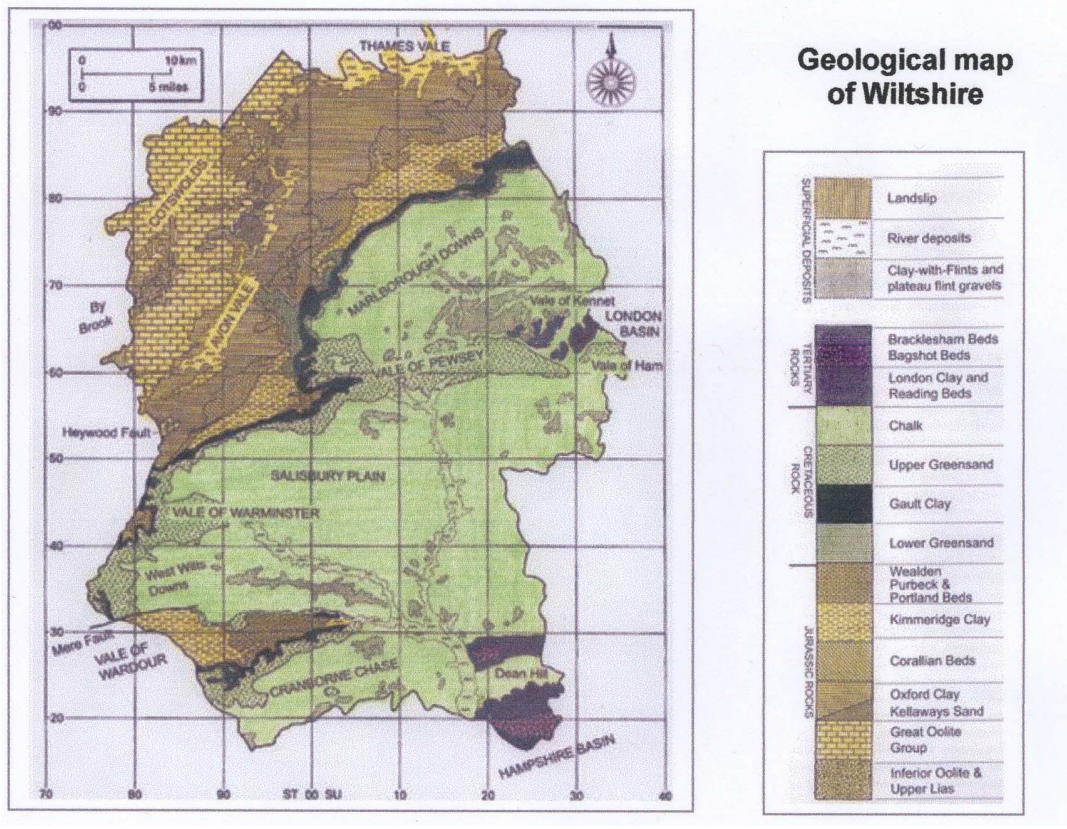
WILTSHIRE BUILDING STONES

OVERVIEW

The character of a region is largely determined by a combination of landscape and the local stone used to build the towns and villages. Even where there is a lack of stone (for example in the Chalk downs), the alternative building materials traditionally used are distinctive.

It is the harder limestones and sandstones that have been used for building. The properties of the stone: colour, texture, bed thickness, durability, plus ease of quarrying, lateral extent and currently available technology for extraction and preparation all determine the use of stone as opposed to alternative (cheaper) building materials. Transport has always been a major factor in stone use because of its sheer weight and bulk. During the Middle Ages, movement of stone by water was often more practicable than overland transport by wagon, so in coastal cities imported stone was utilised for important buildings (e.g. Caen Stone). It was the development of more efficient transport with the advent of first the canal network, then the railways in the 19th century, and subsequently roads, that opened the way for more widespread use of stone far from its origin. This, sadly, has meant that the local character of towns and villages is being lost where non-local building materials are brought in. The use of building stone has anyway declined in the last hundred years, due mainly to the expense and the easy availability of cheaper (and more durable) alternatives these days, especially now that transport is not the major consideration that it was.

Fashion and status have always played some part in the choice of building materials by the rich and powerful, as a public display of their wealth.



JURASSIC BUILDING STONES

Jurassic limestones have provided the best stone for building in Wiltshire and beyond.

