

# Lime Kilns

in the South Devon Area of Outstanding Natural Beauty



## Introduction - What is a lime kiln?

These often substantial stone structures are common in the South Devon AONB, especially around the tidal estuaries, such as the Dart and Kingsbridge Estuaries. Most were constructed between about 1700 and 1850, and many operated until the early 20th century. There are up to 100 known lime kilns in the South Devon AONB, with 22 on the Kingsbridge Estuary alone.

Lime kilns were constructed to convert limestone to quicklime, by burning it. Quicklime was used in construction for mortar, plaster and limewash, but mostly it was used as a dressing on fields to reduce the acidity of the soil.

## Distribution

Limestone occurs naturally at the eastern - and western - most edges of the AONB, many kilns are to be found there, usually in association with limestone quarries. In the 18th and 19th century, fuel in the form of coal or culm (a poor grade coal or lignite) was brought by sea from South Wales and North-East England to major ports such as Plymouth and Torquay. Limestone was quarried at these places and the two commodities were brought by smaller vessels to limekilns which were located beside the estuaries of Devon and Cornwall, with a few on the sea coasts. The burnt lime was spread on fields in the immediate vicinity of the kilns.

## Function

Lime kilns were used to burn limestone with coal or other fuels to make quicklime. Limestone in its natural state is calcium carbonate ( $\text{CaCO}_3$ ). Burning in a kiln at temperatures in excess of 800-900 degrees centigrade, changes the limestone to lumps of calcium oxide ( $\text{CaO}$ ) which fall to the bottom of the kiln. Carbon dioxide ( $\text{CO}_2$ ) is driven off into the atmosphere.

Lime was used in two ways. It could be 'slaked', by applying water ( $\text{H}_2\text{O}$ ) in a controlled manner, which changed it to calcium hydroxide -  $\text{Ca}(\text{OH})_2$ . This was used to make mortar, plaster and limewash. In its unslaked state, quicklime was taken out to the fields where it was evenly spread and harrowed into the soil, slaking naturally over time. Acid soils, created by damp environments such as South-West

England, were bad at nitrate absorption. The intention was to reduce the acidity of the soil to a point where it could better absorb nitrates such as animal dung.



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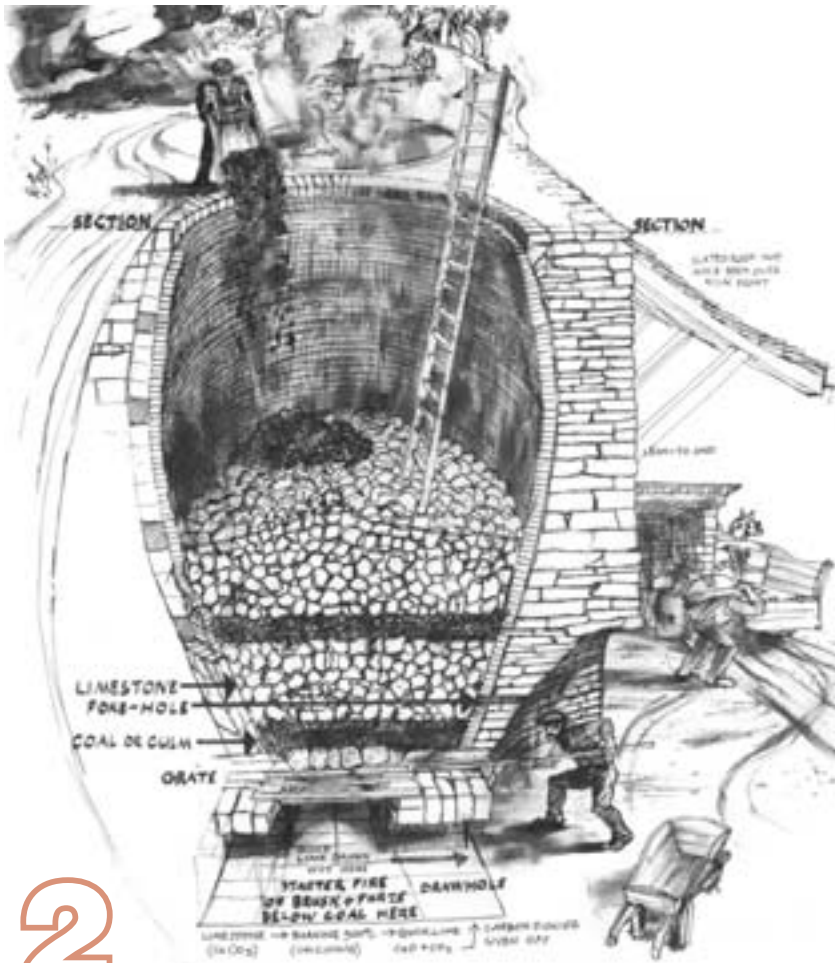
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## How did they work?

