Historic England

Hampshire

Building Stones of England

The Building Stones of England

England's rich architectural heritage owes much to the great variety of stones used in buildings and other structures. The building stones commonly reflect the local geology, imparting local distinctiveness to historic towns, villages and rural landscapes.

Historic England and the British Geological Survey (BGS), working with local geologists and historic buildings experts, have compiled the Building Stones Database for England to identify important building stones, where they came from and potential alternative sources for repairs and new construction.

Drawing on this research, plus BGS publications and fieldwork, guides like this one have been produced for each English county. The guides are aimed at mineral planners, building conservation advisers, architects and surveyors, and those assessing townscapes and countryside character. The guides will also be of interest if you want to find out more about local buildings, natural history, and landscapes.

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First published by Historic England in May 2017. This edition published by Historic England May 2023.

Please refer to this guide as:

Historic England 2023 *Hampshire. Building Stones of England*. Swindon. Historic England.

HistoricEngland.org.uk/advice/technical-advice/

Front cover: Marsh Court, near Stockbridge. Chalk block. © Taylor Tripp.

How to Use this Guide

Each guide describes the local building stones in their geological timescale order, starting with the oldest layers through to the youngest. The guide ends with examples of other notable building stones from other parts of England and further afield.

Geological time periods, groups, formations and building stones

Each building stone is listed under the relevant geological timescale, group and formation. A formation may be divided into members and where relevant these are referenced in individual building stone sections.

Middle Jurassic
↑— geological time period

Inferior Oolite Group, Lincolnshire Limestone Formation
↑— geological group ↑— geological formation

Lincolnshire Limestone
↑— building stone (alternative or local name)

Bedrock geology map and stratigraphic table

To help you with the geology of the area, there is a bedrock geology map and a stratigraphic table which shows the layers of rocks and the associated building stones in this geological timescale, group, formation order.

Page numbers for each building stone are included in the stratigraphic table for ease of reference. The page numbers are inverted to correspond with the geological age order.

Contents list

If you click on the page number for a building stone in the Contents list, you will go straight to the relevant section in the guide.

Building stone sources and building examples

A companion spreadsheet to this guide provides:

- More examples of buildings. Information is included on building type, date, architectural style, building stone source, and listed/ scheduled status
- A list of known (active and ceased) building stone sources such as quarries, mines, pits and delphs
- Additional information on building stones including lithology, grain size, sedimentary structures, key identification features, and notes on failure/weathering, and use.

The Building Stone GIS map allows you to search the Building Stones Database for England for:

- A building stone type in an area
- Details on individual mapped buildings or stone sources
- Potential sources of building stone sources within a given proximity of a stone building or area
- Buildings or stone sources in individual mineral planning authority area.

Further Reading, Online Resources and Contacts

The guide includes geological and building stone references for the area. A separate guide is provided on general Further Reading, Online Resources and Contacts.

Glossary

The guides include many geological terms. A separate Glossary explaining these terms is provided to be used alongside the guides.

The guides use the BGS lexicon of named rock units.

Mineral and local planning authorities

This guide covers the mineral planning authority areas of Hampshire County Council, New Forest National Park and South Downs National Park (part), the unitary authorities of Southampton and Portsmouth; and the local planning authority areas of Test Valley, Basingstoke and Deane, Hart, Rushmoor, Winchester, East Hampshire, New Forest, Eastleigh, Fareham, Gosport, Havant and the national parks.

Contents

1 Introduction

The solid geology of Hampshire essentially comprises a gently folded succession of sedimentary rocks dating from the Cretaceous and Palaeogene periods. These rocks are best understood in terms of a large basin-like structure (the Hampshire Basin), which extends for more than 160km from Dorchester (Dorset) in the west to Beachy Head (East Sussex) in the east. The southern boundary of the basin is delineated by the near-vertical chalk ridge that forms the Purbeck Hills in Dorset, the area from Old Harry Rocks to The Needles and the 'central spine' across the Isle of Wight, and then continues under the English Channel. The northern limit of the basin is reached at the chalk of the South Downs, Salisbury Plain and Cranborne Chase. At its widest point, the basin extends for around 48km between Salisbury (Wiltshire) and Newport (Isle of Wight).

For convenience, Hampshire can be subdivided into six areas on the basis of its geology, each with its own distinct landscape and character. These are: the Wealden Greensand, the Hampshire Downs, the South Downs, the north and south lowlands, the south Hampshire lowlands and the New Forest.

The Wealden Greensand continues into eastern Hampshire from West Sussex and includes part of the South Downs National Park area. Geologically, this is the oldest part of the county and comprises a succession of Lower Cretaceous sandstones, ironstones and siltstones (assigned to the Hythe Formation of the Lower Greensand Group and the overlying Folkestone Formation and Upper Greensand Formation). These strata represent sources of building stones commonly used in the county: the pale grey-green Hythe Sandstone, the deeply coloured carstone (an ironstone) and the pale whitish Malmstone. Historically, Lower Greensand Group sandstones were worked at Passfield, whereas Malmstone was quarried at Old Burghclere, Kingsclere, Upper Froyle and Selborne.

The Hampshire Downs and the South Downs extend through much of central and south-east Hampshire (north of a line from Awbridge to Waterlooville) and form relatively high hills with steep slopes where they border younger clays and sands of the lowlands to the south and north. The Upper Cretaceous chalk of the Downs has seen some use as a building stone. Flint, either quarried directly from the White Chalk Subgroup or gathered from downland fields as derived nodules, is used far more extensively as a building material. It has long been recognised as a very hard, resistant building stone and has been employed in the construction of very many walls and buildings across the Downs and in adjoining areas throughout the county.

The North Hampshire Lowlands and South Hampshire Lowlands (including the coastal plain) are underlain by soft Palaeogene sands, clays and gravels assigned to the Thames, Lambeth, Bracklesham and Barton groups. The coastal plain areas around Southampton, Portsmouth and Hayling Island are dominated by superficial deposits laid down in more recent geological times. Occasional harder layers within the Palaeogene strata were exploited on a localised scale for supplies of building stone, yielding mainly ironstones and ferricretes. Flint cobbles and pebbles present in the deposits of the coastal areas were also used for building purposes. However, the relative paucity of locally available building stones meant that many of the prestigious buildings and structures in these areas utilised imported stone, notably Bembridge Limestone and Quarr Stone from the Isle of Wight and Purbeck Stone and Portland Stone from Dorset. The youngest building stone used in Hampshire is tufa, although this was employed only on a very minor scale in the Hayling Island area.

The geology of the New Forest comprises mainly Palaeogene sediments assigned to the Bracklesham Group and Barton Group. Many of the older buildings in the National Park, especially churches, were constructed of a mixture of locally sourced flint nodules and blocks of red-brown or dark purple-coloured, iron-cemented sandstones and ferricretes, such as Burley Rock. Numerous buildings and structures also feature imported stone, especially Purbeck Stone.

Overall, Hampshire has no commercially significant building stone resources, and no quarries currently extract building stone in the county. Although extensive use has been made of several local stone types in the past, a roughly equivalent number of stones imported from adjoining areas have also been employed for building purposes in Hampshire.

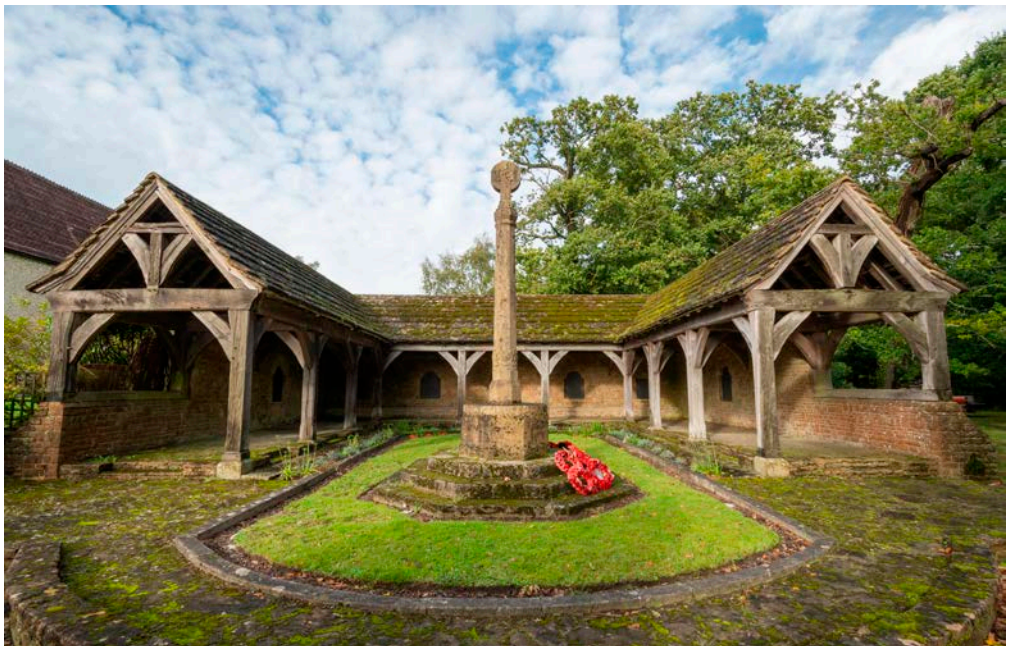
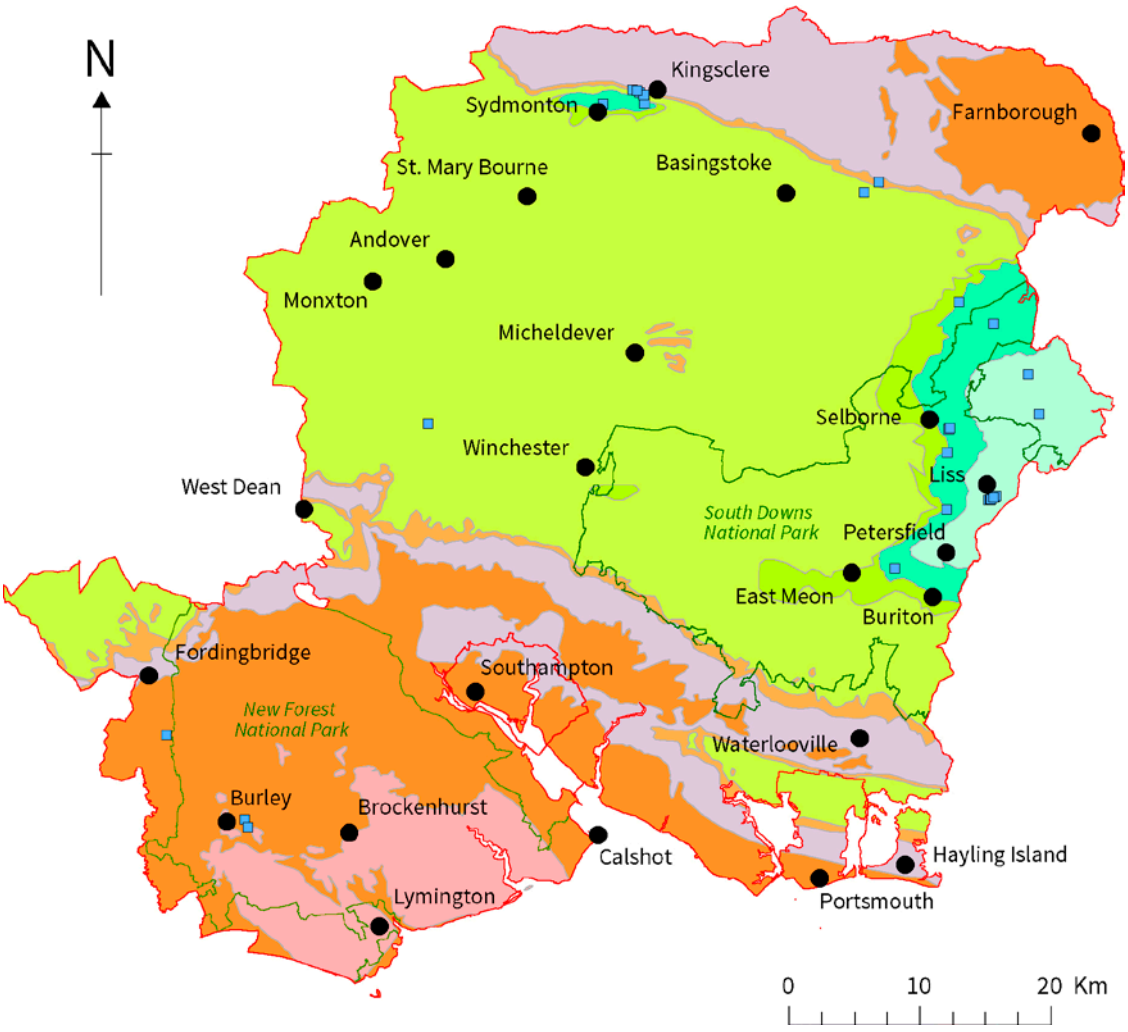


Figure 1: War Memorial cloister, Blackmoor. Bargate Stone.

Bedrock Geology Map



Key

Building stone sources

Bedrock geology

Solent Group — clay, silt and sand

Bracklesham Group and Barton Group (Undifferentiated) — sand, silt and clay

Thames Group — clay, silt, sand and gravel

Lambeth Group — clay, silt, sand and gravel

White Chalk Subgroup: Chalk Group — chalk

Grey Chalk Subgroup: Chalk Group — chalk

Gault Formation and Upper Greensand Formation (Selborne Group) — mudstone, sandstone and limestone

Lower Greensand Group — sandstone and mudstone

Stratigraphic Table

Geological timescale	Group		Formation	Building stone	Page
Quaternary	various		various	Tufa (Travertine) Quaternary Flint (Field Flint, Brown Field Flint, Beach Pebble Flint (Beach Cobble Flint)) Ferricrete (Heathstone (Harley Heathstone), Iron Pan, Ironstone-conglomerate, Ferrells, Sopley Stone, Burley Rock (Puddingstone))	26 23 21
Tertiary	Solent Group		various		
	Barton Group		various		
	Bracklesham Group		various		
	Thames Group		London Clay Formation	London Clay Cementstone (Septaria)	21
			Harwich Formation	Harwich Formation Siltstone (Basement Bed)	21
	Lambeth Group		Woolwich Formation		
			Reading Formation	Reading Beds Sandstone (Reading Beds, Reading Formation Ironstone)	20
			Upnor Formation	Sarsen stone (Greywethers, Bridestone)	19
Upper Cretaceous	Chalk Group	White Chalk Subgroup	Portsdown Chalk Formation	Chalk (Clunch) Quarry Flint (Fresh Flint) Hambledon Chalk	18 17 16
			Culver Chalk Formation		
			Newhaven Chalk Formation		
			Seaford Chalk Formation		
			Lewes Nodular Chalk Formation		
			New Pit Chalk Formation		
			Holywell Nodular Chalk Formation		
		Grey Chalk Subgroup	Zig Zag Chalk Formation		
			West Melbury Marly Chalk Formation		
Lower Cretaceous	Selborne Group		Upper Greensand Formation	Malmstone (Malm Rock, Bluestone, Blue Rag, Firestone)	15
			Gault Formation		
	Lower Greensand Group		Folkestone Formation	Carstone (Forest-stone, Clinker)	14
			Sandgate Formation	Bargate Stone	13
			Hythe Formation	Hythe Sandstone	12
			Atherfield Clay Formation		

Building stones in geological order from the oldest through to the youngest layers.

2 The Use of Stone in Hampshire's Buildings

Hampshire has a rich built heritage, with some 13,000 listed buildings and 200 conservation areas in the county. However, there is a relative dearth of good local building stone. Timber framing dominates the vernacular architecture of the county, even in the area with the largest resource of local building stone: the Wealden Greensand.

In the Saxon and medieval periods, Hampshire was heavily influenced by the extent of royal and ecclesiastical ownership. About 25 per cent of Hampshire's land was church owned. The county's agricultural surpluses financed the building of many fine stone buildings, including castles, the Old and New Minsters at Winchester, monasteries, churches and manor houses, as well as city walls for Winchester and Southampton. The Roman-built Portchester Castle and Saxon and Norman churches made extensive use of coursed unsplit local flint combined with better quality stone for dressings and architectural details. In addition to the local Greensand sandstones and Heathstone (ferricrete), stone was brought in from Wiltshire quarries such as Chilmark. Hampshire's coastal position and river network also facilitated the importation of building stone from the Isle of Wight (Quarr Stone and Nettlestone Sandstone), Dorset (Purbeck Stone), Devon (Beer Stone) and northern France (Caen Stone), all of which were generally used for dressings, wall facings and features such as doorways and windows.