Lias Group:
Building stones of this Early Jurassic group actually crop out south-west of the county boundary, in Somerset. However, they have been used to some extent in Wiltshire.

The Blue Lias Formation, consisting of interbedded limestones and shales, occurs in the lowest part of the Lias Group. The hard, fine-grained muddy limestone beds are only up to 0.3m thick. Blue-grey when fresh, they weather rather patchily to shades of fawn. It was used extensively near its outcrop in buildings but the paving stones travelled more widely. In the 12th and 13th centuries it was used for polished shafts as an inferior substitute for Purbeck Marble. It is still worked in the Polden Hills of Somerset, mainly for walling.

Ham Hill Stone is a local shelly limestone facies of the Upper Lias west of Yeovil in Somerset, capping Ham Hill and nearby hills to the south. The upper 14-15 metres are durable, high-class freestone, composed of well-graded shell fragments with a distinctive golden-brown colour and strong cross-bedding, often accentuated by weathering. It has been used since Roman times and can be found in buildings over a wide area, often as dressings in association with other materials. The most widespread use was in the 19th and early 20th centuries, when it was used throughout the southwest counties including Salisbury as well as London, Oxford and Cambridge.

Inferior Oolite Group:
Although these shelly, oolitic limestones do crop out in river valleys of western Wiltshire, the most important building stone is **Doulting Stone**, still quarried east of Shepton Mallet, Somerset. It has been widely used, particularly in the 19th and 20th centuries, beyond the boundaries of Somerset. The freestone beds are 8-9m thick and readily distinguished by their cross-bedding and coarsely granular texture, formed from the broken-up remains of fossil crinoids (sea lilies) cemented by crystalline calcite. It tends to weather grey, but is yellowish-cream to creamy-brown when fresh. It was much used for ashlar and dressings.

Great Oolite Group:
The Middle Jurassic Great Oolite (Chalfield Oolite) and the Forest Marble formations are the most important units of the group for building stones in Wiltshire.

Typical village buildings in the Wiltshire Cotswolds built entirely of limestone from the Great Oolite Group

The Cornbrash Formation is now included at the top of this group, while at the base is the Fuller's Earth, a mainly clay-rich formation.

The Great Oolite (Chalfield Oolite) Formation includes the nationally renowned 'Bath Stone'. It is up to 30m thick but is only present north of Norton St Philip (Somerset): the "Cotswold stone belt" crosses north-western Wiltshire, from Farleigh Hungerford to Malmesbury.

Freestones, ragstones and tile-stones have been widely used in the Cotswold region for both buildings and dry-stone walls. The older parts of the towns and villages of northwest Wiltshire all have buildings made of these Jurassic limestones.

Even in the clay vales to the east, it was extensively used (e.g. at Lacock), as transport distances were not all that great.

Great Chalfield Manor made of Bath Stone

Bath Stone ooidal limestone has small amounts of shelly debris but is virtually free of large fossils, so can be cut freely in any direction, without splitting, hence its name, "freestone". It comprises three distinct geological members: the lowest is the Combe Down Oolite; the Bath Oolite lies above, usually separated by ragstone; the highest freestone is the Ancliff Oolite, nowadays placed in the overlying Forest Marble (see below).

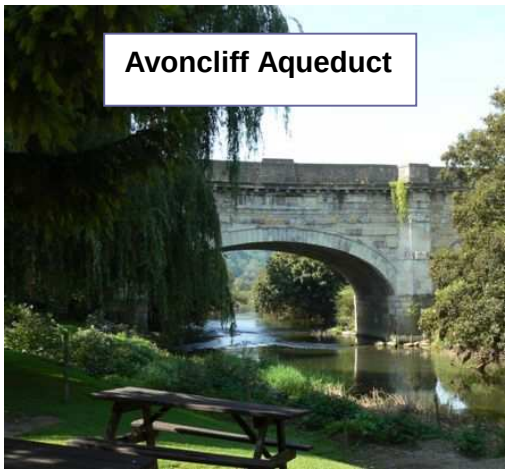
The massive beds have been utilised for building since Roman times, some two thousand years ago, when it was used in Roman Bath. In the Anglo-Saxon period, usage over a surprisingly large area has been recorded (e.g. the 7th century St Laurence chapel in Bradford-on-Avon), continuing through the Middle Ages (Winchester Cathedral, Malmesbury Abbey, Lacock Abbey, Monkton Farleigh Priory, Great Chalfield Manor and Longleat House). However, the "Golden Age" of Bath Stone was in the building of Bath in the 18th century as a fashionable resort. The stone was originally cut from surface quarries but, as the best quality beds are usually only a few metres thick, it soon became necessary to follow them into the hillsides. Vast underground workings developed. Along the route of the Kennet and Avon canal, steep tramways linked the quarries high on the Avon valley sides with the canal

