Historic England

Dorset

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.

This guide is based on original research and text by Jo Pennell.

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Front cover: Woodsford Castle, Woodsford. Cypris Freestone. © Derek Beauchamp. Source: Historic England Archive.

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 Dorset County Council, Bournemouth, Christchurch and Poole mineral planning and unitary authority areas.

Contents

1 Introduction

Dorset has a varied geological succession, and this is reflected in its landscape and buildings. In the past, the inhabitants of each parish would have used the stone that was closest to them to build their towns, villages, houses and farms. Studying these older buildings, therefore, gives a good indication of the range of building stones originating from within the county. Limestone is the principal building stone of Dorset, with sandstone, chert, chalk and flint being used to a lesser extent.

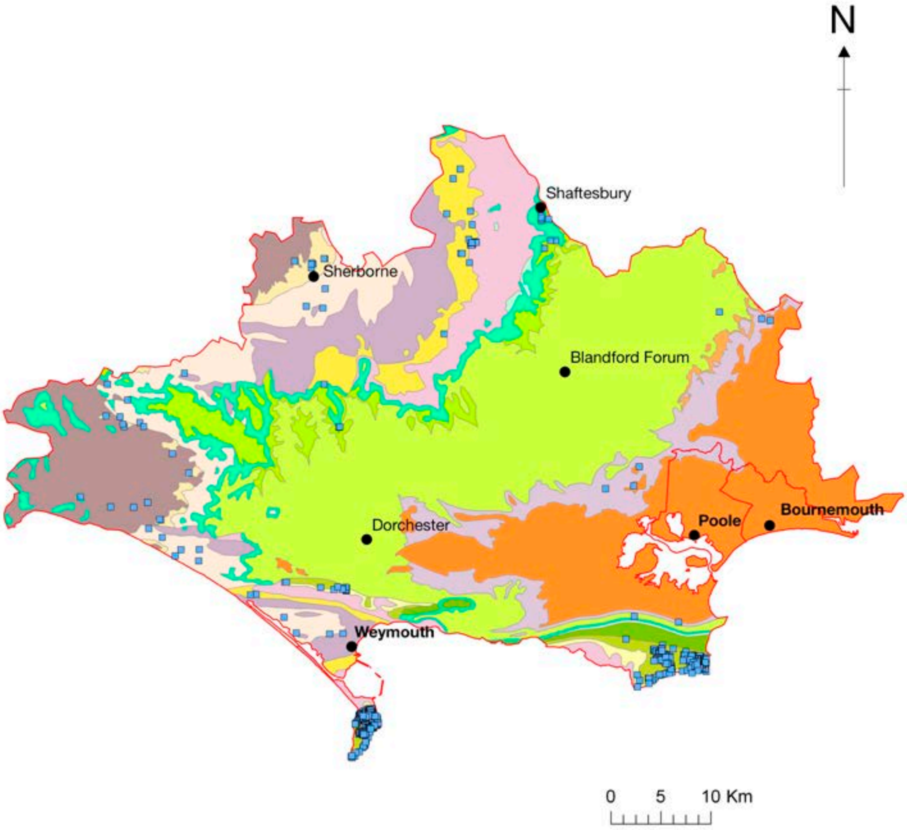
The bulk of Dorset's building limestones were formed during the Jurassic period, with most of the individual limestone beds being less than 1m in thickness. The thicker limestone beds, such as those of the Ham Hill Limestone Member of the Lias Group, were cut (sawn) as ashlar, while the thinner beds were broken into rubblestone or dressed to shape by hand. Some of the limestone beds are highly fossiliferous, containing the remains of ammonites, belemnites, brachiopods and bivalves. Sometimes, the presence of larger fossils can create weak points in the rock, rendering it unsuitable for building purposes.

The limestones chosen for building were (and still are) usually the finer grained, ooidal and bioclastic varieties, which have coarse or finely crystalline calcite cements binding the grains or shell debris together.

Dorset has many grand and small manor houses that have grown and changed during their history. The manor houses could afford to use the best quality stone available within their own estates, while the surrounding villages would have used stone of lesser quality. The best known of the Dorset building stones are the Purbeck Marble and Portland limestones. Both have been used extensively in Dorset, and they have also been exported for use in the construction of important buildings in London, Cardiff, Nottingham, Manchester, Leeds and Dublin, for example. In fact, most of the medieval cathedrals and larger churches in England were decorated with Purbeck Marble.

Although the quarrying of Purbeck Marble and Portland limestones remains an important industry today, most of the smaller quarries that produced Dorset's other building stones have closed down over time as demand for their products waned.

Bedrock Geology Map



Key

	Building stone sources

Bedrock geology

- Bracklesham Group and Barton Group — sand, silt and clay
- Thames Group — clay, silt, sand and gravel
- Lambeth Group — clay, silt, sand and gravel
- White Chalk Subgroup — chalk
- Grey Chalk Subgroup — chalk
- Gault Formation and Upper Greensand Formation — mudstone, sandstone and limestone
- Lower Greensand Group — sandstone and mudstone
- Wealden Group — mudstone, siltstone and sandstone
- Purbeck Limestone Group — limestone and mudstone, interbedded
- Portland Group — limestone and calcareous sandstone
- Corallian Group — limestone, sandstone, siltstone and mudstone
- West Walton Formation, Ampthill Clay Formation and Kimmeridge Clay Formation — mudstone, siltstone and sandstone
- Kellaways Formation and Oxford Clay Formation — mudstone, siltstone and sandstone
- Great Oolite Group — sandstone, limestone and argillaceous rocks
- Inferior Oolite Group — limestone, sandstone, siltstone and mudstone
- Lias Group — mudstone, siltstone, limestone and sandstone