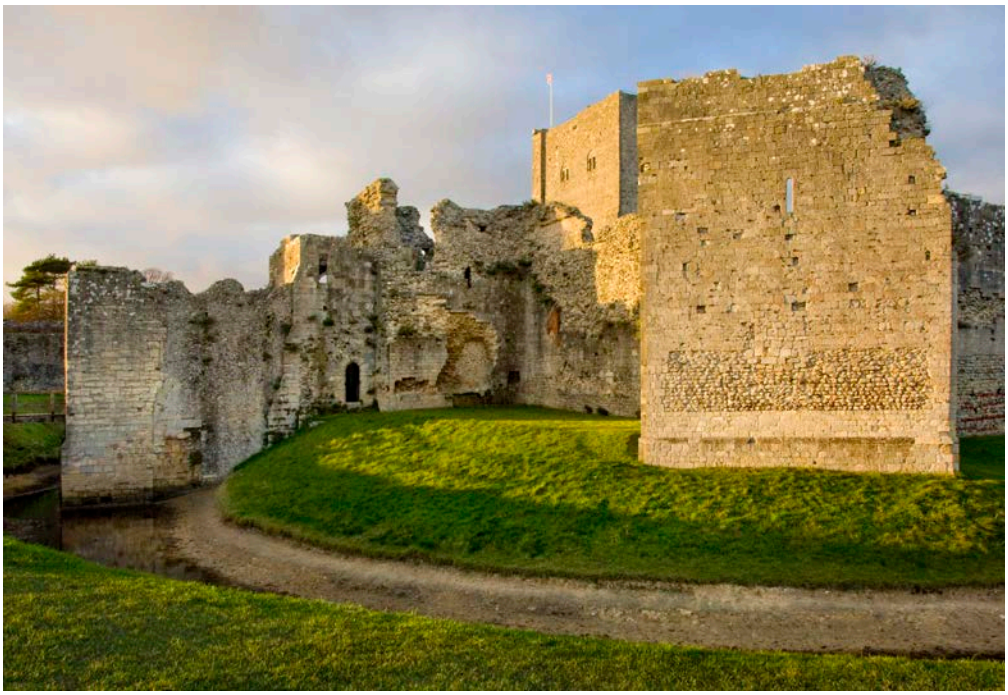


Figure 2: Portchester Castle, near Fareham. Flint walls with Quarr Stone and Nettlestone Sandstone stringers.

From the start of the 14th century, the practice of knapping and squaring flints to produce flat surfaces that could be framed (often in limestone) became common. Such 'flushwork' became highly fashionable in the late 15th century. Flint, generally, is one of the most characteristic building materials of a large part of the county, being found in houses of various social status, farm buildings and boundary walls. It is still used today.

The Dissolution of the Monasteries by Henry VIII resulted in the break-up of monastic lands and a growth in large privately owned farming estates. The abandonment of some monastic buildings provided a new supply of 'local' stone that could be reused in some larger new houses and barns. From the mid-16th century, brick became a fashionable and high-status building material, and it was used in several important houses of this period, including Basing House, Old Basing, and The Vyne, near Basingstoke. By the end of the 16th century, brick was being used for some town houses and rural vernacular buildings, but even into the 17th century brick was mostly used for plinths to timber-framed buildings and for the construction of chimney stacks. By the 18th century, brick had become the dominant building material across the county, although in some areas, such as the Test Valley, chalk cob was widely used for smaller houses.

Several country houses were built or remodelled in the 18th and 19th centuries. They were constructed of brick and then rendered, or used imitation stone, with only limited use of natural stone. Highclere Castle, north of Andover, is one of the few stone-built mansions; it was re-faced in Bath Stone ashlar by Sir Charles Barry in 1839–42.

With enclosure of large areas of downland in the 18th and 19th centuries, as well as changing agricultural practices, some new farmsteads or outfarm groups were built within the newly enclosed fields. Many existing farmsteads added buildings constructed using brick and flint, or brick alone, although timber framing was widely employed even into the mid-19th century.

Wealden Greensand

Despite the local availability of the most valuable building stones found in the county, the use of timber frame predominated in the vernacular buildings of the Wealden Greensand area until the 17th century. Stone was used more for the footings of barn walls or smaller farm buildings such as stables.

However, in localised areas, close to the chain of quarries on the Weald edge, between Bentley and Ramsdean, stone was commonly used in buildings and walls. Upper Greensand Malmstone was used as ashlar, or as coursed and uncoursed rubble. It was occasionally employed as paving, with harder, more chert-rich forms laid as pavement cobbles. Examples of houses and churches built of Malmstone can be seen in villages along the foot of the Wealden Greensand escarpment, such as Selborne and Blackmoor.

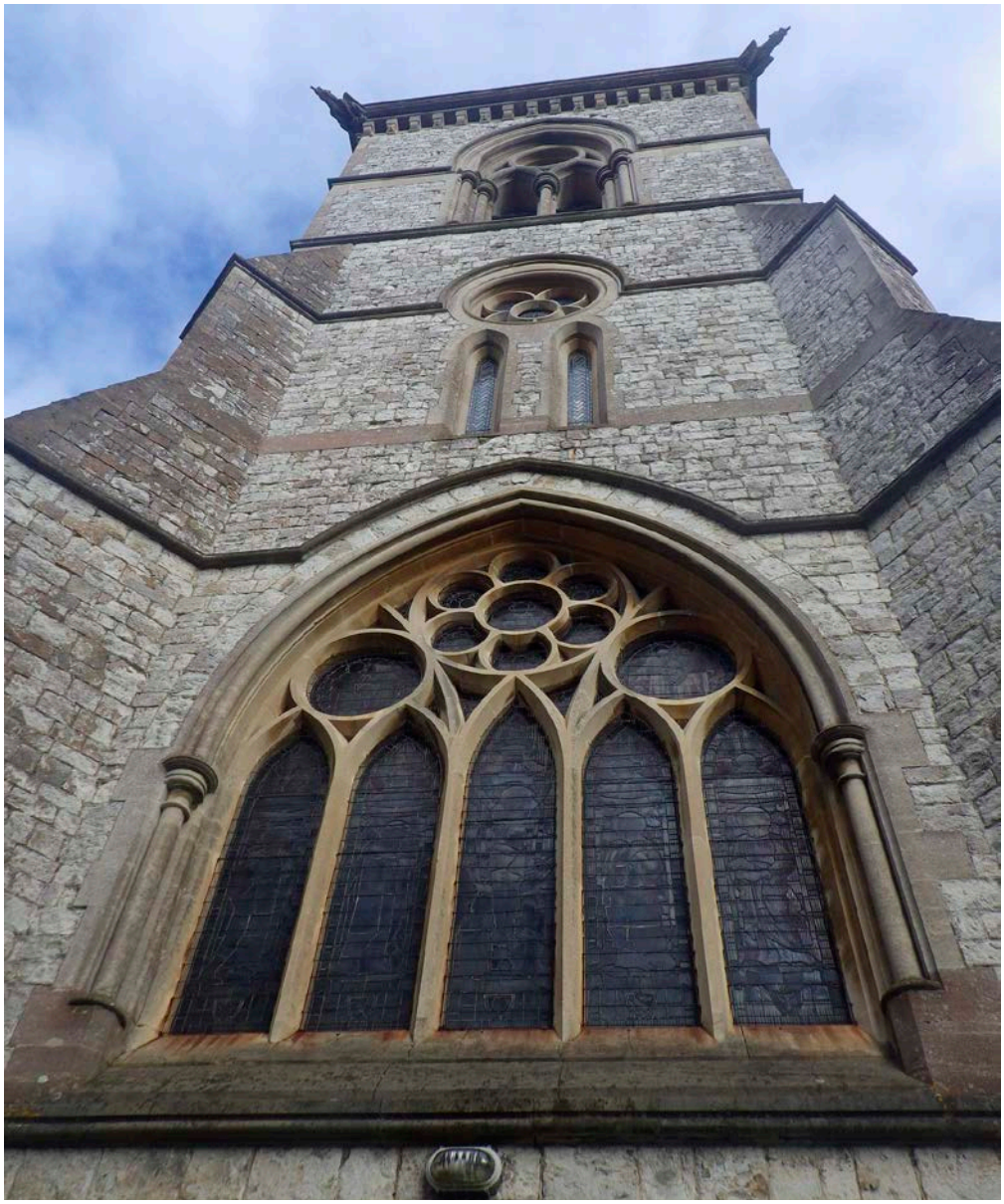


Figure 3: Church of St Matthew, Blackmoor. Malmstone ashlar with Bath Stone dressings.

Stone from the Wealden Greensand was used across the county. Between 1222 and 1224, Henry III rebuilt Winchester Castle using stone from Selborne in addition to stone imported from Caen in France, Wiltshire and the Isle of Wight. Even in the Wealden Greensand area, stone was often imported.

Cardinal Beaufort's residence at East Meon was remodelled between 1438 and 1441 using local Malmstone and flint, but it also features stone from Beer in Devon.

Lower Greensand sandstones were used in many farm buildings in this part of the county, including hop kilns serving the local hop industry that developed from the 17th century, although most hop kilns date to the 19th century. The stone is generally used as coursed rubble, but occasionally it was finely dressed, as seen in the highly unusual barn at Ditcham.

Lower Greensand variants include carstone, Bargate Stone and Hythe Sandstone, which are occasionally used for ashlar work and also in coursed rubble walling. Bargate Stone is sometimes seen as roughly dressed, brick-sized blocks. Some was also occasionally used for pavement cobbles.

Bargate Stone is found in St Mary's Church at Liss and the cloisters at Blackmoor War Memorial, whereas Hythe Sandstone is used in St Peter's Church at Petersfield and many buildings in Bramshott. Carrstone can be seen in the tower of St Mary's Church at Buriton and at Burgates Farmhouse and the walls of adjoining properties in West Liss.

One interesting feature rarely seen in Hampshire is galleting: the practice of pushing fragments of carstone or small flints into the mortar between the main blocks. A good example of carstone galleting, used in conjunction with Malmstone, is provided by the Five Bells public house, Buriton.

Figure 4: Farmhouse wall, West Liss. Carstone (laid to course) and Malmstone blocks.

Hampshire Downs and South Downs

Timber framing dominates the vernacular architecture of this area, despite the plentiful supply of flint from the Chalk Downs. Flint was usually a by-product of the quarrying of chalk for lime or marling, or it was picked from the fields after ploughing. Both forms were widely used across the area, ranging from the rubble core of the New Minster walls at WInchester to the facing stones of numerous church walls and the roughly knapped flintwork of the footings of timber-framed buildings. The widespread use of flint for the walls of houses dates from the 18th century, and it is highly characteristic of 19th-century cottages, where it is combined with brick dressings, quoins and banding.

The Chalk Downs provided another characteristic building material in this area: cob. The chalk-derived soil was mixed with straw and water and built up in layers to form thick walls. These were usually rendered on houses, but often left exposed for boundary walls. Cob cottages, typically thatched, are a particular feature of some Test Valley villages, such as Monxton.

Some harder chalk was used as rubblestone, particularly in the South Hampshire Downs. Occasionally, chalk was used as ashlar: for example, in the Church of SS Peter and Paul at Hambledon (Hambledon Chalk). The use of rubblestone in exterior walls of cottages, farmhouses and barns is common in the Meon Valley, as seen at Soberton. Examples can also be seen at Goodworth Clatford and Wherwell in the Test Valley and at The Dell in Kingsclere in the North Hampshire Downs. At the end of the 19th century, many architects associated with the Arts and Crafts Movement became interested in using local stone. One of the best examples of the use of chalk blocks from Brook Quarries is Marshcourt, a country house south of Stockbridge in the Test Valley, built by Sir Edwin Lutyens.

Figure 5: Hampshire downland thatched cottage. Flint nodules and rubblestone wall.

South Hampshire Lowlands

Historically, much of the landscape was well wooded before its clearance for arable use (assarting), generally by the 14th century. Timber framing was the predominant vernacular form for both farm buildings and houses. The supplies of local building stones were very limited: there is a small outcrop of Lower Greensand at the foot of the chalk scarp near Sydmonton. This and other local stones, such as ferricrete, Heathstone, ironstone, Ferrells and Burley Rock, were used as rubblestone. Examples can be seen at Heckfield, to the north-east of Basingstoke.

The south coast has been dominated by the urban developments of Southampton, Fareham, Gosport, Havant, Portsmouth and Titchfield since the 13th century. The area's brick earths, marine clays and silts provided little in the way of useful building stone. Beach pebble flint and tufa were used in coastal villages and towns, mainly in walls. Beach flint cobbles are found in the walls of the 13th-century Church of St Mary at Hayling Island. To the east of Portsmouth, flint pebbles were often supplemented in walls with Sarsen stone and erratic pebbles. Tufa and Sarsen stone are found in the church at Hayling Island. This building also features irregular rubblestone of Harwich Formation Siltstone.

Imported stones have been used extensively in the area since the Roman period. Large monastic estates developed at Netley and Titchfield, for example. At Titchfield Abbey, the buildings were largely constructed of Quarr Stone. Nettlestone Sandstone was used at Netley Abbey.

Southampton's 2km of city walls were built mainly in Bembridge Limestone and Quarr Stone during the 1360s. Sarsen stone was also used in the city walls, with some rare London Clay cement stone nodules and septaria. Portsmouth's fortifications started to develop from the late 15th century and gradually extended to encompass Gosport in the 17th century. Stone was used for structures such as Southsea Castle and the rebuilding of the city's walls by Henry VIII in the 16th century. The defences of Portsmouth include a remarkable range of forts, reflecting different styles and technologies, defending the area from both sea and land. A range of imported stones were used, including Quarr Stone, Purbeck Stone, Portland Stone and others from further afield, although most of the 19th-century forts were primarily built in brick.

New Forest

The heathland area was agriculturally poor, with few farmsteads and a large number of smallholders. Cottages and farm buildings were timber framed, clay walled and, later, brick. They sometimes incorporated local stones available from the sandy heaths. These included Quaternary iron-cemented sandstones and conglomerates, heathstone, ferricrete and Burley Rock. They were often mixed with nodular flint. Examples can be seen in Brockenhurst, St Michael and All Angels' Church at Sopley and Burley's village walls. Stone from the Tertiary Reading Beds was used on the northern and western side of the area, for example at Fordingbridge and Sopley as well as at the Church of St Mary at Ellingham, near Ringwood. Irregular Reading Beds rubblestone was used occasionally along its outcrop and in adjoining areas, such as in the tower of All Saints' Church at Harbridge.

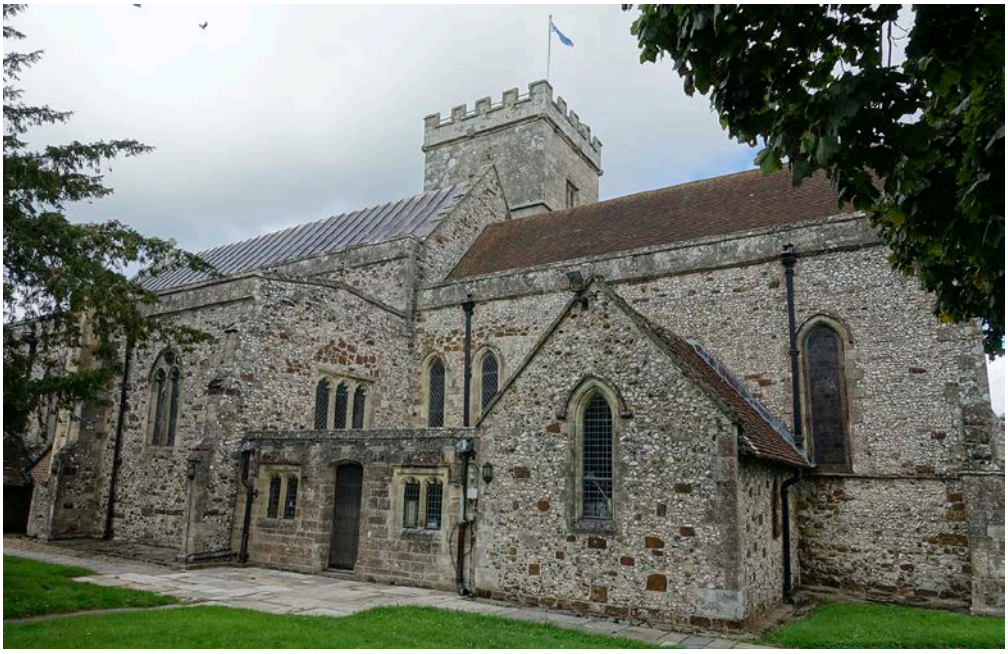


Figure 6: Church of St Mary, Fordingbridge. Flint nodules with blocks of Malmstone, Reading Beds Sandstone and ferricrete.