at Avoncliff, Limpley Stoke, Murhill and Conkwell. Murhill quarry opened in 1803 to supply stone for the Kennet and Avon canal. It was not an ideal choice, as the limestone could not withstand the constant leakage of water from the canal -as witnessed by the crumbling face of the Avoncliff aqueduct, now repaired (see photo).

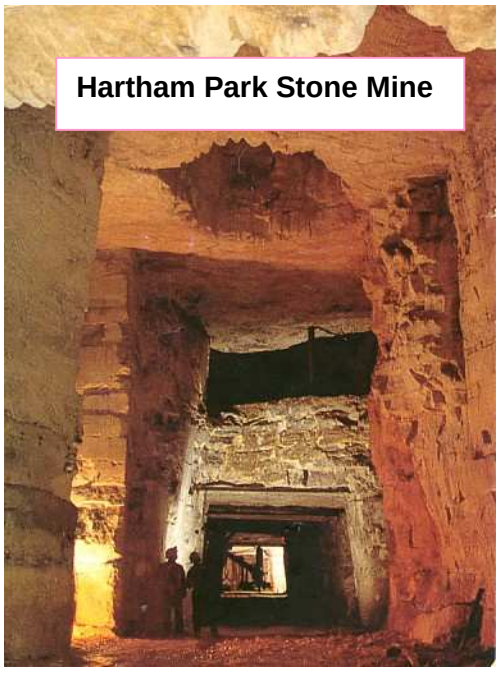
Combe Down Oolite

The quality does vary greatly, differences in durability being related to the fossil content, thickness of beds and level in the formation. The more durable varieties are known as groundstones. The strength of Bath Stone comes from the crystalline calcite cement between the grains, rather than from the ooliths. The cement prevents water being absorbed into the rock by the porous ooliths. This cement is largely derived from shell fragments mixed in with the ooliths, which recrystallised after burial. Thus, it is no coincidence that the best weatherstone in the area, **Box Ground** (**Combe Down Oolite**), contains the highest proportion of shell debris. The same level was extensively worked in the hills around Bath and is still quarried there on Combe Down. It was probably these lower beds of the formation that gave Bath Stone its reputation.

An article in *The Builder* of 1895 (Anon., quoted in Perkins et al.1979) describes in some detail 47 working Bath Stone quarries in the Bath - Bradford-on-Avon - Corsham area. Of these, the higher, softer and purer level of the freestone (Bath Oolite) is still worked underground at Westwood (Westwood Ground), Limpley Stoke (Stoke Ground), Hartham Park at Corsham (see photo) and Monk's Park and Elm Park to the south. The **Bath Oolite** here is up to 13 metres thick and there is enough shell debris and crystalline cement between the ooliths to make good building stone.