Derived from BGS digital geological mapping at 1:625,000 scale, British Geological Survey

Stratigraphic Table

Geological timescale	Group	Formation	Building stone	Page
Lower Tertiary	Barton Group	Boscombe Sand Formation, Barton Clay Formation	Hengistbury Head Ironstone	21
		Poole Formation	Heathstones	21
	Thames Group	London Clay Formation	Warmwell Farm Sand, Lytchett Matravers Sandstone	21
	Lambeth Group	Reading Formation		
Upper Cretaceous	Chalk Group – Upper and Middle Chalk (White Chalk Subgroup)	various	Chalk (Clunch) Flint	20 19
	Chalk Group – Lower Chalk (Grey Chalk Subgroup)	various		
Lower Cretaceous	Selborne Group	Upper Greensand Formation	Shaftesbury Sandstone, Hardown Hill Chert and Upper Greensand chert (Ragstone)	17
		Gault Formation		
	Wealden Group	various		
	Purbeck Group	Durlston Formation	Purbeck Marble Purbeck Limestone including Cypris Freestone (Ridgeway Stone), Downs Vein, Laning Vein, Freestone Vein, Grub, Roach, Thornback, The Burr	16
		Lulworth Formation	Cypris Freestone	16
Upper Jurassic	Portland Group	Portland Stone Formation	Portland Stone including Purbeck-Portland Freestone, Base Bed, Whit Bed, Roach, Under Freestone, House Cap, Pond Freestone, Blue Stone	13
		Portland Sand Formation		
	Ancholme Group (part)	Kimmeridge Clay Formation		
	Corallian Group	various	Cucklington Oolite, Todber Freestone, Osmington Oolite, Corallian Limestone	11
	Ancholme Group (part)	Oxford Clay Formation		
Middle Jurassic		Kellaways Formation		
	Great Oolite Group	Cornbrash Formation	Cornbrash	11
		Forest Marble Formation	Forest Marble	9
		Frome Clay Formation		
		Fuller's Earth Formation		
	Inferior Oolite Group	various	Sherborne Stone, Inferior Oolite limestone (Wild Bed)	6
Lower Jurassic	Lias Group	Bridport Sand Formation	Ham Hill Stone	5
		Beacon Limestone Formation	Junction Bed	5
		Dyrham Formation		
		Charmouth Mudstone Formation		
		Blue Lias Formation	Blue Lias limestone	4

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

2 Local Building Stones

Lower Jurassic

Lias Group

The Lower Jurassic sequence, which is assigned to the Lias Group, is divided into Lower, Middle and Upper divisions. The sequence is characterised by rapid alternations of mudstone and limestone deposited in a shallow marine environment. It has an outcrop that can be traced continuously from Dorset to Yorkshire.

Lias Group, Blue Lias Formation

Blue Lias

The basal unit of the Lias Group is Blue Lias, which contains the oldest of the Jurassic limestones. These thinly bedded limestones are the principal stone quarried from the Lias sequence for building purposes. The limestones are blue-grey in colour, fine grained and micrite cemented, and commonly contain bivalve, ammonite and vertebrate fossils. Beds of harder limestone alternate with fissile mudstone horizons. Some of the darker limestones are rich in organic material. The beds are of variable depth, but they are typically around 0.15m, as can be seen in the Blue Lias Limestone and shale on the shore under Church Cliff, Lyme Regis. The Lower Lias crops out in the west of the county in the Lyme Regis and Charmouth areas. The Lias hills of the coast and around Marshwood Vale (north-east of Charmouth) are topped with Upper Greensand. On the western side of the vale, the Blue Lias limestones and Lower Lias mudstones form the lower slopes of these hills.

Figure 1: Church Cliffs, Lyme Regis. Blue Lias Limestone and shale.

Although Blue Lias has been used for building purposes in Lyme Regis, it tends to weather badly due to its high clay content. To protect the stone from weathering, it is often covered with render or hung with slates. Blue Lias has been used in the Town Mill on Mill Lane and Guildhall on Bridge Street. In the 18th century, this limestone was used to make stucco or interior plasterwork. Much of the Blue Lias used in Lyme Regis was quarried just over the county boundary at Uplyme in Devon. It has also been quarried at Keinton Mandeville in Somerset. The limestone has been used throughout West Dorset for paving. When employed for this purpose, the stone is laid on its bed, and it is sometimes possible to see oysters and other fossils on the exposed surfaces. It has also been used for kerb stones, which can still be seen in Sherborne and Shaftesbury, but these are gradually being replaced by harder wearing imported stones.

Figure 2: Town Mill, Lyme Regis. Blue Lias Limestone.

Lias Group, Dyrham, Beacon Limestone Formation, Bridport Sand formations

Junction Bed, Ham Hill Stone

The Middle and Upper Lias successions generally do not contain lithologies suitable for building purposes. The Middle Lias has three divisions: the Eype Clay Member, Down Cliff Sand Member and Thorncombe Sand Member. The sandy beds are generally too soft for use as building stone, but the harder, calcite-cemented sandstone doggers in the Thorncombe Sand Member have occasionally been used as foundation stones supporting a brick outer shell. Examples can be seen at Bettiscombe Manor near Bridport. In Symondsbury, the Manor Farm stable block contains a few blocks of Thorncombe Sand in the rubble walls.