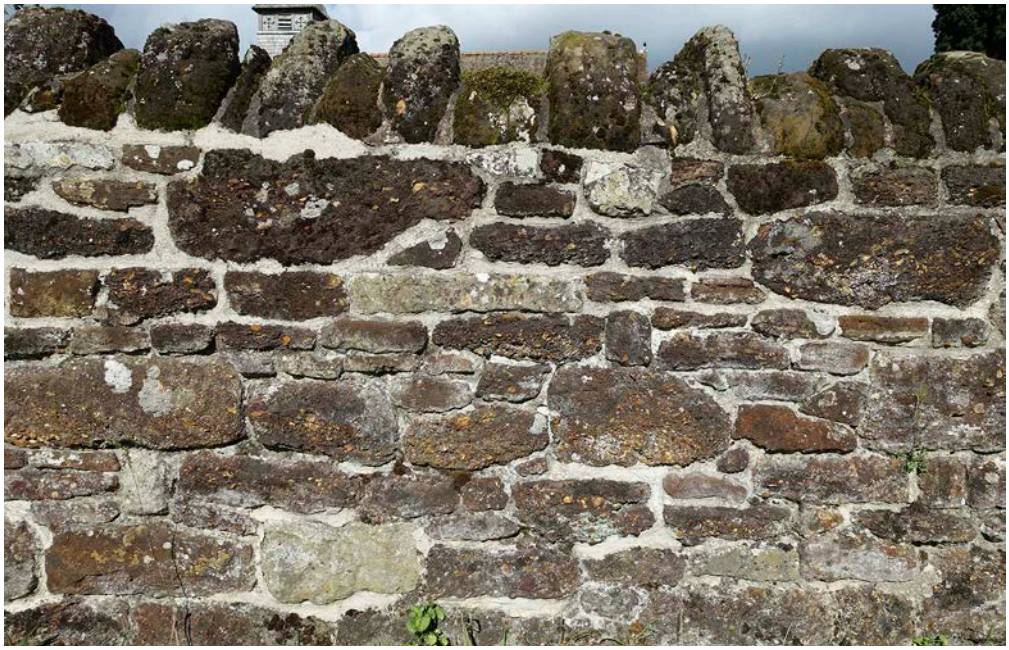


Figure 7: Churchyard wall, Ellingham. Burley Rock, Reading Beds Sandstone and ferricrete.

In the far north-west corner, the chalk of the Martin and Rockbourne Downs dominates the landscape and extends into Cranborne Chase and the chalk downs of Wiltshire and Dorset. In this area of Hampshire, flint used in alternate banding with brick is locally distinctive, as is the use of cob for walls.

Stone was widely imported for churches and larger buildings. In the coastal plain, the Cistercian abbey at Beaulieu was mainly built of Quarr Stone, with Caen Stone used for interior decoration and Purbeck Marble for columns. Remains of large stone-built barns survive at several locations, including St Leonard's Barn, Beaulieu. This is possibly the largest tithe barn in England built of coursed rubblestone, including Quarr Stone and Bembridge Limestone.

Many churches were rebuilt or expanded in the 19th and early 20th centuries, typically using a range of imported stones. For example, Swanage, Chilmark, Bath and Purbeck Stones were used in the Church of St Katherine at Exbury.

3 Local Building Stones

Lower Cretaceous

Lower Greensand Group, Hythe Formation

Hythe Sandstone

Hythe Sandstone is a medium to coarse-grained sandstone that varies in colour from pale brown to yellowish-orange, dark green or pale grey. It sometimes exhibits a bluish sheen. Individual sandstone units may be thinly bedded or more massive. Some contain grey cherty layers, whereas others are friable and striped with alternating paler (quartz-rich) and darker (glauconite-rich) bands.

Many of the sandstones are bioturbated and contain the fossil burrow structures of *Planolites* or *Macaronichus* or are iron stained and exhibit Liesegang banding. The more finely bedded units often exhibit sedimentary structures, including ripple marks and planar and trough cross-bedding on a variety of scales. Hythe Sandstone is typically hard and resistant, although weathering often picks out layers with less calcareous cement. Grey cherty layers (where present) often remain more prominent.

Figure 8: Passfield Farmhouse, Liphook. Hythe Sandstone.

Hythe Sandstone is employed mainly in the far east of Hampshire, in the area extending from Headley south to Petersfield, and it is used as fine cut or roughly dressed ashlar and as rubblestone (sometimes coursed). Good examples of its use can be seen in numerous buildings, including the Churches of St Peter at Petersfield, St Mary Magdalen at Sheet, St Luke at Grayshott, St Mary at Bramshott and All Saints at Headley, as well as Old Holme School in Headley and Passfield Farmhouse near Liphook. The village of Bramshott contains several particularly fine examples of the use of locally quarried Hythe Sandstone.

Lower Greensand Group, Sandgate Formation

Bargate Stone

Bargate Stone is a hard, relatively durable, medium to coarse-grained, calcareous sandstone or gritstone. It is characteristically pale orange, honey-brown or pale brownish-grey in colour, and typically weathers with a brown surface.

The sandstone varies from massive to well bedded. The latter naturally breaks into flaggy layers that are 100 to 150mm thick, enabling it to be easily used as brick-sized blocks. The stone occasionally exhibits cross-bedding or honeycomb weathering textures and contains layers of the 'macaroni-like' fossil burrow *Macaronichus*, which are typically 5mm-wide cylindrical structures, each surrounded by a rim of glauconite grains.

Bargate Stone is intermittently exposed along a narrow outcrop that follows the upper edge of the underlying Hythe Formation in eastern Hampshire, extending from Petersfield northwards via Liss, Langley, Liphook and Lindford to the west of Churt.

It is mainly used as coursed rubble walling, although it is not uncommon to see it employed as roughly dressed brick-sized blocks. Examples of its use include St Mary's Church at Liss and St Peter's Church at West Liss (the south wall of the south aisle), as well as the cloisters at Blackmoor War Memorial.

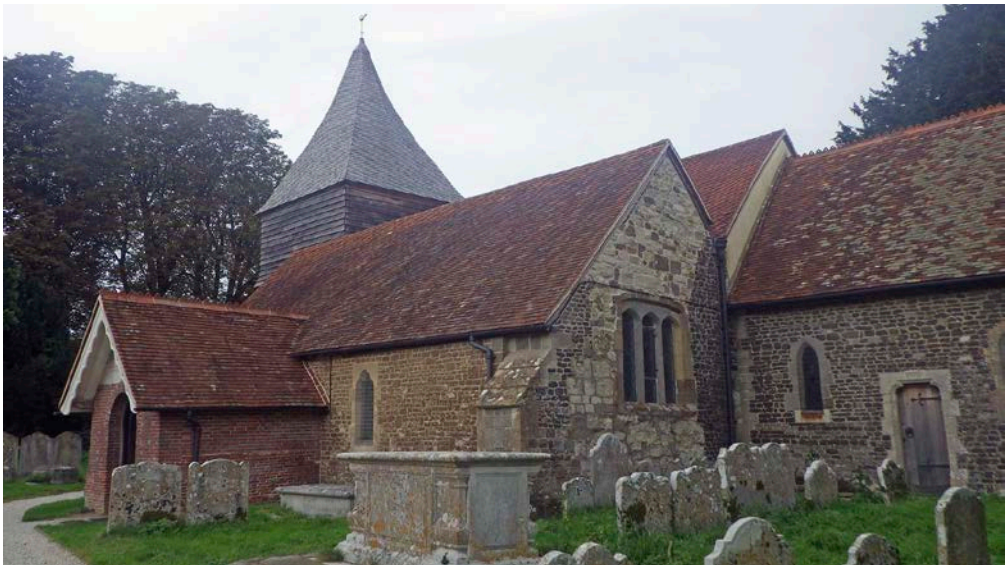


Figure 9: Church of St Peter, West Liss. Bargate Stone, carstone, Malmstone and ferricrete.

Lower Greensand Group, Folkestone Formation

Carstone (Forest-stone, Clinker)

Carstone is a hard, medium to coarse-grained, ochreous to dark brown or reddish-black, quartzose sandstone or gritstone, containing chert and quartz pebbles set within a matrix of iron oxides and hydroxides. It occurs as irregular-shaped masses, thin layers and veins within the 'typical' sands that comprise the Folkestone Formation. It may be distinguished from the similarly coloured Burley Rock (a type of ferricrete) by its lack of orange-stained flint clasts.

Carstone is often massive, but larger blocks may reveal cross-bedding structures and display Liesegang banding. The surfaces of cut blocks may exhibit a bluish sheen caused by veneers of iron oxide. Generally, carstone is a hard and durable rock that is resistant to weathering.

Carstone has found widespread use in eastern Hampshire across and adjacent to its outcrop, which comprises a roughly north-north-east to south-south-west trending band from Frensham in Surrey through Bordon to Petersfield. It is typically employed either as coursed (often roughly hewn) or uncoursed rubble in walling. Numerous examples of its use can be seen in Greatham (at Golds House and around the old church) and West Liss (the tower of St Peter's Church, Burgate Farmhouse and Palmers along Warren Road). Many buildings in Buriton, such as the tower at St Mary's Church, have carstone walls and it has been used as galleting in walls alongside Malmstone in the Five Bells public house. Other notable examples of carstone occur in Kingsley (Church of St Nicholas), Liss, Blackmoor and Woolmer Forest.

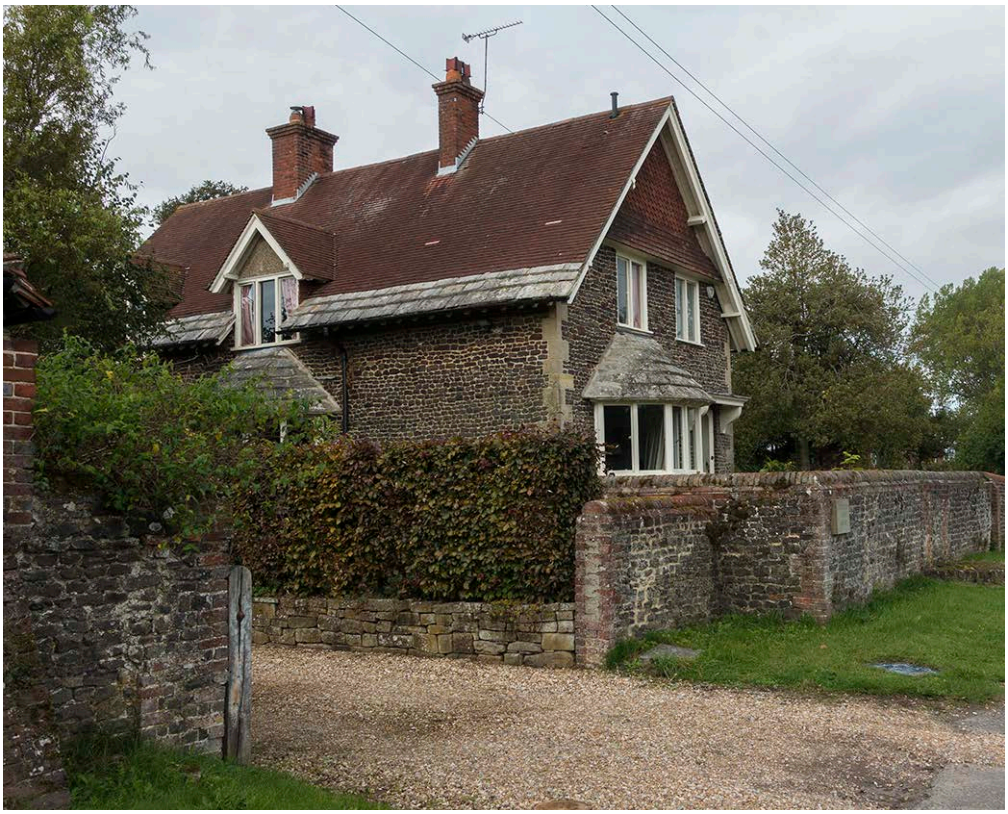


Figure 10: Burgate Farmhouse, West Liss. Carstone with Purbeck Stone slate roof eaves.

Selborne Group, Upper Greensand Formation

Malmstone (Malm Rock, Bluestone, Blue Rag, Firestone)

Malmstone is a massive, sparsely fossiliferous, calcareous siltstone that varies in colour from near pure white to pale blue-grey. Some beds are darker, with cherty layers that sometimes fill burrow structures. Chert-rich forms are more typically grey or have grey cherty streaks and a sub-conchoidal fracture. Some beds are glauconitic and contain fossil bivalves, echinoids and ammonites, as well as trace fossils. Pale-coloured Malmstone can appear similar to chalk, but it does not powder in the same way and weathers to an attractive cream or pale buff colour.

The best quality and hardest building stone varieties are known as Bluestone or Blue Rag. These have a bluish sheen and typically weather with a buff to pale brown, sometimes flaky, crust. They contain more chert and calcite cement than the paler whitish siltstone varieties. The latter are relatively soft and often show concave weathering away from the mortar joints in walls.

Malmstone is very widely employed throughout Hampshire, but especially in eastern Hampshire where it predominates over all other building stone types. It was formerly worked all along its outcrop, which forms a distinct escarpment running from Binsted in the north, south through Selborne to Langrish, then east to Buriton. In eastern Hampshire, many exposures of Malmstone are still visible along roadsides and sunken lanes, particularly in the Selborne area.

Although much of the stone is a freestone and has been used as ashlar, it is generally roughly dressed and laid to course, or used as rubblestone. Harder, chert-rich forms are occasionally used as paving cobbles.

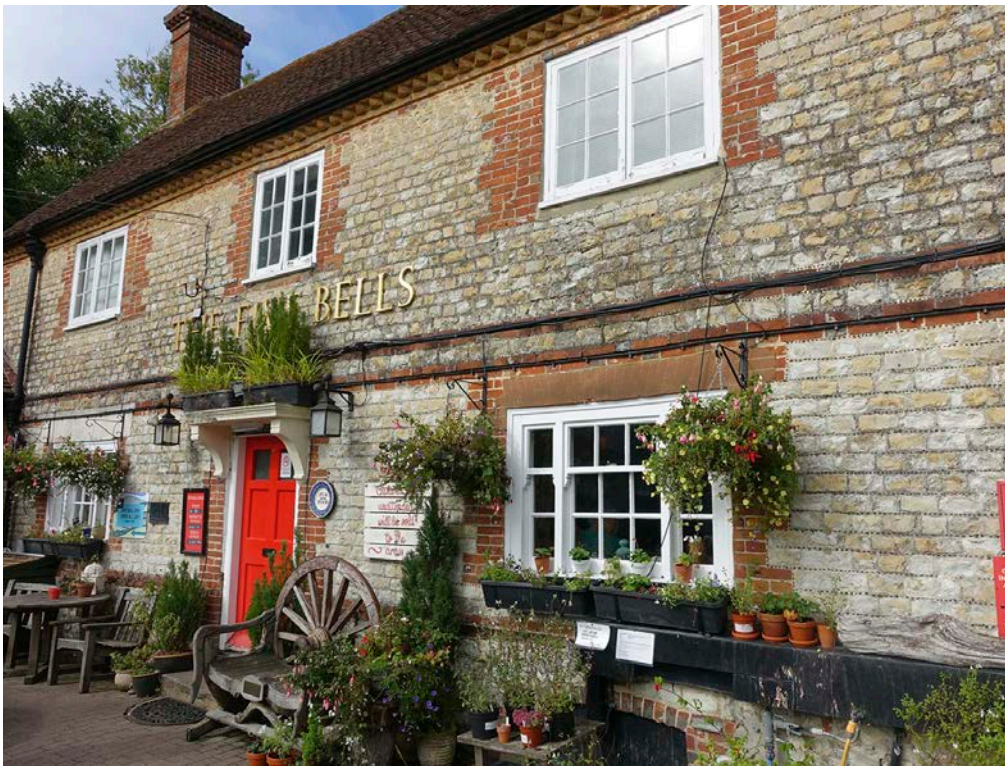


Figure 11: Public house, Buriton. Squared and coursed Malmstone blocks with carstone galleting.