Avoncliff Aqueduct



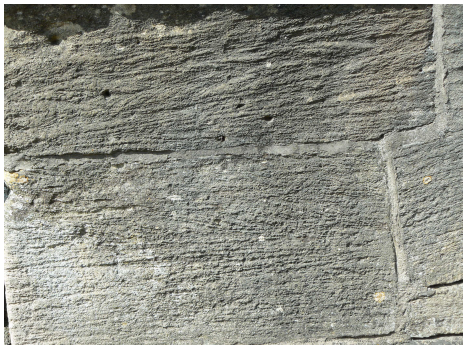
Hartham Park Stone Mine

Bradford-on-Avon library built of Bath Oolite

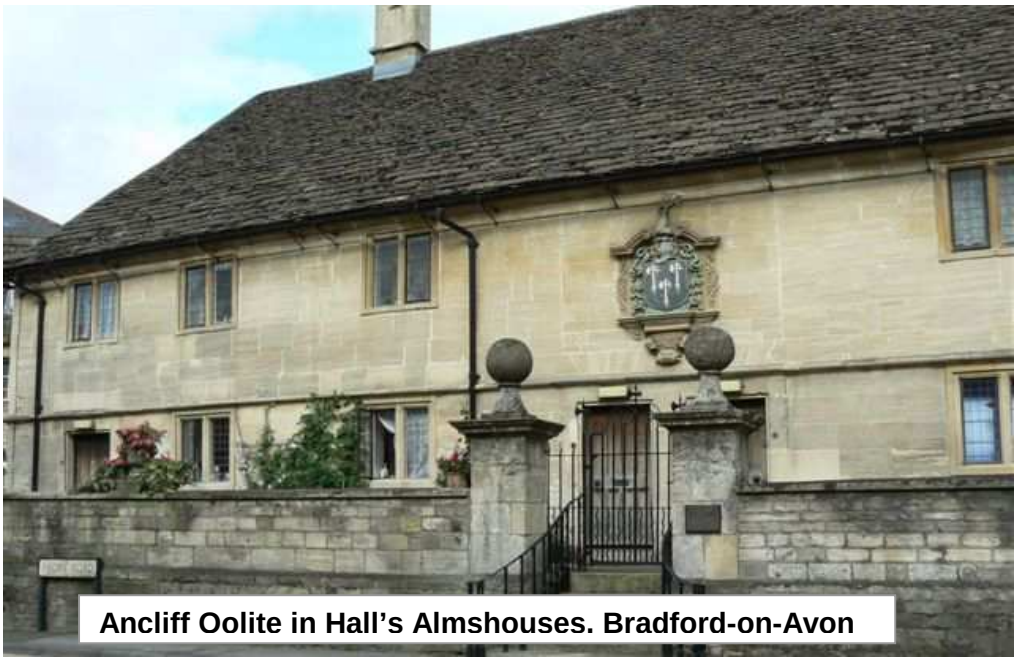
With the development of transport systems such as the Kennet and Avon canal and the Great Western Railway, its use spread further afield. It was even used in London by John Nash in the 19th Century (although it decayed so badly in the pollution that Portland Stone had to be used to replace it; the latter is particularly resistant to air pollution). The Westwood underground quarries were opened originally as a source of stone to build the railway, and it was the building of the Great Western Railway's Box tunnel which revealed more valuable high quality stone running in the direction of Corsham, resulting in vast underground workings in this area below the Forest Marble Formation, which continue to the present day. By 1900 there was a network of tunnels and tramways for the removal of stone totalling around 60 miles in length.

Any irregularities or cracks ruin the stone for top-quality building, thereby reducing its value. The stone is soft and easy to work when first quarried. It is traditionally kept underground until May because the freshly quarried stone can be damaged by frost (owing to its high water content). It is then seasoned on the surface through the summer, when it loses water. The huge demand for stone in the 19th century resulted in unseasoned stone being used, with disastrous consequences. The stones must also be kept the right way up when building, with the bedding planes horizontal. Otherwise, fine layers will tend to flake off from the surface because weathering picks out any weaknesses in the bedding.

The Forest Marble Formation comprises a varied sequence of limestones, sands and clays. The name derives from the ancient Forest of Wychwood in Oxfordshire where limestone that could be polished was formerly quarried. The freestone from the Bradford-on-Avon area, the **Ancliff Oolite**, occurs here just locally in the lower part of the Forest Marble. It is distinctive, being characterised by strongly developed cross-bedding with layers of sorted shell fragments, which are picked out by weathering (see photo). It was widely used from the 18th - 20th centuries in Bradford and Trowbridge but is no longer worked.



Local Ancliff Oolite is widely used in Bradford-on-Avon



Ancliff Oolite in Hall's Almshouses. Bradford-on-Avon

In the Forest Marble generally, the bedding is more irregular and there are clays separating the limestones. Poorer quality limestones, known as "ragstone" are typically yellow-brown with a blue 'heart'. They are made of broken shell debris and are less thickly bedded: cross-bedding is typical and the matrix is crystalline calcite, making them a good weatherstone but they are too intractable to be used for dressings. They have been extensively used for cottages, farm buildings and as a walling stone. Thinly bedded, fissile, shelly limestones, provided stone roof "tiles", typical of the older Cotswold buildings (see photo), as well as cobbles and larger paving slabs. Small pits in fields around Bradford-on-Avon, Atworth, Gastard and Malmesbury were excavated for this purpose.