Spanning the Middle–Upper Lias boundary is the Beacon Limestone Formation, which encompasses the 'Junction Bed' and which occasionally outcrops in Dorset. Its colour is a mix of pink, white and orange, and it tends to be rubbly in character. Although rarely used for building stone, the Junction Bed Limestone has provided firm foundations for buildings at Symondsbury and Melplash. The limestone is never used solely on its own and can be seen in buildings alongside other stone types in Trent and Sandford Orcas. Here, the stone is white and often contains ammonites. Generally, however, the Junction Bed has been used for lime burning.

The Bridport Sand Formation sits at the top of the Lias Group. This thinly bedded, sandstone-dominated unit includes a well-developed bioclastic limestone interval at Ham Hill in North Dorset. Despite forming a series of spectacular sea cliffs at Bridport, these fine-grained, variably cemented sandstones appear, in general, to have been rarely used for building purposes outside the town itself.

Although widely used in many Dorset buildings, Ham Hill Stone only crops out near Yeovil in Somerset, where it has been quarried for building since medieval times. The orange-brown limestone consists of ferruginous, calcite-cemented, shell debris. It is about 15m thick and strongly cross-bedded. West Dorset has many prestigious houses and churches that have been built using this stone. Numerous houses in Symondsbury and other villages have also been dressed with Ham Hill Stone. The stone is particularly suitable for dressings and mouldings because it retains its strength even when used perpendicular to its bedding.

The limestone is best carved fresh from the quarry because it hardens when it dries out and then becomes more difficult to work, as do many such limestones.

Middle Jurassic

Inferior Oolite Group, various formations

Sherborne Stone, Inferior Oolite limestone (Wild Bed)

The Inferior Oolite Group comprises hard, shelly and ooidal limestones that were deposited in a sub-tropical, shallow marine environment during the Middle Jurassic period. The limestones contain an abundance of ooids. The group is relatively thin, ranging from less than 2m in parts of southern Dorset to about 20m in the north near Sherborne. The limestones are commonly iron rich, and this gives rise to their often strong orange colour.

The succession, in general, comprises a thin sandy limestone at the base, overlain by a thicker ooidal limestone bed with abundant fossils. Overlying this are several thinner limestone beds of up to 1m in thickness. In the quarries near Beaminster, there is a red-stained limestone bed, indicating a particularly high iron content.

The Inferior Oolite limestones are important building stones that are widely used in West Dorset. The beds used for building stone are generally fine-grained, micritic limestones, which are cream to orange in colour and contain few fossils. The colour of the limestone tends to vary. In the Yeo Valley, the Inferior Oolite quarried to the west of Sherborne, around Bradford Abbas and Nether Compton, is darker in colour than the South Dorset stone. In contrast, the Sherborne building stone is lighter due to its lower iron content. Low's Hill Quarry to the west of Sherborne provides good exposures of the darker coloured, more ferruginous Inferior Oolite limestone. This quarry is 3m deep and the quarry face is a Site of Special Scientific Interest.

Figure 3: Low's Hill Quarry, near Sherborne. Inferior Oolite Limestone (Wild Bed).

Between Burton Bradstock and Drimpton (near Broadwindsor), 138 former quarries have been recorded. Many of them are isolated on the tops of small hills, such as Jacks Hill near Mapperton and Chideock Quarry Hill. Near Sherborne, the outcrop of the Inferior Oolite Group is continuous from Nether Compton to Oborne, where 48 former quarries have been recorded. Coombe Farm Quarry at Mapperton and Frogden Quarry at Oborne are still working the Inferior Oolite.

Most of the Inferior Oolite quarries were able to provide blocks large enough for ashlar. The church, manor houses and vicarage of each village were, therefore, built of the best stone. The cottages used dressed stone, whereas the farm outbuildings were built of rubble.

In Symondsbury, Inferior Oolite Limestone has been used extensively as a building stone. The Old Rectory is Inferior Oolite ashlar, the stable block in Mill Lane is a mix of stone, which includes Inferior Oolite Limestone, and the Old Post Office Cottage is entirely constructed of Inferior Oolite Limestone. Crepe Farm and its barn, which are set apart from the village, are built with limestone, too, but the stone is a darker orange. This was sourced from quarries at Sloes Hill and Watton Hill, where the stone is known as 'Wild Bed'. Most village buildings were originally constructed of stone from their own parish quarries, but these may have been worked out by the 19th century. Thereafter, the best quality stone was said to come from the quarries at Whetley Cross, Horn Park and Barrowfield in Beaminster. The quarry on Allington Hill, which produced the limestone used in the 13th-century hospital of St Mary Magdalen near Bridport, was worked out during the 18th century. There were also several quarries around Mapperton and Beaminster that provided Inferior Oolite limestone for building purposes until the 20th century.

Figure 4: Cottage, Symondsbury. Inferior Oolite Limestone.

Figure 5: House, Symondsbury. Inferior Oolite Limestone.

Bridport uses a good deal of Inferior Oolite, which is thought to have originated from the quarries at Allington Hill or Hyde Hill. Hyde Hill Quarry provided limestone for the 19th-century buildings in Walditch. All villages that had Inferior Oolite Limestone quarries made use of the stone. Those villages near to Bridport incorporated the more thinly bedded Forest Marble from Bothenhampton as damp-proof foundation stones. At Loders, in the south-west of Dorset, the walls of the Church of St Mary Magdalene are of local Inferior Oolite Limestone and stand on a plinth of Forest Marble Limestone from Bothenhampton. The east wall of the church was repaired during the 19th century using stone from Chiselcombe Quarry at Loders Cross.