Excellent examples of houses built of Malmstone can be seen in villages all along the foot of the chalk escarpment, where many old buildings and boundary walls are made of regular trimmed blocks. Particularly fine examples of the use of Malmstone occur in the villages of Bentley, Binsted (Roxford Cottage), Blackmoor (Church of St Matthew), Buriton (Church of St Mary, the Five Bells, Brook Cottage and Rose Cottage in North Lane), East Meon, East Worldham (Church of St Mary the Virgin), Froyle, Hawkley and Oakshott (Oakshott Farm). The village of Selborne also contains noteworthy examples of the use of Malmstone in buildings, including the Church of St Mary and the Old Vicarage, and also as cobbles and paving.

Upper Cretaceous

Chalk Group, White Chalk Subgroup, various formations

Hambledon Chalk

Hambledon Chalk is a white, uniform, coarse-grained (gritty) chalky limestone with scattered phosphatic grains and occasional small flints. Bioturbation structures are present, which weather out leaving a coarse texture. It is a relatively durable form of chalk, but susceptible to frost action. Hambledon Chalk is similar to some forms of Lavant Stone, which is seen in West Sussex and also originates from the Newhaven Chalk Formation.

Hambledon Chalk is restricted to south-east Hampshire. It has been used mainly as ashlar and walling stone in the Church of St James at Southwick and the Church of SS Peter and Paul at Hambledon. Both villages sit on the Newhaven Chalk Formation.

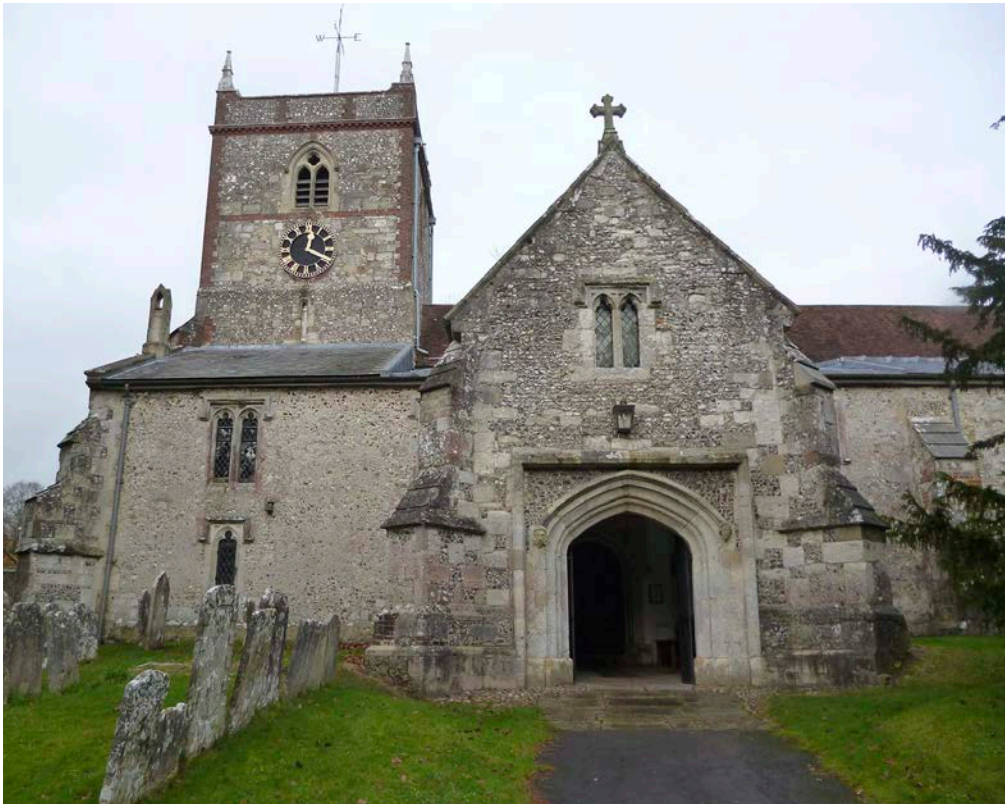


Figure 12: Church of St Peter and St Paul, Hambledon. Flint, Malmstone and Caen Stone with Hambledon Chalk.

Quarry Flint (Fresh Flint)

Quarry Flint is one of the most common and widely used building stones in Hampshire. It originates from bands and nodules of flint that occur within the chalk beds of the White Chalk Subgroup. Quarry Flint was dug from chalk pits and has been used extensively close to and within the outcrop area of the White Chalk, both on and adjacent to the Hampshire Downs.

Quarry Flint is an extremely fine-grained (cryptocrystalline) and hard form of silica containing microscopic, quartz-crystal aggregates. It usually occurs as irregularly shaped nodules that are 100 to 200mm across, or as (sub-)rounded pebbles and cobbles. Occasionally, it is also found as weakly banded tabular sheets or layers up to 200mm thick. The colour is very distinctive: fresh flint nodules have a white outer cortex with a darker coloured (black, dark grey) interior.

Quarry Flint breaks with a characteristic conchoidal fracture, producing razor-sharp fine edges. The cleaved surfaces may exhibit banded structures resulting from the alternation of layers of slightly different composition. Flint nodules may contain cavities lined with translucent botryoidal chalcedony or small transparent quartz crystals. Some flints contain well-preserved fossils, with echinoids, sponges, bivalves and burrow structures being the most commonly encountered types.

The stone is widely used across the outcrop of the White Chalk Subgroup in central Hampshire, within an area bounded by Netherton, Ludgershall (Wiltshire, West Tytherley, Clanfield, Bordean, Long Sutton, Basingstoke and Kingsclere. Quarry Flint is employed primarily as coursed and uncoursed nodular rubblestone for walling, but it is also seen roughly knapped, single faced or trimmed into square blocks for high-quality use, especially in

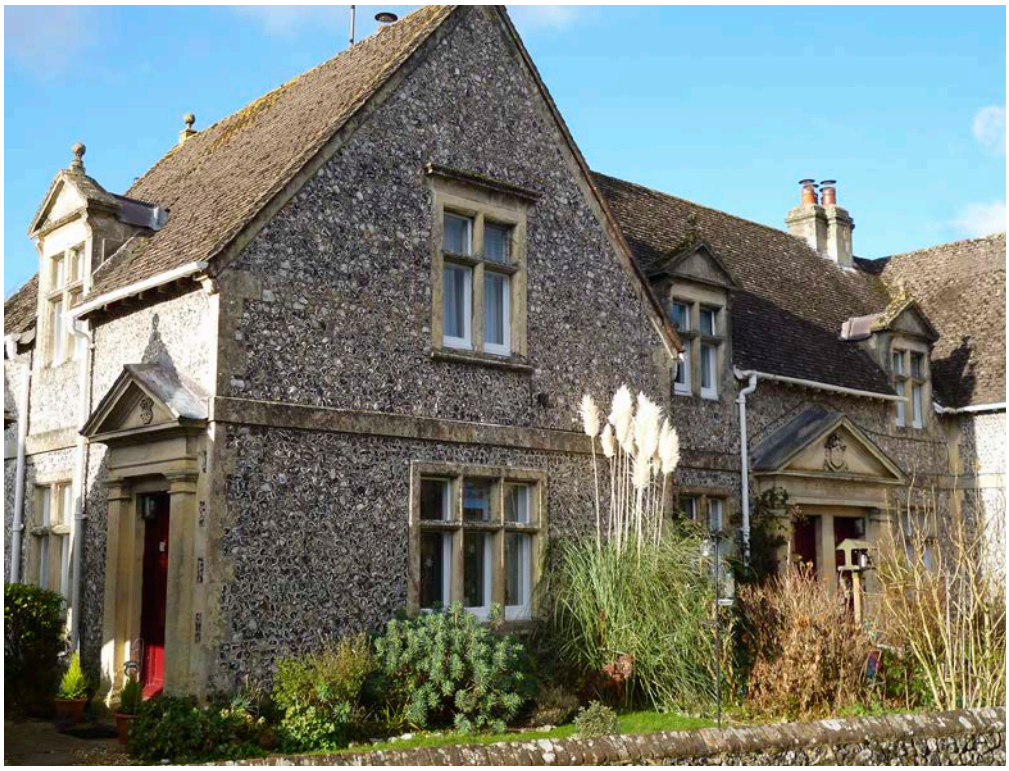


Figure 13: Forbes Almshouses, East Meon. Knapped flint nodules with Bath Stone dressings.

churches and larger houses. Flint flakes are commonly used for galleting. Examples of its use in churches include St John the Evangelist at Langrish, St Peter at High Cross, St John the Evangelist at West Meon, All Saints at East Meon, St Michael and All Angels at Chalton, SS Peter and Paul at Exton, St Nicholas at Wickham and St Mary at Bishopstoke. Particularly good examples of Quarry Flint can also be found in the villages of East Meon (Forbes Almshouses) and Bishop's Waltham (the Bishop's Palace). Noteworthy examples of dressed flint nodules with flint galleting occur at Church Cottages, Compton, and in the western end of St Mary's Church, Broughton.

The extremely hard and durable nature of Quarry Flint-type nodules has resulted in them being recycled by natural processes into younger deposits. These reworked types of flint, which have distinctive characteristics, are described in the Quaternary section of this guide.

Chalk (Clunch)

The White Chalk limestones of the Upper Cretaceous White Chalk Subgroup are among the most distinctive and easily recognised building stones employed in Hampshire. They are white to very pale grey, typically structureless, fine-grained limestones, sometimes containing fossil bivalves (inoceramids) and echinoids, and occasionally crinoids, brachiopods and belemnites. Pale-coloured Malmstone can resemble chalk, but it does not powder in the same way.

Chalk is generally unsuitable for exterior stonework because repeated wetting and drying, coupled with frost action, causes the relatively soft rock to powder and disintegrate into small angular brash. Softer forms of the stone, when used externally, may show concave weathering away from mortar joints. Where used as a building stone in Hampshire, chalk tends to be protected from rain by wide eaves or is set on a foundation course of a more durable stone.

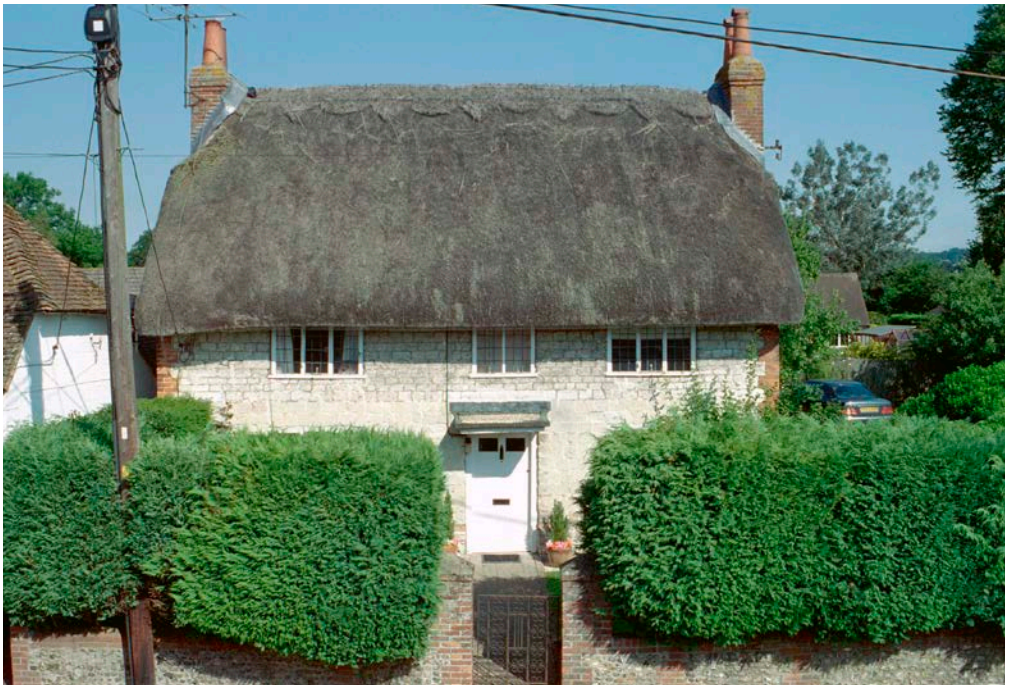


Figure 14: Cottage, Holybourne. Malmstone blocks (ground floor) and chalk block (first floor).

Chalk has been quarried as a local source of building stone across much of its outcrop in Hampshire, although its use is relatively limited, especially in eastern Hampshire where Malmstone predominates as a near-equivalent building stone. Some chalk finds localised use as ashlar, but a significant proportion of this is confined to internal use. Its most widespread use is along the west and east Hampshire Downs, notably as a rubblestone (sometimes referred to as 'clunch') in exterior walls of cottages, farmhouses and barns in the Meon Valley (where care is needed to distinguish it from Malmstone). Examples can also be seen at Goodworth Clatford, The Dell at Kingsclere, Mapledurwell, Wherwell (Winchester Road and Fullerton Road) and Ropley. However, some former examples of buildings featuring clunch have been demolished since they were first recorded in these areas during the 1900s. Chalk blocks from Brook Quarries were used in the construction of Marsh Court, near Stockbridge.

Figure 15: Toll Cottage, Wherwell. Chalk block.

Tertiary

Lambeth Group, Upnor Formation

Sarsen Stone (Greywethers, Bridestone)

Sarsen stones often occur as rounded or elongate pebbles, cobbles, boulders or metre-scale slabs (up to 2m in length). They are typically grey to pale brown in colour, becoming distinctly creamy-buff when weathered. They possess a very fine to fine-grained texture, comprising sub-rounded quartz grains set within a silica matrix, which is visible on a fractured surface. Sarsen stones are very hard and resistant and their surfaces are often smooth and may occasionally show poorly defined bedding structures.

Sarsen stones have a relatively local and limited use in Hampshire. They are found mainly as isolated pebbles and cobbles in ancient church and town walls in the south and south-eastern parts of the county. Examples can be seen in the walls of the 13th-century Church of St Mary at Hayling Island and in the ancient city walls of Southampton.

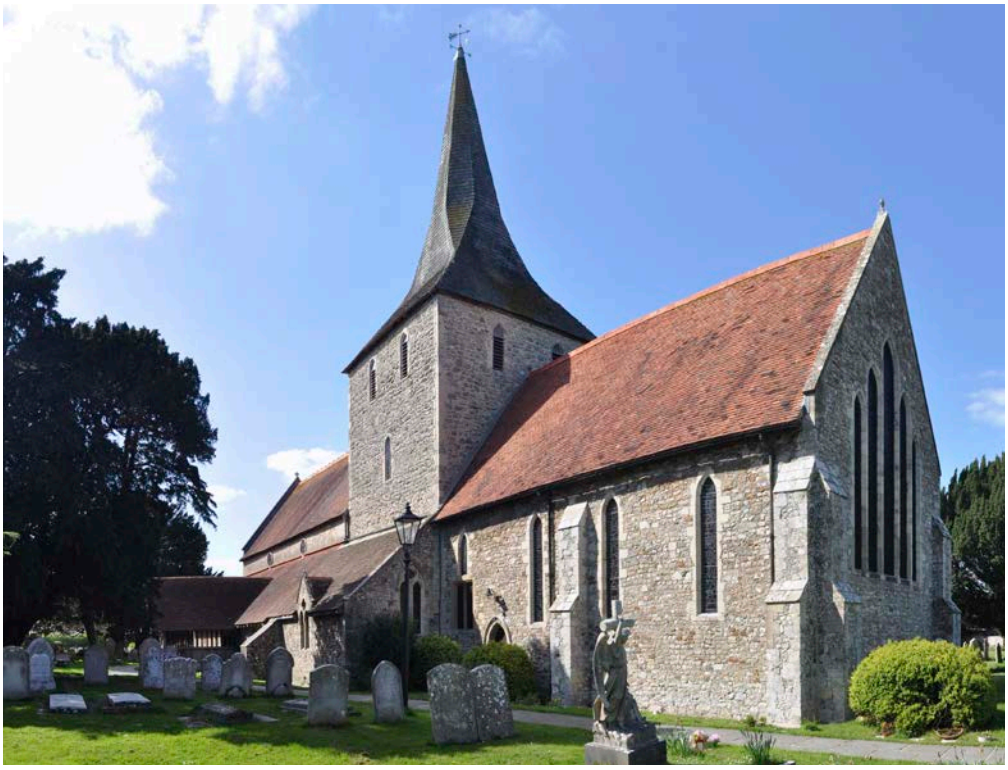


Figure 16: Church of St Mary, Hayling Island. Sarsen stone, Harwich Formation Siltstone, Beach Cobble Flint.