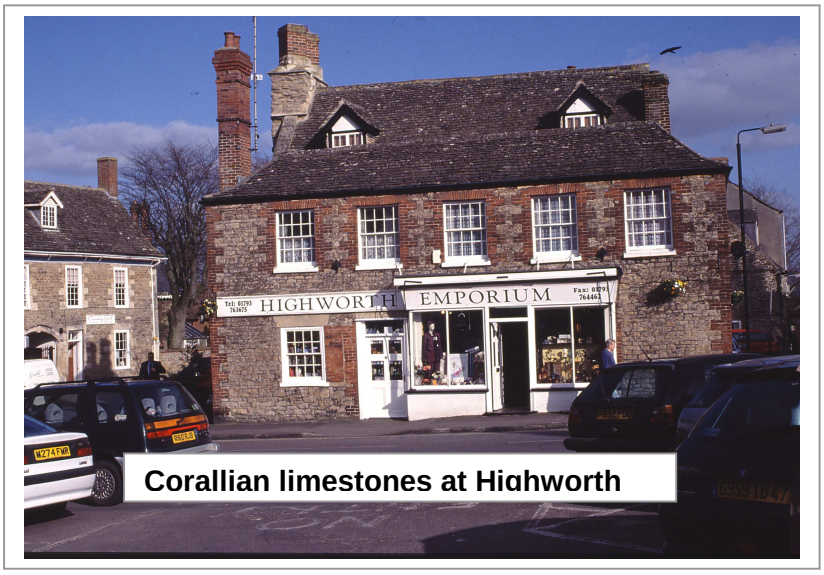
Forest Marble roofing 'tiles'

The Cornbrash Formation is the uppermost formation of the Great Oolite Group. It weathers to a rich brown colour and is a ragstone used mainly for walling along the outcrop.

<u>The Kellaways & Oxford Clays</u>:
The Kellaways Formation (Middle Jurassic) is the lower formation of the Avon and Thames valleys, which separate the Cotswold region from the Chalk downlands. It does contain a local building stone horizon at the top, known as the **Kellaways Rock,** which crops out northeast of Chippenham, around the village of Kellaways). Here hard calcareous sandstone up to 4 metres in thickness has been used to build Maud Heath's Causeway, a 15th Century foot-bridge over the floodplain.

Maud Heath's Causeway near Chippenham uses Kellaways Rock

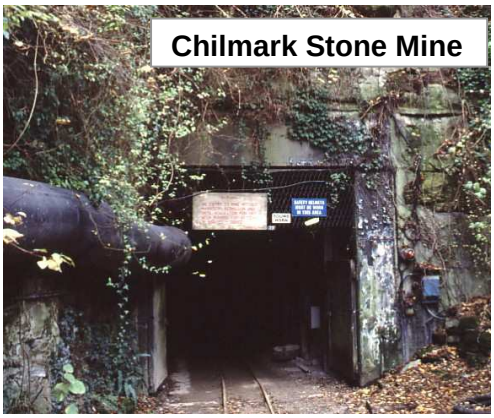
<u>The Corallian Group</u>:
This Upper Jurassic group includes many different rock types used locally for building: sandstones, sandy and shelly limestones, often with pellets or ooliths, and coral limestones. They are not very regularly bedded, generally, but do provide durable building stones. The white **Calne Stone** is a cross-bedded pellet limestone with small shell fragments. It was quarried around Lyneham and Calne. Freestones are exceptional in this formation, however, and Corallian areas typically show a variety of hardstone and rubblestone in the buildings. The wide variety of textures and tones of cream, grey and brown impart a particular charm to the villages and towns along its outcrop like Highworth and Wootton Bassett. Dressings are often of local brick or freestone (see photo). The Coral Rag is a fine-grained coralline rubbly limestone; around the reefs detrital deposits built up, which can make good quality very durable building stone.