Most building stone would be used within the parish where it was quarried, travelling no more than a few kilometres. However, records from the 19th century show that the stone from some of the larger quarries was taken further afield. Accounts for the two quarries in Waddon Hill show customers in Thorncombe (7.5km west) and Burton Bradstock (13.6km south-east).

Great Oolite Group, Forest Marble Formation

Forest Marble

The thick beds of ooidal limestones that characterise the Great Oolite Group of the Bath area in Somerset are not present in Dorset, where the equivalent beds are dominated by the deeper water mudstones and finer grained, argillaceous limestones of the Fuller's Earth Formation and Frome Clay Formation. Lithologies suitable for building stone are only present among the harder limestones of the uppermost part of the group, in the Forest Marble Formation and Cornbrash Formation.

The Forest Marble Formation is a thin unit consisting of mudstones, thin sandstones and shelly limestone. The term 'marble' is misleading because the limestone is not a metamorphic marble – formed under high heat and pressure – but refers to the limestone being hard enough to take a good polish. The Forest Marble is named after the Wychwood Forest in Oxfordshire, and it was formed in the Middle Jurassic around 165 million years ago. The hard, fossiliferous, crystalline limestone beds provide a very durable building stone.

Figure 6: Rope factory, Bridport. Forest Marble.

Figure 7: St John the Baptist's Church, Symondsbury. Forest Marble plinth.

In the north-west of Dorset, there is a discontinuous, roughly north-east to south-west trending outcrop of Forest Marble between Stalbridge and Halstock. Forest Marble can also be found in the south-west of Dorset, between Watton Cliff near Bridport and Radipole near Weymouth. Watton Cliff is capped with the Forest Marble. The beds of shelly limestone within the succession are about 30mm thick in the upper part of the deposit and up to 1m in the lower part. The thin limestone beds are used for roofing, and the thicker beds for ashlar and rubblestone. A working quarry still exists at Bothenhampton. The limestone was also worked in a series of quarries east of Burton Bradstock towards Swyre and West Bexington. The Forest Marble's general hardness, durability and lack of porosity are characteristics that make it suitable for plinths and foundation stones. Forest Marble plinths can be seen at St John the Baptist's Church at Symondsbury, St Mary Magdalene Church at Loders and the Church of the Holy Trinity at Bradpole.

The large quarries that worked the limestones in Wych Hill in Bothenhampton date back to the 14th century. They provided stone for Bridport, where the majority of houses and the rope factory were built entirely from Forest Marble. Over the centuries, there have been as many as 12 quarries working the limestones, and two of them remained active until the 1940s. Beds from these quarries produced dressed stone and paving stone for Bothenhampton. At Fleet, a quarry in the Forest Marble Formation provided limestone for the 15th-century parish church and 18th-century Moonfleet Manor hotel. South of Sherborne, the Forest Marble quarries from Lillington Hill to Longburton were used for Sherborne Castle Estate. Forest Marble can also be seen in buildings in Melbury Sampford, Evershot and Yetminster.

The appearance of the Forest Marble is distinctive, and it can be recognised throughout West Dorset. Subtle changes are observed in the lithology, however. In Longburton, for example, the shells within the limestone are much darker and give the stone a darker overall appearance.

Whithill Quarry in Lillington near Sherborne is still working the Forest Marble today.

Great Oolite Group, Cornbrash Formation

Cornbrash

The Forest Marble Formation is overlain by a thin development of the Cornbrash Formation. This comprises a thin, hard, rubbly limestone, which is pale yellow in colour and often highly fossiliferous. The limestone is interbedded with soft, cream-coloured, calcareous mudstone. The Cornbrash is rarely used as a building stone and was generally employed for lime burning. It has been quarried in Stalbridge for this purpose. Limestone from the Fleet and Chickerell quarries was used in the old village of Chickerell, and the remains of a quarry in the Cornbrash Formation can be seen next to the road in Fleet. Cornbrash was also used in Radipole, near Weymouth, for St Ann's Church and the manor house.

Upper Jurassic

Corallian Group, various formations

Cucklington Oolite, Todber Freestone, Osmington Oolite, Corallian Limestone

The varied beds that comprise the Upper Jurassic Corallian Group represent the depositional products of a marginal marine environment. The group comprises a series of sedimentary cycles involving ooidal and reefal limestones, lagoonal mudstones and sandstones. The strata crop out in the Weymouth Anticline, from Abbotsbury to Osmington on the northern limb of this structure, and along the Wyke Regis coast in the south.

In North Dorset, the principal building stone obtained from the Corallian Group is known as the Todber Freestone (Stour Formation). The best building stone is found at Marnhull, where it is slightly paler than the typical Todber Freestone. Lower in the succession is a second ooidal limestone bed, the Cucklington Oolite (Stour Formation). This is a medium-grained ooidal limestone, which has a micrite cement. The most important quarries were in the Blackmore Vale, between Marnhull and Todber, and currently there are still three working quarries in that area.

The Todber Freestone Member thins and dies out to the north and south, and other limestones were, therefore, worked for the surrounding villages.

At Hinton St Mary, Todber Freestone was produced from village's own quarries. The stone can be seen at St Peter's Church and also as dressings at the White Horse Inn. At Todber, the fossil-rich beds of the Clavellata Formation (above the Todber Freestone) were found to be unsuitable for building because the fossils create weak points in the stone. The Todber Freestone is almost fossil-free.

