: Faber (4th ed.).

Tatton-Brown, T. 2001 The quarrying and distribution of Reigate stone in the Middle Ages, *Medieval Archaeology*, **45**, 189-201.

Worssam, B.C. and Tatton-Brown, T. 1993 Kentish Rag and other Kent building stones, *Archaeologia Cantiana*, **112**, 93-125.

POLICY

- 1.** To preserve historic stonework, wherever possible.
- 2.** To replace stone with identical stone, or with the best matching stone in terms of colour, texture and weathering properties.
- 3.** The DAC will normally require to inspect samples of replacement stone and of masonry walling in new build.
- 4.** Should the case for stone replacement seem marginal, the DAC will expect to see it justified by a stone conservator's report.
- 5.** Lime mortar should be used in all repairs and repointing.
- 6.** Approval of stone repairs, and of masonry in new work, should be subject to the inspection of a sample panel.

This is one of a series of DAC Guidance Notes obtainable from the Diocesan Resources Centre (Tel: 01245 294405)

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