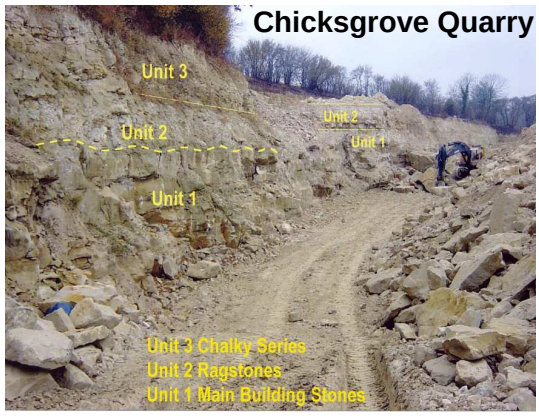


Corallian limestones at Highworth

<u>The Portland Group</u>:
In Wiltshire, the Portland Group appears beneath the Cretaceous rocks in the Vale of Wardour and at Swindon. The beds vary from highly calcareous, greenish-grey

sandstone to pale cream sandy limestone, all with a variable speckling of glauconite grains (a dark green iron silicate mineral). In the Vale of Wardour, the upper part of the group, the Portland Stone Formation, has been quarried extensively for building since mediaeval times. It is generally known as **Chilmark Stone**, though the main outcrop is around Tisbury, where it is known as **Tisbury Stone**. At Chicksgrove quarry nearby around 20 metres of this Tisbury Member are still worked (Main / Lower Building Stones - see photo). The upper part consists of paler, creamy white limestones, with less obvious sand and glauconite.





The formation reappears in a valley southeast of Chilmark, where Chilmark Stone has been extracted extensively. Here, as well as the Tisbury Member, a higher freestone, 5 metres thick, has been exploited in the past. This Chilmark Member is distinguished by abundant ooliths, less sand and lack of glauconite. Chilmark and Tisbury stone give a distinctive character to the local villages and were used in Salisbury Cathedral (Tatton-Brown, 1998). In Victorian times Gilbert Scott specified them for cathedral and church restorations across southeast England.

Chilmark Stone in Salisbury Cathedral

Chilmark Church in local stone

Swindon Stone was extracted from several old quarries on the Old Town hill. It is a creamy-grey calcareous sandstone / sandy limestone that becomes rather drab when weathered, but it was widely used in this area of the town (with dressings of Bath Stone). The shelly limestone below has been used locally as a ragstone.

All these Portland Group freestones described above are quite different in character to the white ooidal Portland Stone on the Isle of Portland.

The Purbeck Group:
In Wiltshire, The Purbeck Beds contain white, fine-grained limestones, also used for building locally. Some were sufficiently fissile for roofing. Limestones of this age have been utilised only in the Vale of Wardour and at Swindon. Elsewhere, they were removed by erosion in early Cretaceous times.

Purbeck Marble, the most famous of Purbeck stones, has been imported from Dorset's Isle of Purbeck. It is a hard, dark limestone composed largely of the shells of freshwater snails, which takes a polish. It was used extensively for pillars, paving and monuments all over the country. In Salisbury Cathedral it is used for columns, the dark bluish-grey contrasting with the pale Chilmark stone elsewhere in the building.

CRETACEOUS BUILDING STONES

The Lower Greensand:
The Lower Greensand has only locally been used as a building stone, where natural cementation by iron oxide has rendered it sufficiently durable. The area around Sandy Lane (south-west of Calne) had quarries which provided the dark orange-brown sandstone for the cottages in the village (see photo).

Sandy Lane is mostly built of Lower Greensand

The Upper Greensand:
The Upper Greensand is recognisable by the abundant small dark green grains of glauconite in the sandstone that give it a distinctive greenish grey colour. There is commonly a scattering of shells and fossil burrows. **Hurdcott Stone** is still quarried

near Barford St Martin, 6 miles east of Tisbury, where it is used particularly for restoration work. The Upper Greensand is generally only hard enough for building in the south of the county, where there has been cementation by calcite and silica.

It has been widely used for building in Mere (see photo) and around Shaftesbury. Norman churches in south Wiltshire contain Upper Greensand. The upper part here contains chert beds which have been used locally, e.g. at Stourhead (see photo).

Upper Greensand building in Mere and the chert Rock Arch at Stourhead

Farther north, Upper Greensand buildings are not common, with the exception of the Potterne Stone, a fine-grained calcareous sandstone used locally at Potterne and in the Vale of Pewsey.

The stone was found to make a good damp course, transmitting less moisture from the ground than brick; so it was used for house foundations and is often seen in the lower parts of brick and timber buildings (see photo).