The limestones of the Osmington Oolite Formation are the most important source of building stone within this sequence. In South Dorset, this formation has been extensively quarried in Abbotsbury and used within the village. The limestone is predominantly orange in colour, but this is dependent on its disseminated iron content, and a range of colours from cream to orange are seen. When freshly quarried, the stone is often blue-grey, but this colour only remains until the disseminated iron oxidises.

The Osmington Oolite limestone is quarried from Chapel Coppice and Oddens Wood. The outcrop at Oddens Wood extends eastwards to Rodden and Langton Herring where the Corallian Limestones are also used extensively.

Corallian Limestone has also been used throughout the Stour Valley. Above Blandford and north of Fifehead Magdalen, the Cucklington Oolite is used alongside better quality stone from Marnhull. Most of the prestigious houses in the Stour Valley are built from limestone ashlar from the Marnhull or Todber quarries. The 11th-century Church of St Mary at Iwerne Stepleton and individual houses at Sutton Waldron and Marnhull are also built from the Corallian Limestone. The villages of Shillingstone and Child Okeford and nearby Fontmell Parva House have all used Corallian Limestone, either in association with other building stones or as dressings. Both Whiteway Hill Quarry in Marnhull and Redlands Quarry in Todber are currently working of the Corallian Group limestone.

Figure 8: St Andrew's Church, Todber. Todber Freestone.

Figure 9: Thatched cottage, Abbotsbury. Osmington Oolite.

Portland Group, Portland Stone Formation

Portland Stone including Purbeck-Portland Freestone, Base Bed, Whit Bed, Roach, Under Freestone, House Cap, Pond Freestone and Blue Stone

Limestones of the Portland Group are quarried on the Isle of Portland and the Isle of Purbeck. The white, ooidal limestone most commonly described as Portland Stone is probably the best known of England's building limestones and is internationally recognised and designated as a Global Heritage Stone Resource. It has been exported and used in prestigious buildings in many cities, including London, Dublin and Cardiff. In the 14th century, the stone was exported to Exeter for its cathedral, and in the 17th century to London to build St Paul's Cathedral.

On the Isle of Purbeck, similar although more thinly bedded ooidal limestones are worked as Purbeck-Portland Freestone.

The sediments that make up the Portland Group include marine sands, cherty limestones, and ooidal and bioclastic limestones. The ooidal and bioclastic limestones in the upper part of the group form the main worked freestone beds on both the Isles of Portland and Purbeck. In the Portland quarries, the freestone beds are subdivided into the Base Bed, Whit Bed and Roach. Each one is between 1 and 2m thick.

The ooidal Whit Bed contains common shells, whereas the Base Bed is generally less shelly in character. The fossiliferous Roach Bed is the most distinctive of the Portland limestones as it exhibits large, open, biomoldic pore spaces. These relate to the leaching out of examples of the large gastropod *Aptyxiella portlandica* (the Portland Screw).

On the Isle of Portland, fine quality freestones are used extensively. The stone at Portland is a distinctive white oolite, which contains a scattering of thick-walled fossils. It was used by the Romans, and occasionally in medieval times. There are 35 named quarries on the Isle of Portland, but only a few are still being worked. Today, King Barrow Quarry is a nature reserve and Tout Quarry is a sculpture park and public open space. Perryfield, Broadcroft and Withies Croft are still active and all work the Portland and Purbeck formations.

On the Isle of Portland, most of the houses built in the 19th century were constructed of Portland Stone. There was an increase in the use of Portland Stone during the 18th, 19th and 20th centuries. It has been quarried from the Isle of Portland, the cliffs of the Isle of Purbeck and the Ridgeway above Weymouth. The Portland Stone from Purbeck is said to be harder and denser than the Portland Stone from Portland. The hard and durable Roach Bed is confined to the north end of Portland and is often used for sea defences.

On the Isle of Purbeck, the lower beds of the Portland Stone Formation were quarried directly from the cliffs, where the Under Freestone – which provided the best quality stone – was taken from beds up to 2m thick. Overlying the Under Freestone are three further beds of limestone that were worked: House Cap, Pond Freestone and Blue Stone. The Pond Freestone, which is about 2m thick, is generally considered to be the best building stone bed. Cliff-side quarries continued to work until the 1930s, and inland, the Pond Freestone is still worked at St Aldhelm's Head Quarry, for example, to produce the Purbeck-Portland Freestone.

At Seacombe and Winspit, the main stone mining galleries are in the Under Freestone. At Seacombe, there are also galleries in the Pond Freestone. On the Isle of Purbeck, the cliff quarries provided Portland Stone that was used in Norman work at Christchurch Priory. These quarries were active earlier than those at Portland because the stone was easier to reach. Several manor houses in Dorset built before the 17th century recorded using Purbeck Stone, but closer examination has revealed that it was a Portland Stone from the Isle of Purbeck, now often referred to as the Purbeck-Portland Freestone.