Lambeth Group, Reading Formation

Reading Beds Sandstone (Reading Beds, Reading Formation Ironstone)

Typically, Reading Beds Sandstone is a fine to medium-grained, iron-rich sandstone that has a rich reddish-brown or orange-brown colour, although some (glauconitic) sandstones may be grey-green in hue. The reddish-coloured stones are very distinctive, with the lighter and richer red colouration of some blocks being a useful means of distinguishing this ferruginous stone from the otherwise similar carstone.

Reading Beds Sandstone is found along the edge of the Chalk Group outcrop in northern Hampshire (between East Woodhay and Long Sutton), in western Hampshire (adjoining the New Forest National Park between North End and Fordingbridge) and in southern Hampshire (extending from West Dean, near Salisbury, Wiltshire via Bishop's Waltham to Horndean).

The tougher, coarser grained forms of Reading Beds Sandstone are relatively resistant to weathering, and this, combined with its attractive colour, has meant that the stone is used as an irregular rubblestone along its outcrop and in neighbouring areas, especially in the New Forest. Good examples of its use include the church walls at Ellingham and Fordingbridge and the church tower at Harbridge (where it is present as occasional blocks).

Thames Group, Harwich Formation

Harwich Formation Siltstone (Basement Bed)

This thin siltstone unit (formerly known as the London Clay Basement Bed) is only 4m thick. It occurs in a narrow outcrop in northern Hampshire (from East Woodhay to Old Basing) and southern Hampshire (around Fordingbridge, Shootash to Havant and Rownhams to Hayling Island). It comprises grey to brown, fossiliferous siltstones with occasional shelly argillaceous limestones. Some beds are packed with small, straight, calcareous fossil burrows of the serpulid worm *Ditrupa*, which may reach up to several centimetres in length.

Harwich Formation Siltstone has a very local and limited use as an irregular rubblestone. An example is the Church of St Mary at Hayling Island. Isolated blocks can also be observed in walls in the village of Up Nately.

Thames Group, London Clay Formation

London Clay Cementstone (Septaria)

The dominant lithology of the London Clay Formation is clay, although there are layers of concretionary sandstones and cementstones throughout the formation that have been used locally for building in the south and far south-east corner of Hampshire.

London Clay cementstone comprises ellipsoidal concretions of fine-grained, pale to dark brown mudstone and siltstone, which reach up to 600mm in diameter. Individual concretions are often septarian and exhibit a transverse network of pale coloured calcite veins or mud-filled cracks. The pale to dark brown colouration of the concretions is distinctive, although upon weathering they sometimes develop a pale greyish or whitish ‘skin’.

Cementstones have a very localised and limited usage in Hampshire. They were employed as an irregular rubblestone, either ‘as found’ or split and crudely dressed. Examples can be seen in Southampton’s ancient city walls.

Quaternary

Various groups, various formations

Ferricrete (Heathstone (Harley Heathstone), Iron Pan, Ironstone-conglomerate, Ferrells, Sopley Stone, Burley Rock (Puddingstone)

Ferricrete is the generic name given to iron oxide-cemented, coarse-grained sands, gravels, conglomerates and breccias that have formed within soil and superficial sediments due to the percolation of ferruginous groundwaters. It often occurs on sandy heaths overlying Palaeogene strata in irregular layers

up to 500mm thick. It is relatively soft when first excavated, but hardens upon exposure to air.

Ferricrete is variable in colour, although it typically occurs in various orange-red, dark reddish-brown or purplish-brown hues. The distinctive conglomeratic or brecciated texture, created by clasts of flint, chert or occasionally sandstone set within an iron oxide-rich sandy matrix, readily distinguishes ferricrete from the otherwise similar, dark reddish-brown carstone.

Typically, ferricrete is seen as isolated rounded blocks in rubblestone walling or as roughly hewn blocks in medieval church walls. It occurs in the places where it was worked, mainly over sandy heath areas in northern and southern Hampshire. It was widely employed in the New Forest area where, along with other Palaeogene ironstones, it forms strikingly coloured patches in the rubblestone walls of many of the local churches, including the Church of St Mary at Ellingham.

Several distinct varieties of ferricrete are now recognised in the New Forest area.

Sopley Stone is a homogenous, relatively fine-grained variety with a distinctive dark mauve-purple colour. It has an even texture and colour, which distinguishes it from the otherwise similar carstone. The best example of Sopley Stone is above the main entrance porch to the Church of St Michael and All Angels at Sopley. The source of this stone type remains unknown.

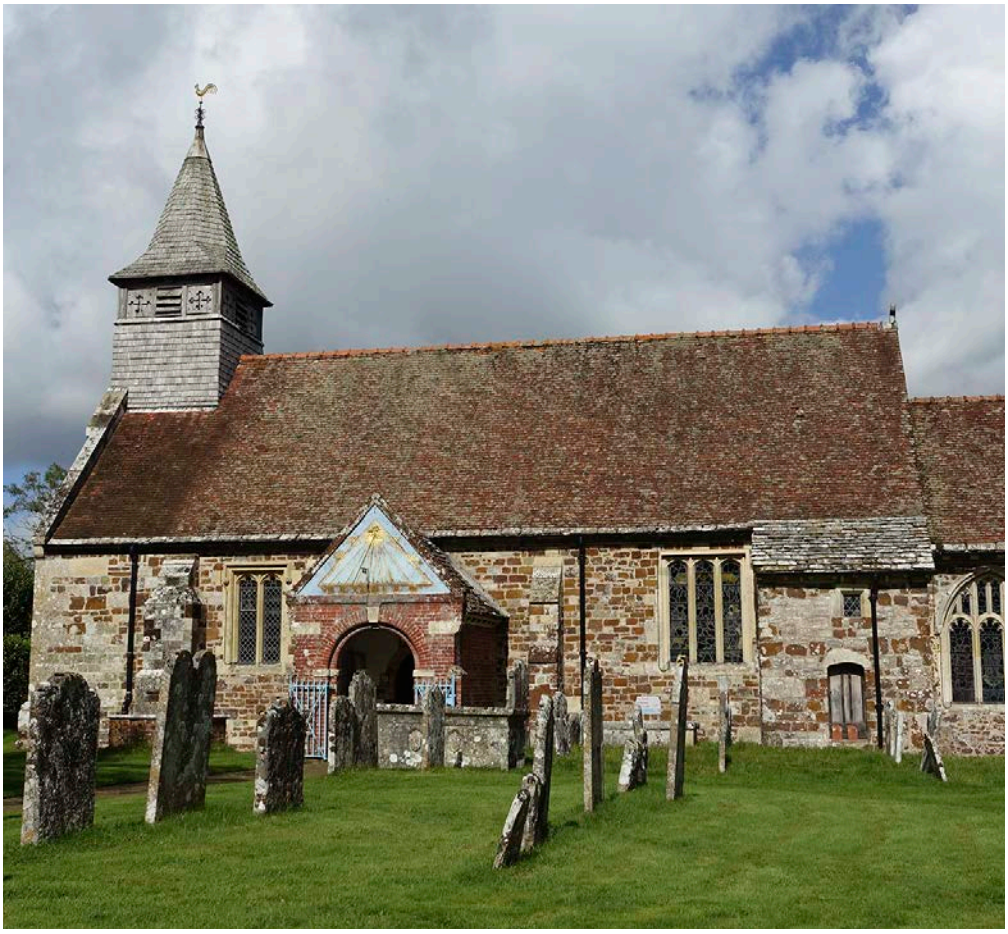


Figure 17: Church of St Mary, Ellingham. Ferricrete, Reading Beds Sandstone and Purbeck Stone with Chilmark Stone dressings.

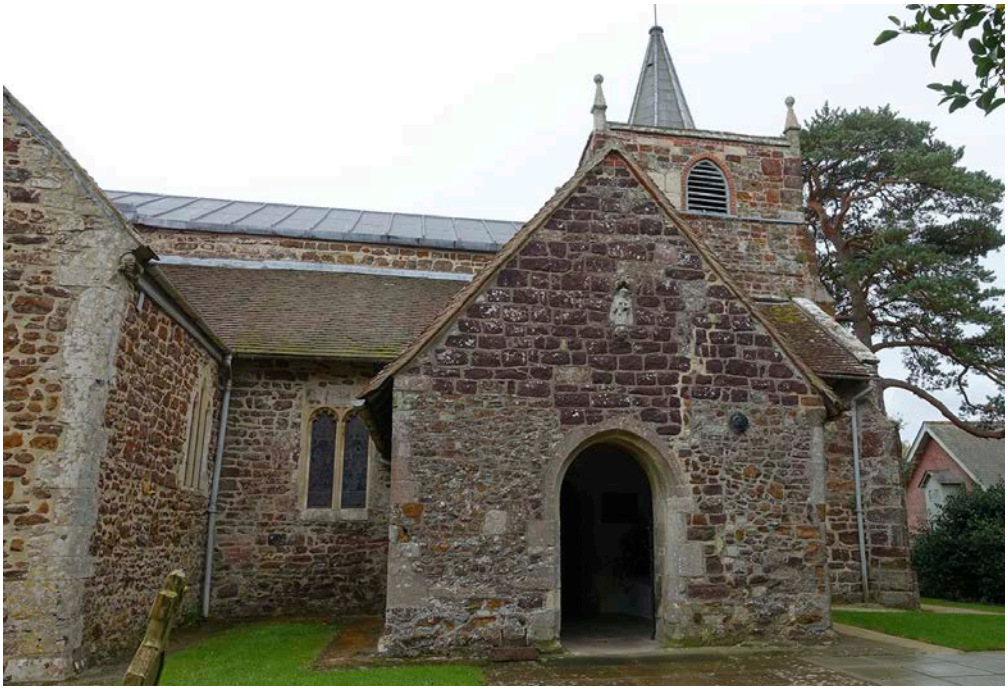


Figure 18: Church of St Michael and All Angels, Sopley. Sopley Stone, various ferricretes and Burley Rock.

Burley Rock (or Puddingstone) is a dark purplish-brown to purplish-black variety of ferricrete, containing sub-angular to sub-rounded flint pebbles and flakes. These are often whitened internally and stained pale brownish or orange by iron hydroxides. Burley Rock was originally quarried around Burley village, and it can be seen in several buildings and walls within the village. A particularly fine example can be seen in the churchyard wall of the Church of St Mary at Ellingham.

Hasley Hill Heathstone is a relatively homogenous, medium-grained, pale orange or ochreous-coloured variety of ferricrete that occurs at Hasley Hill. The developments of this stone overlie sands and clays assigned to the Bracklesham Group.

Quaternary Flint (Field Flint, Brown Field Flint, Beach Pebble Flint (Beach Cobble Flint))

Quaternary Flint occurs in large quantities in Hampshire and deposits are present across large parts of the Hampshire Downs and coastal plains. Its widespread availability, combined with its hardness and durability, means that Quaternary Flint is one of the dominant types of building stone used in the county. It typically occurs as irregularly shaped nodules or sub-rounded pebbles and cobbles, depending on the flint type. The colour is variable: less weathered flint nodules or pebbles have a cream outer cortex with a darker coloured (greyish) interior; weathered flints, or those that have lain in soil or superficial deposits for a long period, may be variously discoloured or bleached, often with brown-stained interiors due to the precipitation of iron hydroxides from percolating ferruginous water.

Quaternary Flint is used extensively as a walling stone in a wide variety of ways: as nodules or pebbles laid roughly to course; as squared blocks forming part of chequerwork; as knapped, faced, trimmed or cleaved-face stone in random or decorative arrangements; or as galleting.

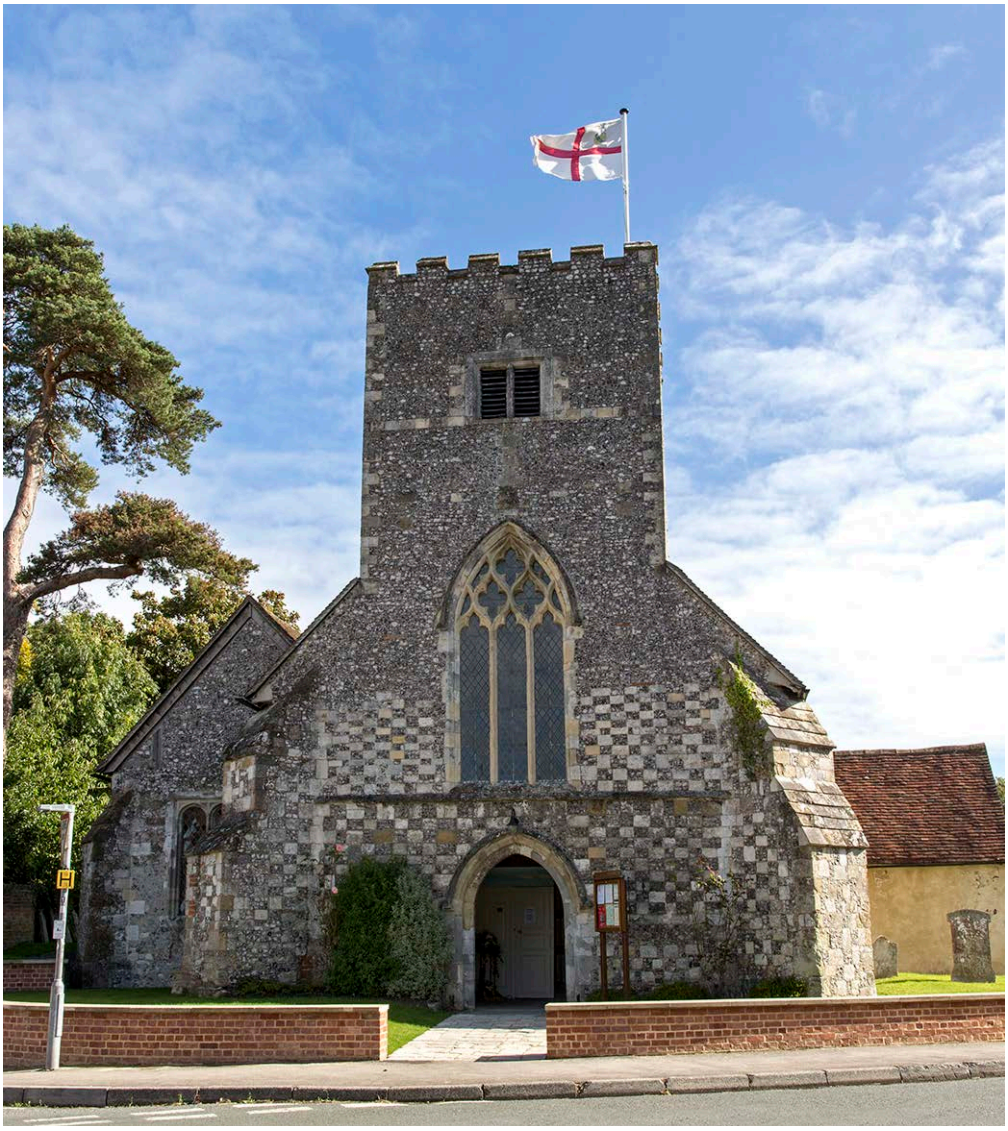


Figure 19: Church of St James, Southwick. Flint chequerwork with Malmstone, Caen Stone and Hambledon Chalk.

Two main types of Quaternary Flint were used in Hampshire, Field Flint and Beach Pebble Flint.