Upper Greensand foundations at Market Lavington

<u>The Chalk Group:</u>

The Chalk has the widest outcrop in the county, so of necessity it was in former times pressed into service for want of anything better, though it is not a satisfactory building stone. It is normally too soft and even the hard nodular ‘rock’ bands (such as the Melbourn Rock and the Chalk Rock) have poor weathering properties, though these have been used in the past in buildings. This stone is known as "clunch". It was usually necessary to have quoins of a harder stone or brick, while around windows and doors wooden beams, limestone or brick dressings provided extra support. Because chalk is porous and weathers badly, it was essential to have “good shoes and

a hat" to keep the wall dry, preventing absorption of water and flaking on freezing in winter. A foundation of less porous material (brick or stone) is therefore required, with a protective cover of brick or tile.

Chalk blocks used in building

It is found occasionally in walls, as rubbly infill panels in old cottages (see photos above), and on the inside of some churches e.g. at Aldbourne and Wanborough.

In Chalk regions, chalk has traditionally been ground up and mixed with water into a slurry with clay, plus chopped straw, horsehair or other binders like manure to make "cob". This is a durable, if not water-resistant, building material. Cob walls were built up layer upon layer, each layer being left to dry in before the next was added. The resultant broad walls can be identified by their rounded outlines; corners were avoided. Sometimes, a chalk, mud and water slurry was poured between shuttering to make pugged walls. Wattle and daub involves daubing such a mixture onto a framework of wood. Plaster is applied on top to make it waterproof. Cob and pug, like wattle and daub, needed covering to protect them from the rain. Hence the quaint tiling or thatching which forms an attractive feature of some village walls in the Chalk country (see photos). Stone or brick foundations were again necessary to avoid damp rising from below.

Cob wall at Steeple Langford

Flints, particularly common as nodules or bands in the Upper Chalk, are virtually indestructible. It is resistant to weathering and can thus be used in walls as a protective outer layer. Flints can be used in their original nodular form, to give a wall of rough appearance, or can be split or "knapped" to give a smoother, glassy surface on the outward-facing side. In skilful hands, the flints can be knapped into rectangular blocks with a flat face, which can be laid in courses like bricks to produce a neat wall. However the shiny impervious surfaces of fully knapped flints don't bond as well with mortar as those flints with their porous white outer layer still intact. Stone or brick courses were often incorporated in a flint wall to give it extra strength. Limestone was used for carved window dressings and doorways, corner stones and buttresses. Decorative effects have been achieved by alternating flint with bricks or stone (see photo below). This can be seen throughout eastern and southern Wiltshire, where a chequered pattern of flint and stone, characteristic of the Chalk country, has been produced; dressings are brick or limestone. This use of flint with limestone characterises the majority of church buildings in the chalk downlands.

Milton Lilbourne Church with flint and stone-work and Jurassic limestone tower

TERTIARY BUILDING STONES

The east and southeast borders of the county have preserved above the Chalk sands and clays of the succeeding Lambeth, Thames and Bracklesham groups, laid down in the succeeding Tertiary period. Most of these are unconsolidated, with the exception of sandstones in the Bracklesham Group and the sarsen stones.

The Bracklesham Group:
Locally sands of the lower **Bracklesham Group** of south-east Wiltshire have been cemented by iron oxides to produce a red pebbly sandstone. This ferruginous sandstone can be found in the older buildings around Downton.

Bracklesham Beds in Downton Church

Sarsen stones:
Sarsen stones, found today scattered over the Marlborough Downs, have been used for building locally since Pre-historic times, when they were used for the standing stone circles of Avebury and Stonehenge. They were probably more widespread in their distribution, but over the years they have been cut up and incorporated into buildings, walls etc. Romano-British foundations contain them; and they have been used as tramway setts and curbstones. They have an unfortunate habit of "sweating" in damp weather, by condensing atmospheric water vapour onto their surface when there are rapid temperature changes. This restricted their use somewhat. Mediaeval builders split them by lighting a fire to heat them, then splitting them by pouring on

cold water. By Victorian times accurate cutting techniques had been developed. The building of the Kennet and Avon canal allowed them to be carried further afield, although it also allowed the cheaper import of bricks. Marlborough and the villages of the Kennet valley are where sarsen has been most widely used in the buildings, a reflection of their abundance in this area. Dressings are of brick or imported freestone.

Sarsen house with brick dressings, Lockeridge

Sarsen block path, Alton Barnes

West Overton Church

Sarsen, flint and Bath Stone at West Overton

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