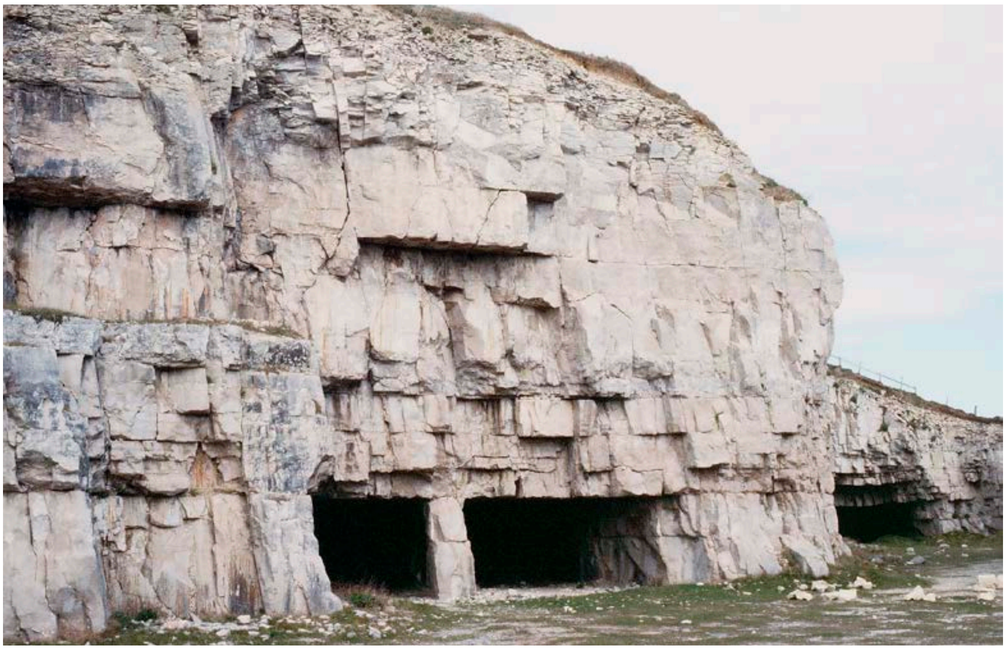
Figure 10: Portland Castle, Castletown. Roach.

The Ridgeway quarries at Upwey were worked into the sides of the hills. Here, the Portland Limestone being quarried lies below the Lower Purbeck Cypris Freestone, and it is finer, more micritic and chalky in character. Purbeck Limestone from the Ridgeway quarries has been used in a wide area of West Dorset. There is evidence to suggest that the quarries at Portesham, Chalbury and Poxwell were worked occasionally during the 20th century.

The quarries at Chalbury and Poxwell produced limestone of a fine-grained, chalky texture. Sitting below this is a chert-rich bed, and below this are two more beds of limestone. Stone from the Ridgeway quarries, both Portland and Lower Purbeck, was used for the abbeys in Abbotsbury and Cerne Abbas. The Tudor manor at Athelhampton also used both these stones, although the main walls are Lower Purbeck limestones. At Waddon Manor and Corton Farm, both Portland and Purbeck limestones were employed.

Stone quarried from the Portland Stone Formation at Chilmark and Tisbury (Wiltshire) has been used in northern and eastern Dorset. The building stones produced in this area include fine-grained, white or buff, sandy, ooidal limestones and glauconitic sandy limestones varying from green to buff in colour. They have been used for constructing bridges and sluice gates in the Tarrant and Stour Valleys.

Figure 11: Quarried galleries, Winspit, near Worth Matravers. Under Freestone.



Lower Cretaceous

Purbeck Group, Lulworth Formation and Durlston Formation

> **Purbeck limestones including Cypris Freestone (Ridgeway Stone), Downs Vein, Laning Vein, Freestone Vein, Grub, Roach, Thornback, The Burr**

Overlying the Portland Group is the Purbeck Group, which is now believed to be largely of Lower Cretaceous period. The Purbeck Group comprises a series of thin limestones, mudstones and calcareous clays deposited in shallow freshwater or marginal marine environments. The limestones have abundant fossils, mostly bivalves, but the beds worked as 'marbles', which are higher in the sequence, contain mostly gastropods. The hardness of the marbles and some of the bivalve-rich limestone beds means they can be polished. The Purbeck Group succession crops out on the northern and southern limbs of the Weymouth Anticline, and in the southern half of the Isle of Purbeck. Limestone from the group has been used locally for building and decorative stonework, from Roman times to the present day.

The many limestone beds or 'veins' found within the sequence were all give individual names by the quarrymen. Many appear to have been quarried for specific purposes such as paving or for roofing tiles. On the Isle of Portland, near the base of the sequence, are the limestones named the Cap. Above the Cap, are the oldest beds used for building, the laminated micritic limestones known as the Cypris Freestone. The Cypris Freestone was quarried from the hills south of the Ridgeway between Weymouth and Dorchester.

The basal Lulworth Formation of the Purbeck Group incorporates the Mupe Member, which contains a number of thin limestones, including the Cypris Freestone, in particular. This was used for building in the area north of Weymouth and Dorchester, as far east as Coombe Keynes near Wool and

Figure 12: Guesthouse, Cerne Abbey. Cypris Freestone and flint, Ham Hill Stone, and Portland Stone.

as far west as Abbotsbury. In the small village of Winterbourne Abbas, west of Dorchester, the majority of buildings were constructed of the Cypris Freestone, including the Church of St Mary. However, the new houses in the village used limestone from the Durlston Formation, worked on the Isle of Purbeck.

From Portesham to Upwey, and in the Poxwell area, the quarries produced both Portland and Purbeck limestones. These lower beds are followed by dark mudstone of the Ridgeway Member and Worbarrow Tout Member. The overlying Durlston Formation comprises a succession of calcareous mudstones, cherty beds, limestones and clays. The limestones assigned to this formation include the two principal marble beds, which sit near the top of the formation in the Peveril Point Member, above the massive 'Burr' bed.