Field Flint or Brown Field Flint typically occurs as irregularly shaped nodules within the soil of fields on the Hampshire Downs. The size of the nodules varies from 100 to 300mm, but larger nodules can occur. The outer cortex of the nodule is usually cream coloured, with a darker brownish or greyish interior that becomes white on old fractured surfaces exposed to weathering. This lightly weathered appearance helps distinguish Field Flint from the much fresher-looking Quarry Flint, which has a white outer cortex and very dark grey or black interior.

Field Flint is a very common and widely used stone in Hampshire, and it was employed in a great variety of buildings and structures across the area of the Downs and (to a lesser extent) along the coastal plains. It was used extensively in walls in several different ways, with nodules often being selected for their shape and size and laid in either a random or coursed manner.

Field-picked flint was also much used to maintain field tracks and as a source of decorative dressed flints for buildings. Many flint-built buildings and walls,

such as the brewhouse and bakehouse buildings at Bishop's Waltham Palace, the Church of St Peter at Bishop's Waltham itself (especially the south wall of the chancel) and the Church of the Holy Trinity at Blendworth, provide sporadic examples of the use of this variety of flint. Other good examples occur at Silchester Fort, Boarhunt, Southwick, North Waltham, Crondall, Up Nately, Mapledurwell, Ellisfield, Farleigh Wallop and Warnford.

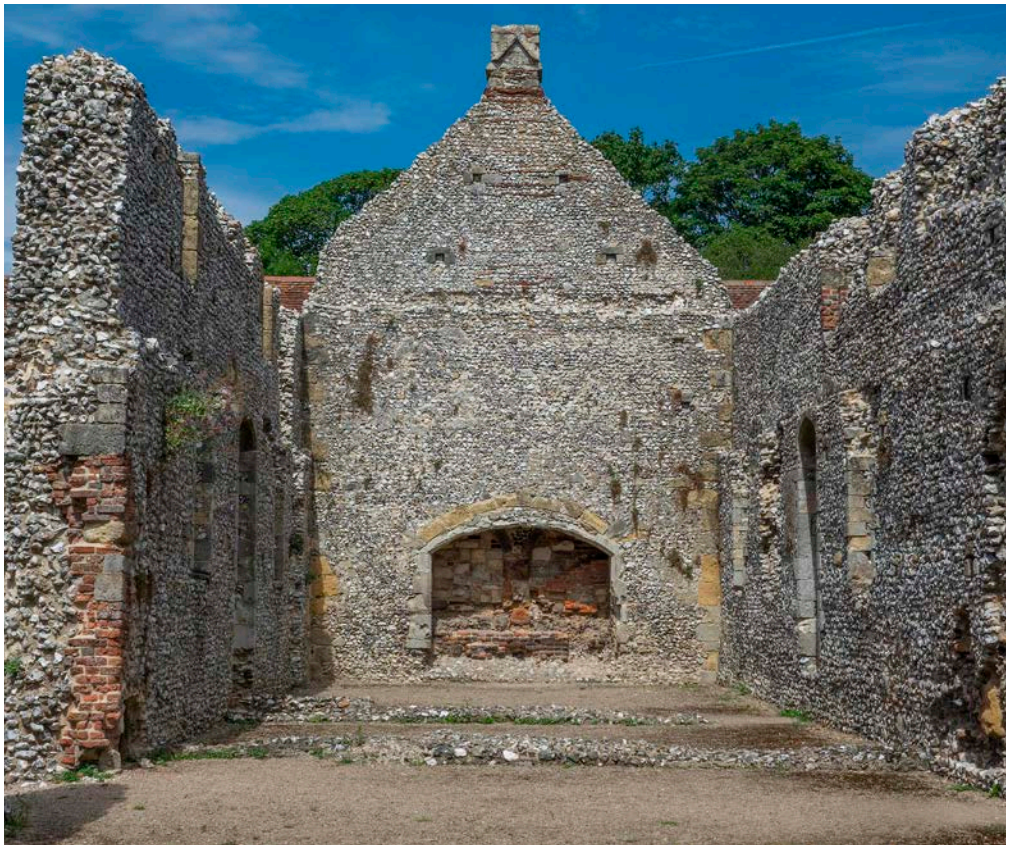


Figure 20: Palace brewhouse and bakehouse, Bishop's Waltham. Field Flint nodules.

Beach Pebble Flint (or Beach Cobble Flint) typically occurs as pale to dark greyish, rounded pebbles and cobbles up to 100mm in size. They are occasionally larger. The pebbles often exhibit a 'frosted' surface appearance or 'chatter marks' (small surface cracks) caused by impacts with other beach pebbles.

Beach Pebble Flint was typically used as and where it was found, mainly in the southern Hampshire towns and villages within the coastal strip and adjoining low-lying coastal areas between Milford-on-Sea and Lymington eastwards as far as Hayling Island. It was employed mainly in walls in a variety of ways, although pebbles and cobbles obtained from the beach were often sorted for size and laid to course. To the east of Portsmouth, flint pebbles used for walling purposes were often supplemented by Sarsen stones and erratic pebbles obtained from the same source. A notable example of the use of Beach Pebble Flint cobbles can be seen in the walls of St Mary's Church at Hayling Island.

Tufa (Travertine)

Tufa is a whitish or pale grey-coloured, highly porous limestone formed by the precipitation of calcium carbonate (lime) from springs where the water has passed through calcareous rocks, such as limestone or chalk. Surfaces often exhibit a fibrous or mammilated structure or show faint traces of banding.

Tufa has seen only very localised and occasional use as a rubblestone in medieval church walls in south-eastern Hampshire. It occurs as isolated blocks in the Church of St Mary at Hayling Island, along with a very wide range of other unusual and little used building stones, including Quarr Stone, Nettlestone Sandstone, Harwich Formation Siltstone, Bognor Rock and Sarsen stone.

4 Examples of Imported Building Stones

Devonian

Tamar Group, Plymouth Limestone Formation

Plymouth Limestone, Devon

A pale to dark grey, occasionally pinkish limestone which may contain irregular white calcite veins and fragments of fossil corals and shells. Use in Hampshire is extremely localised, mainly in churches in the south around Totton, Southampton and Haying Island.

Lower Carboniferous

Tournai Marble, Belgium

A black, very fine-grained limestone which takes a high polish. Occasional fossils are preserved in white calcite. It is resistant to weathering. It is normally used for interior memorials and one of the best known examples is the font in All Saints' Church, East Meon.

Middle Jurassic

Calcaire de Caen

Caen Stone, Normandy, France

A high-quality, creamy or yellow-coloured limestone (freestone). Caen Stone was employed in Victorian new-build churches, especially as ashlar walling, ornate decorative column or arch work, as well as mouldings for doors and windows. Examples of its use in Hampshire include St John the Evangelist's Church at West Meon, Holy Trinity Church at Blendworth and St Mary's Church at Andover.

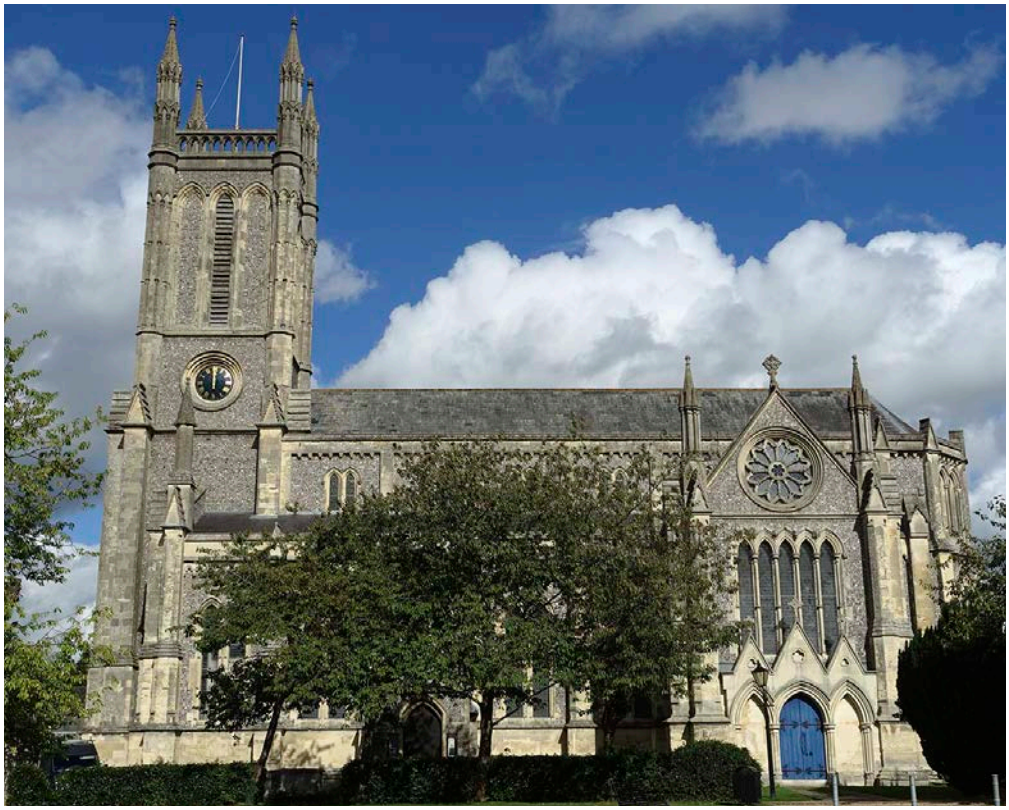


Figure 21: Church of St Mary, Andover. Knapped flint walls and Caen Stone dressings.

Great Oolite Group, Chalfield Oolite Formation

Bath Stone, Bath, NE Somerset and possibly Corsham area, Wiltshire

A creamish to ochreous, oolitic limestone (freestone). This stone was much used in Victorian new-build and church refurbishment, especially as ashlar for walling and mouldings for doors and windows. Examples include All Saints' Church at Hinton Ampner, St Andrew's Church at Farlington, All Saints' Church at Denmead, St Mary's Church at Bishopstoke and St Saviour's Church at Brockenhurst.

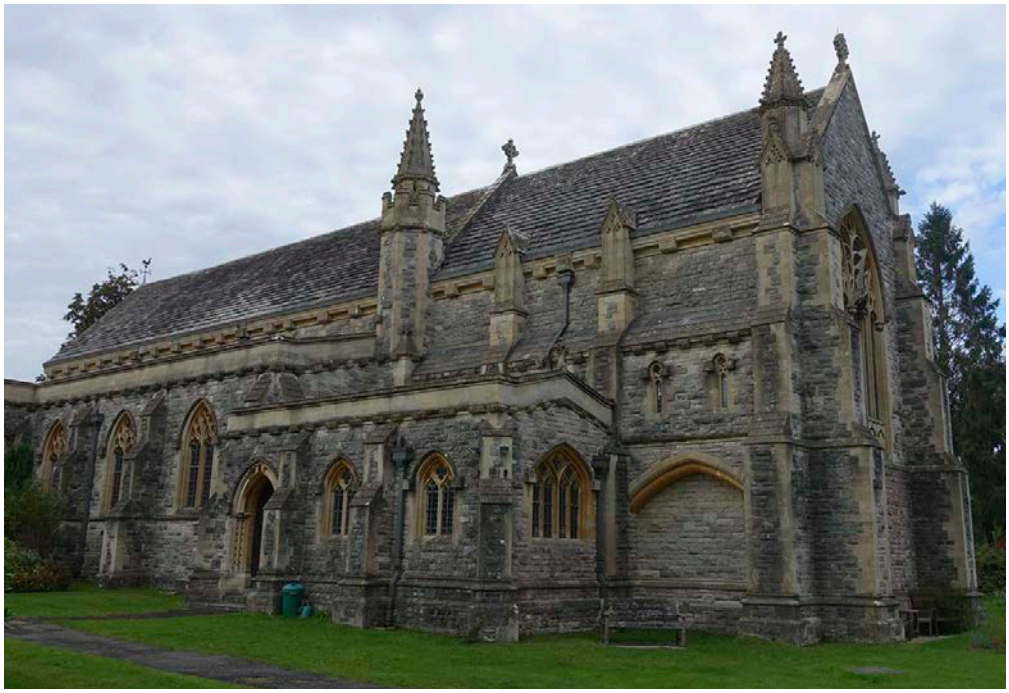


Figure 22: Church of St Saviour, Brockenhurst. Purbeck Stone with Bath Stone dressings and tracery.

Upper Jurassic

Portland Group, Portland Stone Formation

Chilmark Stone, Wiltshire

Pale grey, fine-grained, shelly limestone, often showing sections of the fossil bivalve *Trigonia* and cross-bedding. In Hampshire, Chilmark Stone is typically used as an ashlared freestone or for dressings (mouldings) in churches, due to its uniform nature. It has also been employed for effecting repairs to churches and more extensively for Victorian restoration work. Examples of its use include All Saints' Church at Headley (for window repairs), Holy Trinity Church at Blendworth (for the porch windows), St Mary's Church at Selborne (for window repairs) and St Mary's Church at Micheldever, Winchester.

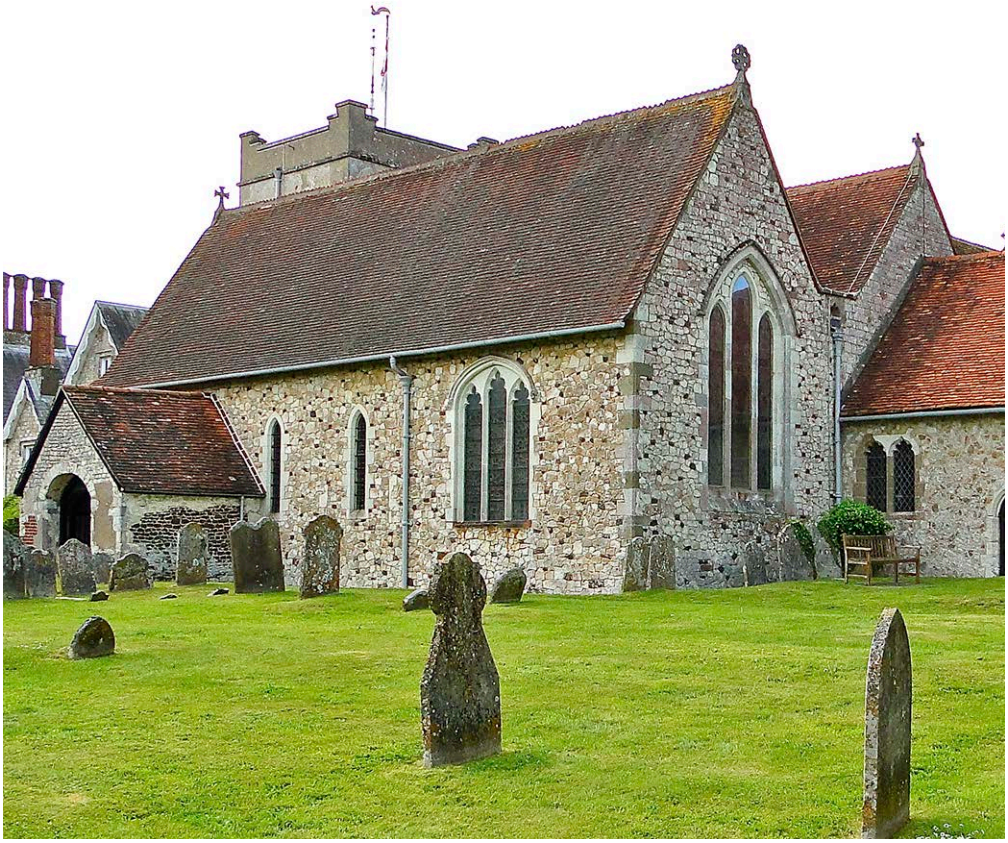


Figure 23: St Mary's Church, Selbourne. Chilmark Stone window repairs.

Portland Stone, Isle of Portland, Dorset

Very pale, white, fine-grained limestone. This stone was used as a freestone in classical facades, pillar work, ornate dressings and Victorian new-build churches and restoration works. Examples include Calshot Castle, 116-118 Commercial Road, Portsmouth, the Guildhall and Park Building of Portsmouth University and the Nelson Monument in Boarhunt. It has also seen use in Hampshire's churches, including St Peter's Church at Bishop's Waltham, St Barnabas' Church at Swanmore (especially for windows and string course) and St John the Evangelist's Church at West Meon.

Figure 24: Nelson Monument, Boarhunt. Portland Stone ashlar on a granite base.

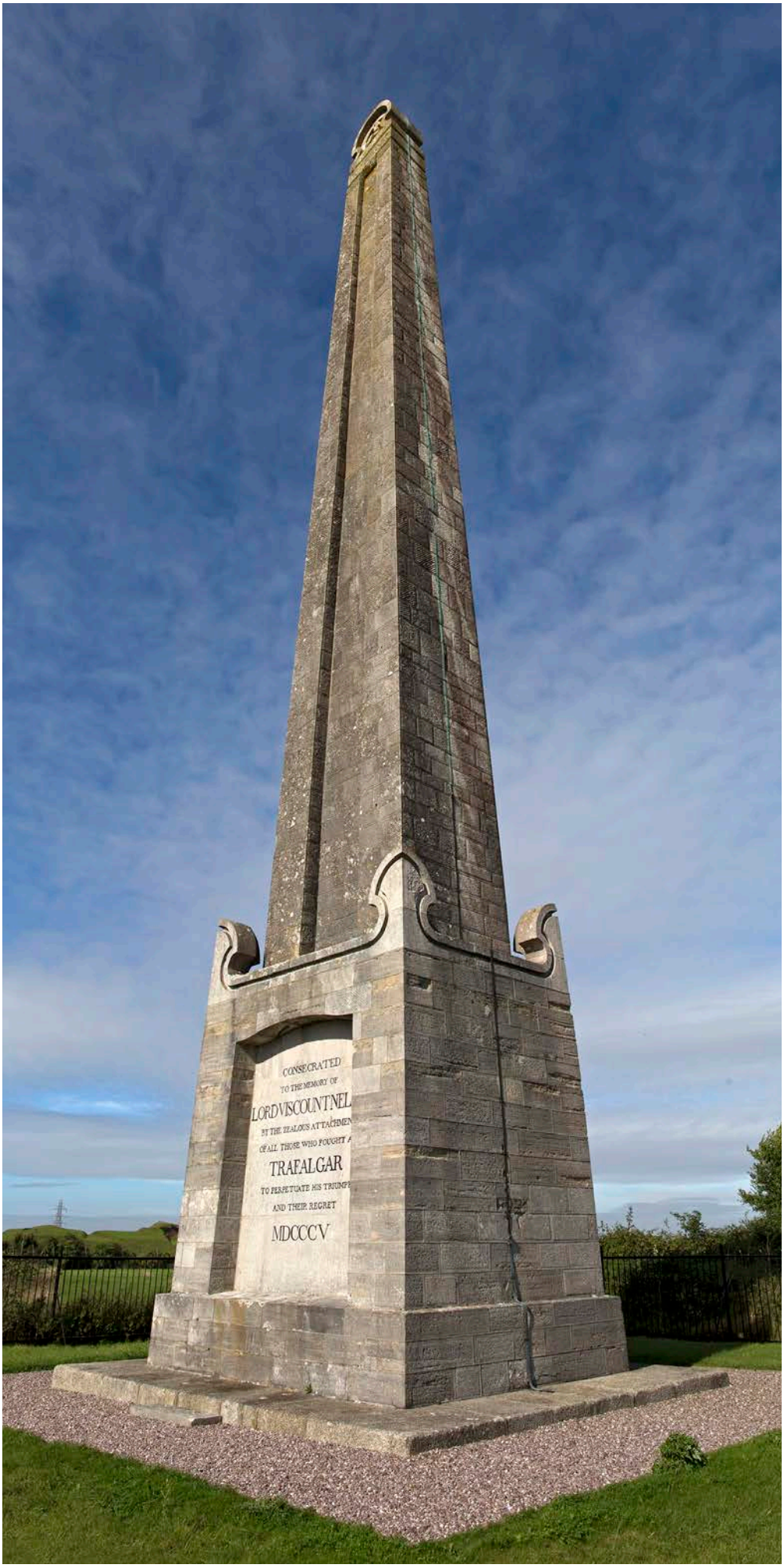


Figure 25: Portsmouth Guildhall. Portland Stone ashlar.

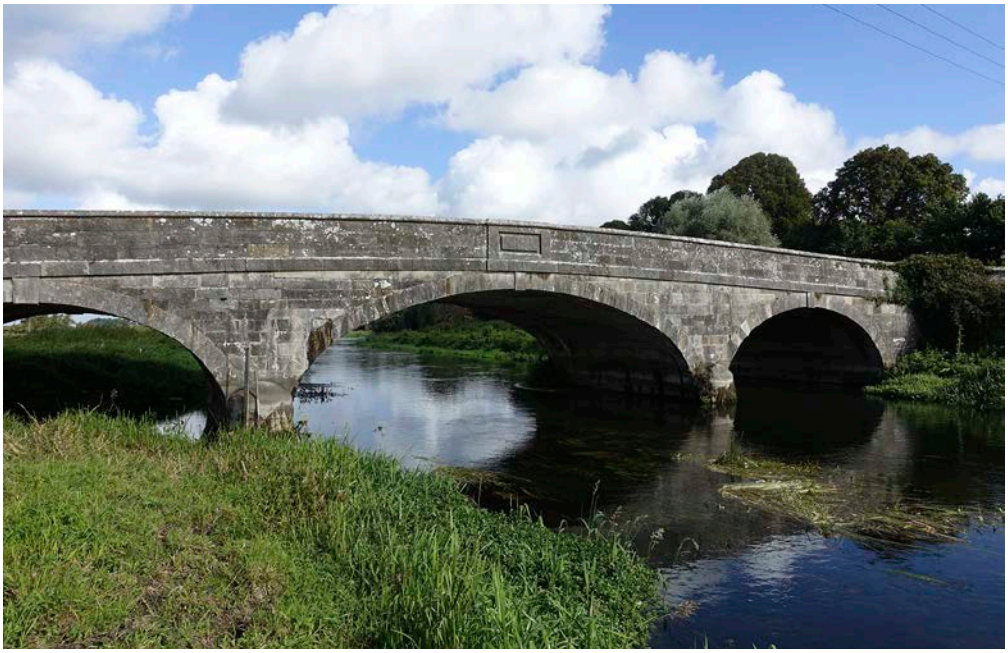
Lower Cretaceous

Purbeck Group, Durleston Formation

Purbeck Stone (Swanage Stone), Isle of Purbeck, Dorset

A buff to pale grey limestone, sometimes with shelly fragments or voids; fresh surfaces often cream coloured. Purbeck Stone is a good general purpose building stone, used as a rubblestone and as squared or ashlar blocks for walling. Dressed blocks often exhibit a rusticated or cut diagonal-trough finish. Notable examples of its use in Hampshire can be seen at the Church of St Katherine at Exbury, Lepe in the New Forest and Ibsley Bridge near Harbridge.

Figure 26: Ibsley Bridge, near Harbridge. Purbeck Stone.



Purbeck Stone Slate, Isle of Purbeck, Dorset

A grey or buff, heavy, fossiliferous, slabby limestone. It is typically employed in the form of a narrow strip or broad edging along the eaves of roofs, adjoining clay tiles or pantiles. Examples can be seen at Burgate Farmhouse, West Liss, and St Mary's Church, Ellingham.

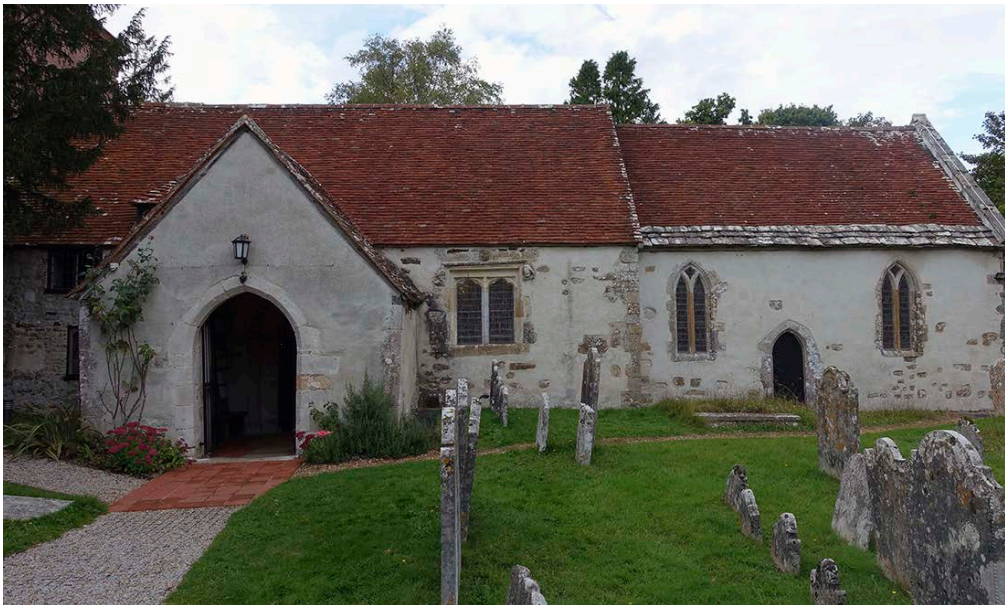


Figure 27: Church of St Nicholas, Brockenhurst. Purbeck Stone slate eaves.

Wealden Group, Weald Clay Formation

Horsham Stone Slate, West Sussex

A medium to dark grey stone which is finely laminated but are otherwise mostly structureless. Horsham Stone slate readily splits into 20 to 30mm-thick slates. It has seen only occasional and isolated use as a roofing slate in Hampshire. An example is the porch roof of Holy Cross Church at Binsted.

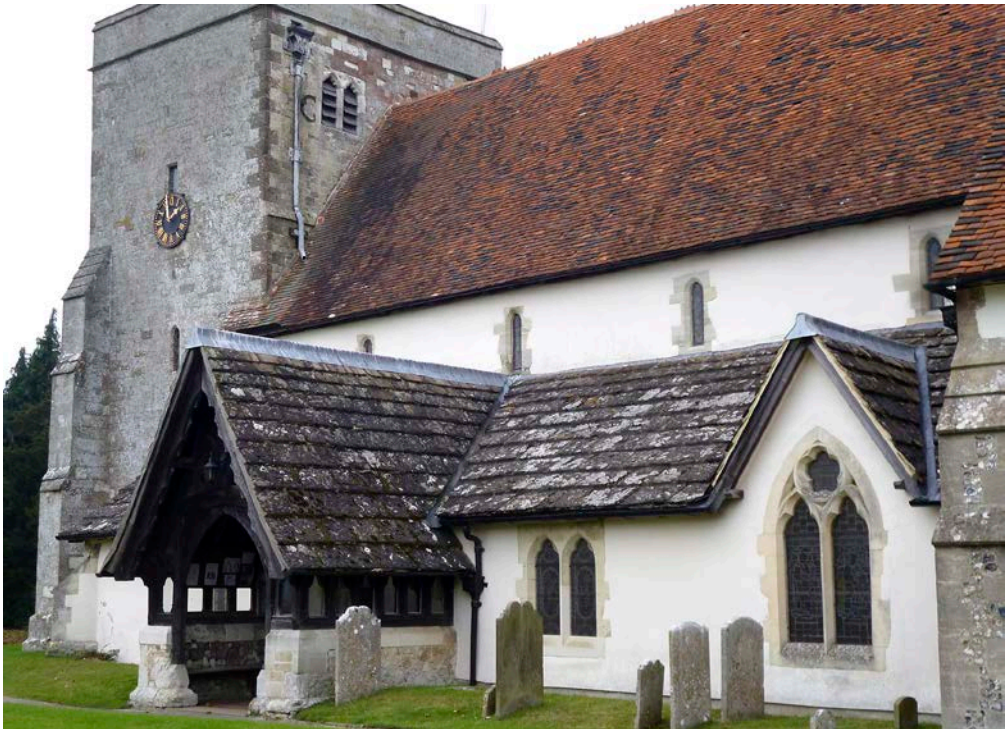


Figure 28: Porch and aisle, Holy Cross Church, Binsted. Horsham Stone slate tiles.

Selborne Group, Upper Greensand Formation

Ventnor Stone, Isle of Wight

A massive, grey-green, glauconitic, fossiliferous sandstone, often bioturbated and iron-stained, that tends to weather badly. This stone is quite widely used in Hampshire, especially as a general walling stone. It was mostly dressed in rectangular or square blocks, and was less commonly employed as ashlar. Examples of its use include churches along the western edge of the New Forest National Park, including All Saints' Church at Harbridge, and St Mary's College, College Street, Winchester.

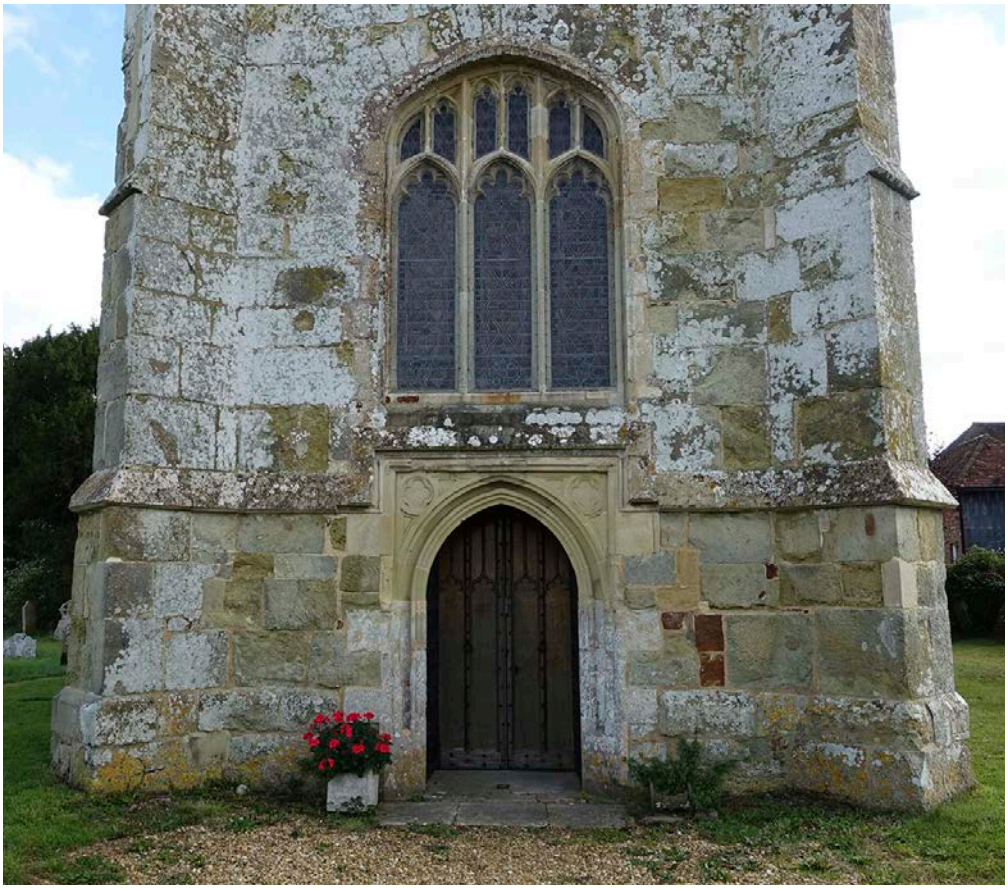


Figure 29: All Saints' Church, Harbridge. Ventnor Stone, Malmstone and ironstone.

Green Ventnor Stone, Isle of Wight

A distinctly green-coloured variety of Ventnor Stone, with a higher concentration of green glauconite grains. It has seen occasional use in the southern part of Hampshire, principally in churches. Green Ventnor Stone is generally found as single blocks, but sometimes as ashlar walling. Examples include St James' Church at Southwick and SS Peter and Paul's Church at Wymering.