The majority of the limestone quarries on the Isle of Purbeck are in the Stair Hole Member of the Durlston Formation. Most of the veins used for building stone are above the basal Cinder Bed. For example, the Downs Vein is a thick, cream-coloured limestone that splits easily, with some chert on the top. At the top of many of the quarries is the Laning Vein, which lies above the Freestone Vein. It is a cream-coloured, sandy limestone in which the shells have been replaced by calcite spar. The Roach, Thornback and Grub stones from the Freestone Vein have been used for paving and kerbs. Thinner slabs of the Downs Vein, which can be up to 20mcm thick, have been used for roofing tiles throughout the Isle of Purbeck and the Frome Valley.

In the Middle Purbeck, the Cypris Freestone is the best stone for building because it occurs in thick beds that can be cut for ashlar. The manor house at Dunshay was one of the earliest to be built of Cypris Freestone, in 1642. Freestone was used a great deal during the 19th century for churches in Poole and Bournemouth.

Open-cast quarrying in Worth Matravers and Langton Matravers is now providing Middle Purbeck Limestone for new-build projects and repairs across Dorset. In the absence of local quarries, it has also been used in villages that would be regarded as Inferior Oolite or Corallian Limestone villages.

Selbourne Group, Upper Greensand Formation

Shaftesbury Sandstone, Hardown Hill Chert and Upper Greensand chert (Ragstone)

The Upper Greensand Formation was deposited in a shallow marine setting at the end of the Lower Cretaceous period. The formation is sandstone dominated, with cherty nodules common in its upper part. The sandstones are green in colour because of the abundance of the mineral glauconite. In West Dorset, the lowest part of the formation, known as the Foxmould Member, is poorly cemented and fine grained. This poorly consolidated sand is often used for making mortar. The Foxmould Member is overlain by the Whitecliff Chert Member, the chert beds of which are used locally for building in the same way as flint. At the top of the formation is the coarse-grained, well-cemented sandstone known as the Eggardon Grit Member.

The Upper Greensand Formation forms the capping to the flat-topped hills of Golden Cap, Langdon Hill, Hardown Hill, Coney's Castle and Lambert's Castle. There were many small quarries working the chert beds and chert drift at Hardown Hill, Lambert's Castle and Blackdown. The Hardown Hill chert mines are still open but are not worked. Hardown Hill Chert has been used as far as Exeter for road stone. It is commonly used for walling in Charmouth and Marshwood Vale and is often used with Blue Lias in this area. In Charmouth, St Andrew's Church was built from Upper Greensand chert, and Forest Marble was used for the plinths.

In North Dorset, the Foxmould Member is replaced by the Shaftesbury Sandstone Member, which provided a good quality building stone and has been used for ashlar. Here, the sandstone appears a darker green than in the west because of its high glauconite content. The beds include a weakly cemented sandstone lower down, with hard, shelly, calcite-cemented glauconite sandstone above. The upper sandstone bed was commonly known as Ragstone and was quarried on both sides of the hilltop at Shaftesbury, where quarrying continued until 1888. Shaftesbury Sandstone has been used for building in all the villages around Shaftesbury, and also as far as Wimborne. St Mary's Church at Sturminster Newton is built entirely from Shaftesbury Sandstone, as is Pond House in Ashmore. However, the stone is often used with other materials, such as flint (in Ashmore), Poole Formation Heathstones (in the Tarrant Valley) and Purbeck Limestone (further south).

The only quarry currently working the Upper Greensand Formation for building stone is Manor Farm Quarry in Melbury Abbas. The sandstone is fine grained, calcareous and glauconitic. It is very similar to the Shaftesbury Sandstone and the two are, therefore, very difficult to distinguish.

Figure 13: Pond House, Ashmore. Shaftesbury Sandstone.

Upper Cretaceous

Chalk Group, various formations

The chalks of the Chalk Group were deposited in an open marine environment from about 100 million years ago, during the Upper Cretaceous period. They crop out extensively over central parts of Dorset, from the north-east to south-west regions. Traditionally, the Chalk Group succession was divided into three subdivisions: Lower, Middle and Upper Chalk. However, there has been considerable revision of the nomenclature, several new formation names have been introduced. The Lower Chalk interval comprises the West Melbury Marly Chalk Formation and the Zig Zag Chalk Formation, which together are about 57m thick. The Middle Chalk interval is about 41m thick and comprises the Holywell Nodular Chalk Formation and the New Pit Chalk Formation. It shows the first appearance of flint nodules in the group. The Upper Chalk interval comprises five formations: the Lewes Nodular Chalk, the Seaford Chalk, the Newhaven Chalk, the Culver Chalk and the Portsdown Chalk. Tabular and nodular flint layers are common throughout the succession. The Chalk Group caps the eastern hills of the Marshwood Vale, and between Rampisham Down and Bulbarrow Hill steep-sided valleys cut the Chalk Downland.

Flint

Flint nodules are present in much of the Chalk Group, but they are particularly concentrated in the Upper Chalk. Flint is composed of a very hard, cryptocrystalline silica, which is black or dark brown in colour. It has a conchoidal fracture and a glassy appearance. The silica was derived from the siliceous skeletal components of marine organisms such as sponges. The formation of the regular bands or tabular layers of flint may be associated with infaunal burrow fills, but the more randomly distributed flint nodules are often found in association with macrofossils.

The hardness and durability of flint make it a good building material, providing a weather-proof exterior or a strong rubblestone wall core. The one problem with using it for building, however, is its uneven shape. Village houses built on the Chalk Downland use flint banded or chequered with brick or stone as exterior facing.