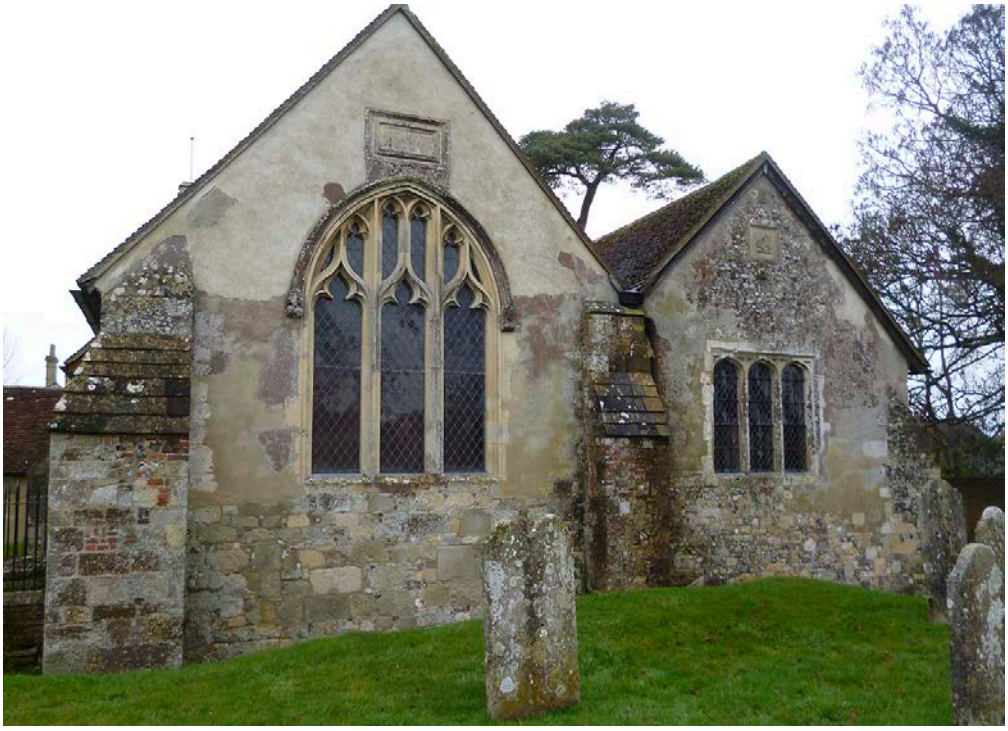


Figure 30: Church of St James, Southwick. Green Ventnor Stone.

Purbeck Group, Durleston Formation

Purbeck Marble, Isle of Purbeck, Dorset

A dark grey to buff, shelly limestone containing *Viviparus* fossil shells and other finely broken shell material. It has been used mainly for memorials, ledgers, columns, bases and capitals inside churches. The effigy stones standing in the inner doorway at Sopley Church are carved from Portland Marble.

Upper Cretaceous

Chalk Group, Holywell Nodular Chalk Formation

Beer Stone, Devon

A pale grey to buff, gritty chalk limestone containing fine shell debris. One of the best examples of its use is in The Court House, East Meon.

Palaeogene

Bracklesham Group, Selsey Sand Formation

Mixon Stone, West Sussex

A tough, coarse-grained, pale grey to honey-yellow bioclastic limestone or calcareous sandstone containing numerous microfossils, especially disc-shaped foraminifera *Fasciolites (Alveolina)*. In Hampshire, the use of Mixon Stone is essentially limited to the Langstone area, where it is employed

mainly for coursed rubble walling. Its uses include the construction of Hayling Island bridge in 1824, the east wall of the Church of St Thomas à Becket at Warblington, the remains of the old sea wall and Old Hayling Island Bridge on the north foreshore of Hayling Island and garden walls in Langstone.

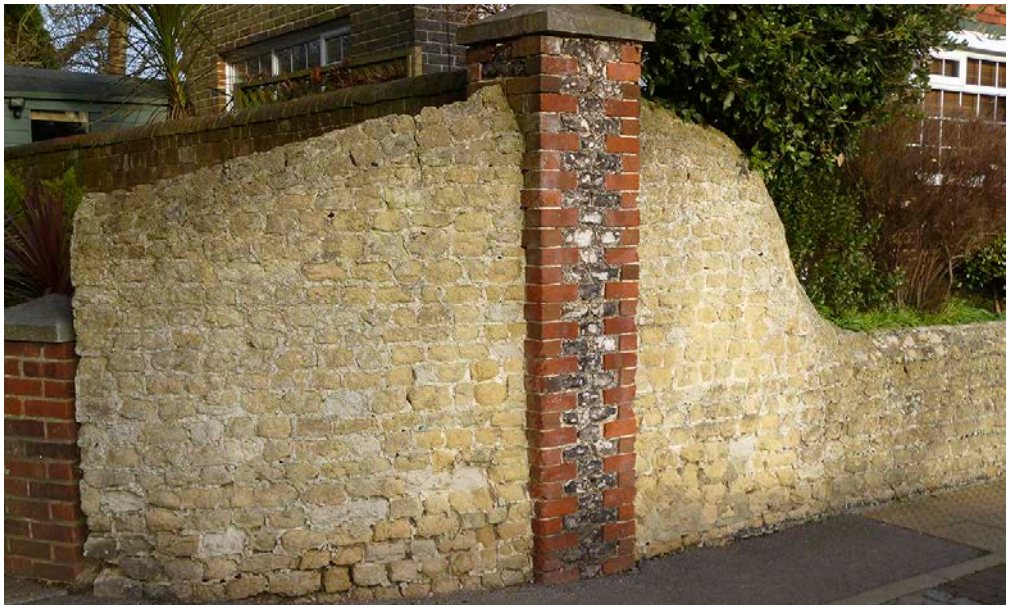


Figure 31: Garden wall, High Street, Langstone. Mixon Stone.

Solent Group, Headon Hill Formation

Nettlestone Sandstone, Isle of Wight

Pale grey to buff, flaggy, calcareous, fine-grained silty sandstone that characteristically displays well-defined, small-scale cross-bedding and ripple marks. In Hampshire, it finds occasional and local use mainly as tabular blocks or rubblestone in walls. It is a commonly seen building stone at Netley Abbey, near Southampton, and in string courses at Portchester Castle.

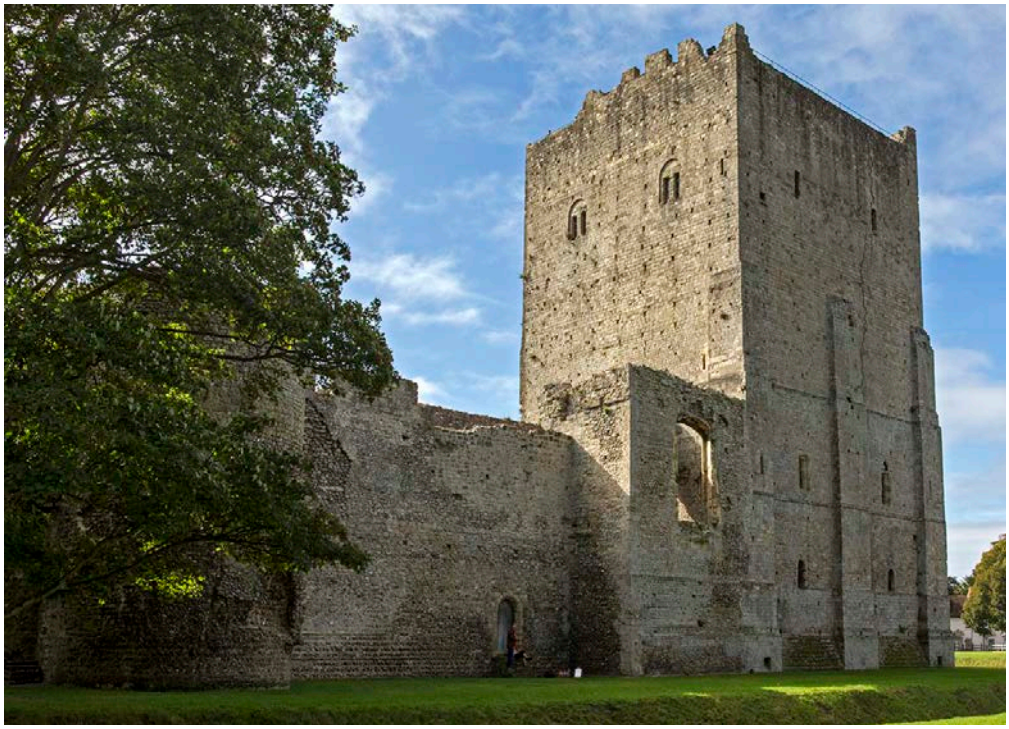


Figure 32: Keep, Portchester Castle, near Fareham. Nettlestone Sandstone and Quarr Stone.

Solent Group, Bembridge Limestone Formation or Headon Hill Formation

Quarr Stone, Isle of Wight

A pale grey to buff, porous, open-textured, shelly limestone. Fossils are typically present as internal moulds. Quarr Stone can often be seen in the Saxon and Norman remnants of several churches in Hampshire, especially those in the southern part of the county. It is mainly employed as ashlar in walling and buttresses, although usually only scattered pieces have survived later rebuilding works. It is recorded at churches in Bishop's Waltham, Boarhunt, Corhampton (of Saxon age), East Meon, Fareham, Headbourne, Hinton Ampner, Little Somborne, Tichborne, Titchfield, Southwick (in the buttresses of St James' Church), KIng's Worthy and Wymering. Quarr Stone was also used in medieval military architecture at Portsmouth, Portchester and Southampton and in surviving medieval walls and buildings in Southampton. It is recorded in Bishop's Waltham Palace (brewhouse and bakehouse buildings) and was occasionally used for carved work, at the font in St Peter's Church at Bishop's Waltham, for example.

Figure 33: Church of All Saints, East Meon. Quarr Stone, Bath Stone, Lower Greensand Group sandstone and downland flint nodules.

Solent Group, Bembridge Limestone Formation

Bembridge Limestone, Isle of Wight

Buff, fine-grained, shelly limestone. The fossils include the gastropod *Galba* and alga *Chara*. Bembridge Limestone (and its varieties) typically provides a good freestone that has been used in Hampshire as large ashlar blocks and as a walling stone often laid to course. It is commonly used for quoins. Typically, it occurs in medieval buildings in the southern part of the county, principally churches, including St Nicolas' Church at North Stoneham, St Michael and All Angels' Church at Chalton, the tower of St Mary and All Saints' Church at Droxford and St James' Church at Southwick. It is also recorded in Bishop's Waltham Palace (brewhouse and bakehouse buildings) and at the former blacksmiths near Sopley. Bembridge Limestone was also employed for fortifications at Portsmouth, including 17th and 18th-century harbour defences, and in the Norman and medieval city walls of Southampton.

Figure 34: Former blacksmith's shop, London Lane, near Sopley. Reused stone, including Bembridge Limestone.

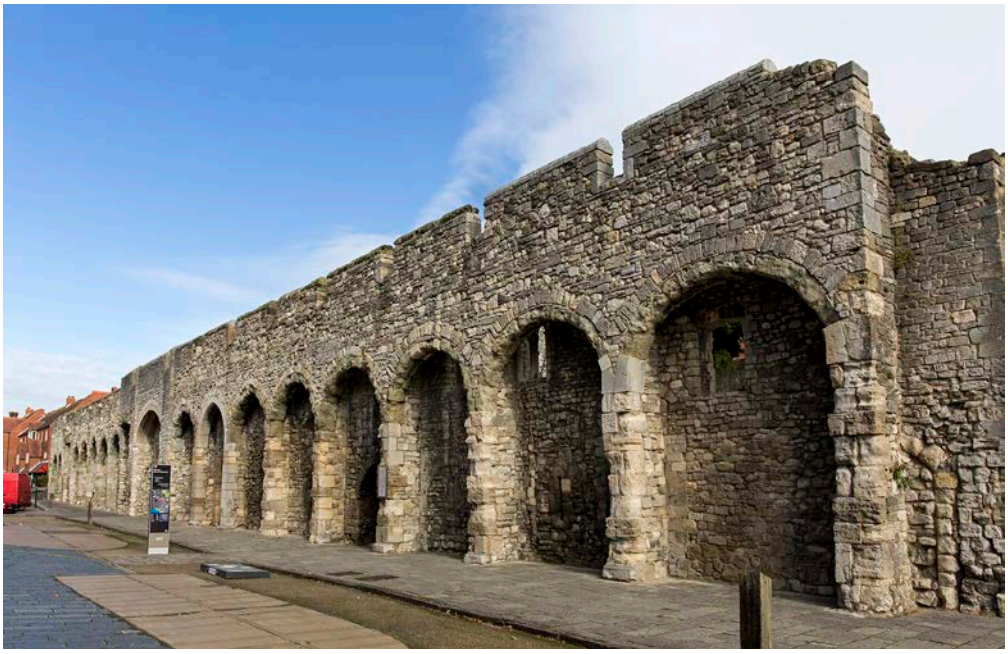


Figure 35: The Arcades, Southampton. Bembridge Limestone with some Quarr Stone, Reading Beds Sandstone, Basement Bed, Sarsen stone and exotics.

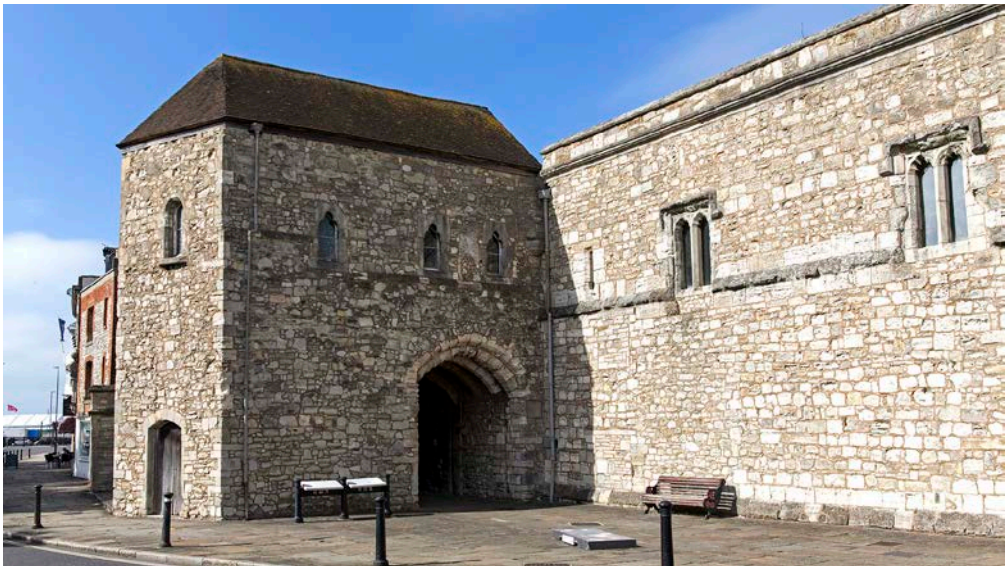


Figure 36: Gatehouse, Southampton. Bembridge Limestone with Sarsen stone, Bognor Rock, ferricrete and septaria.

Solent Group, Bembridge Limestone Formation

Binstead Stone, Isle of Wight

This variety of Bembridge Limestone is little used in Hampshire. Examples include some of the blockwork and dressings at Sopley Church, and a wall at Le Breton Farmhouse, Gosport.

Thames Group, London Clay Formation

Bognor Rock, West Sussex

Bognor Rock is a dark grey, glauconitic, carbonate-cemented sandstone which typically weathers to a distinctive, light orchreous-brown colour. *Glycymeris* bivalve and *Rotularia* coiled serpulid worm fossils are diagnostic. It is occasionally used in walls in the far south-east corner of the county, and usually as coursed and random rubble.

Igneous and various exotic building stones

Examples of exotic building stones from many different origins can be found. They range from from dark coloured igneous dolerites and basalts to paler coloured metamorphic quartzites. Some are re-used ships' ballast. They can be spotted in rubblestone walling such as Southampton's old city walls.

5 Further Reading

The Further Reading, Online Resources and Contacts guide provides general references on:

- Geology, building stones and mineral planning
- Historic building conservation, architecture and landscape.

There is also a separate glossary of geological terms.

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7 Acknowledgements

The Building Stones of England series was developed by Geckoella Ltd (Andy King), the British Geological Survey (Don Cameron, Graham Lott, and Stephen Parry), and Historic England (Clara Willett).

Historic England and the British Geological Survey developed the Building Stone Database for England with advice from many local geologists and historic building experts and all these individuals are thanked for their contributions.

For this guide, Historic England would like to also thank the South Downs National Park Authority (Robert Thain), David Bone, Bobby Alexander, and Bob Edwards (Forum Heritage Services).

The Department for Levelling Up, Housing and Communities supported the development of the Building Stones of England database project, and the South Downs National Park Authority sponsored the Hampshire project.

Figures

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Product code: HEBSE19
Publication date: May 2017
Reissue date: May 2023
Design: Historic England