Flint is the most important building material on the Chalk Downland across central Dorset. The 15th and 19th-century parts of St Mary's Church at Maiden Newton are built of flint and Purbeck Limestone. The cottages in Tarrant Gunville are flint, Upper Greensand chert and brick, and in the upper part of Piddle Valley, the cottages are flint and brick or Purbeck Limestone from the Ridgeway. Flint is still being quarried for building construction from Woodsford Quarry in the Frome Valley, where it comes from the terrace gravels.

Figure 14: Terraced cottages, Tarrant Gunville. Flint, Upper Greensand chert and brick.

Chalk (Clunch)

The Lower Chalk has been used in Cerne Abbas, Sydling St Nicholas and Cattistock. The Middle Chalk is characteristically flinty. North Barn in Cerne Abbas is one building that has remained intact over the years; it has an outer wall of large nodular chalk blocks containing scattered lumps of flint. This is characteristic of the Middle Chalk, which would have been quarried from Giant Hill. Only a small number of buildings have chalk stonework in the exterior walls because it was generally too soft to survive exposure to the agents of weathering. The great barn at Iwerne Courtney has external walls that are constructed of Shaftesbury Sandstone and flint, but it is lined with chalk. In Coombe Keynes, the Purbeck Stone and Heathstone cottages sometimes have chalk block internal walls. At Cattistock, many walls have been rendered, and some of the chalk blocks found in the walls contain scattered sand grains. At Sydling St Nicholas, the chalk is also sandy.

Most chalk pits in Dorset have been quarried for road stone or lime production. The only evidence of quarrying for chalk blockstone is provided by the surviving buildings of the villages around the edge, or in the valleys, of the Dorset Downs, where the chalk was used in block form for house building.

Generally, chalk is not the predominant stone in buildings over its outcrop because of its vulnerability to weathering and high porosity. It is, however, used extensively in buildings with other stones that are not so susceptible to weathering. Many cottages that were once built from chalk have been demolished and rebuilt with other local stone.

Figure 15: North Barn, Cerne Abbas. Chalk block with flint.

Tertiary

Thames, Bracklesham and Barton groups, Reading, London Clay, Poole, Boscombe Sand, and Barton Clay formations

Warmwell Farm Sand, Lytchett Matravers Sandstone, Heathstones, Hengistbury Head Ironstone

The Lower Tertiary succession in Dorset is subdivided into the Reading, London Clay, Poole, Boscombe Sand and Barton Clay formations, which represent the depositional products of fluvial and marginal marine environments. The sediments are mostly clay and sand dominated, with some pebble beds. The lithological complexity and variability of the successions exposed, both vertically and laterally, have made precise determination of the stratigraphic position of some stones difficult.

Within the London Clay Formation, there are two iron-cemented sandstones: Lytchett Matravers Sandstone and the Warmwell Farm Sand. These ferruginous beds have been mapped in isolated patches around Lytchett Matravers and north of Wimborne. Overlying this formation are the sediments of the Poole Formation, which is predominantly composed of alternating clay and sand beds, again with occasional lenses of ferruginous sandstone. The London Clay Formation and the Poole Formation form a continuous strip from Broadmayne to Cranborne across the south-east of Dorset. The nature of the sands and clays has given rise to an extensive heathland landscape over the whole of south-east Dorset. The ferruginous sandstones provided the only suitable building material and were, therefore, widely used. They were known locally as 'Heathstones'.

The Lytchett Matravers Sandstone was used in St Mary's Church at Lytchett Matravers and St Mary's Church at Almer. At Lytchett Matravers, the sandstone is a dark brown colour, but at Almer the south wall sandstone is a lighter orange/brown. The quartz grains are generally very rounded and coated with iron, whereas in other buildings in Lytchett Matravers the grains are not so well rounded and are less ferruginous in character. This sandstone is likely to have come from the Warmwell Farm Sand Member. The original quarries for these Tertiary sandstones are hard to locate because there is little evidence remaining of surface workings. In Chalbury, Horton, Woodlands, Knowlton Church and Cranborne, the Lytchett Matravers Sandstone has been used in association with other stones.

Figure 16: St Mary's Church, Lychett Matravers. Lytchett Matravers Sandstone.

The majority of buildings that have used Heathstones are likely to have obtained the sandstone blocks from the local Poole Formation. In the Poole Formation, iron-cemented sandstones only occur in patches and have been collected from sandpits. The only Heathstones source at present is in the Henbury Sand and Gravel Pit, located between Corfe Mullen and Lytchett Matravers. The Poole Formation was also quarried at Woodhouse Hill, Studland and near Kingswood Farm.

The Lytchett Matravers Sandstone Member has a finer grain size than the Poole Formation sandstone. Both vary in colour from dark to pale yellow-brown in eastern Dorset. The Poole Formation sandstones south of Wareham exist in various shades of brown, with an almost blood-red sandstone being found around Studland.

In Canford Magna, the parish church tower is constructed of Heathstones, as is the tower at St Andrew's Church at Kinson, built in the 12th century. In Kinson, the Heathstones have been dressed as ashlar. Heathstones can also be seen in buildings in Sturminster Marshall and Shapwick.

At the top of this early Tertiary succession in Dorset is the Barton Group, comprising the Boscombe Sand Formation and Barton Clay Formation (which include the Chama Sand Member and Becton Sand Member). A ferruginous sandstone from these units is used for building. It is fine grained and blood-red to purple in colour. This ironstone is not from a heathland area, however, but from Hengistbury Head, where it crops out as two bands of ironstone 'doggers' in the Barton Clay.

Figure 17: Canford Magna Parish Church, Canford Magna. Heathstones.

3 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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Figures

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