The illustration of Perchwood lime kilns at Tuckenhay (below) shows how a kiln worked. The open-fronted lean-to enabled the lime be unloaded out of the rain. Quicklime is very unstable: a violent chemical reaction occurring when water is added to it.

Where lime kilns were built beside the sea or on an estuary, the vessels which brought the limestone and coal were beached at high tide and their cargoes unloaded into carts. Most estuary-side kilns were built into the riverbank, and a steeply sloping track was necessary to haul the carts to the charging platform at the top of the kiln. There, the coal and limestone were dumped into the kiln wells in layers, with a well-constructed fire of wood at the bottom. A burn would last for three to five days, depending on the size of the well, after which the lime was shovelled out of the stoke hole and packed into casks.



Illustrations by Tony Harrison by kind permission Cornworthy and Ashprington History Society

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## History & development

Although lime burning has a history going back several thousand years, most standing lime kilns date from the 18th and 19th centuries. This is partly because earlier kilns were small, seldom surviving, and were often only temporary. The other reason was because the great heat generated in a 'burn' caused the kiln walls to crack and break up, making running repairs necessary. Many old kilns were heavily buttressed for this reason.

From the early 16th century, lime began to be spread on fields to improve their productivity. Documentary evidence suggests that lime was being spread on the fields in the West-Country by the later 16th century and lime kilns are often mentioned in 16th and 17th century leases to farms and riverside quays. From the middle of the 18th century, books on agricultural improvement began to be published, and construction of agricultural lime kilns began in earnest. Most of those we can see now date from the period between 1750 and 1850, though a few are from earlier in the 18th century.

We can date kilns by their design and shape. In the earliest examples, which date from before 1800, the outer walls followed the curvature of the inner well. A few were free-standing, and look like ring doughnuts - they were often drawn this way on old maps. One of this variety stands on Wonwell Beach at the mouth of the Erme Estuary and is a useful visual example because coastal erosion has removed half of it, exposing the well and showing how the walls were constructed.

The majority of this early type had a D plan: the curved sides returning to the cliff or hillside against which the kiln was constructed. Freestanding kilns were rare, due to the extra expense of constructing a ramp to reach the charging deck. A freestanding kiln at Goodshelter near East Portlemouth (privately owned) has such a ramp.

Later kilns are square or rectangular in plan and often have sloping or 'battered' walls to increase stability. Sometimes a square kiln has been added to an earlier round or D shaped kiln: several examples can be seen on the Kingsbridge Estuary.

Kilns after 1800 are sometimes built in 'banks' of two or more. These became increasingly complex and some had quite intriguing flues built into them to increase or improve the draughting. Brick linings to the wells became more common, either as an addition to an old kiln, or as a 'sacrificial lining' to a new one. The height of these kilns is often much greater than previously, examples at Frogmore on the Kingsbridge Estuary being up to 5 metres high. This greater height and size often came at the cost of structural strength, and many of the walls of these taller kilns lean out towards the top and bear evidence of repeated repairs and relinings of their wells.



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Lime kilns eventually went out of use due to improvements in transport, such as railways, which enabled coal to be carried to large industrial kilns in limestone quarries. The lime was then packaged up and carried ready-burnt to its place of use. Improvements in artificial fertilisers in the later 19th century also had an effect. The last kilns to be used in Devon were in the Tamar Valley in the 1920s. Most kilns in the South Devon AONB are likely to have gone out of use by the First World War.

## Details

### Construction

Usually of coursed stone rubble, with well-built faces and rubble cores. Earlier kilns were often clay-bonded, rather like houses and farm buildings of the same period, while later ones had limestone bonded wall faces. Strangely, limestone was often used for construction: as long as it was not directly exposed to heat, this was not important

### Iron fittings

The base of the well normally had a bar across it, to prevent the weight of the charge smothering the fire before it was fully alight. Sometimes traces of hinges or latches for wrought iron doors are found across the stoke hole. These would be shut towards the end of a burn to prevent hot lime dust from spilling out. The little hole which is usually found just above the stoke hole was used to poke a bar in and break up lumps of limestone and for checking on progress.

### Loading ramps

These would normally be close to the kiln, but where the bank or cliff was very steep they would be located in the nearest available place.

### Charging deck

This often had a low parapet wall around it, to prevent spillages, and for safety. The heat of working kilns often attracted poor people in cold weather, and sometimes tramps were found to have died from the fumes while sleeping near the mouths of the wells.

### Lime burners' cottages

The lime burner and his family often lived in a cottage close to the kiln. Sometimes very remote kilns have an abandoned cottage beside them, such as that on the south side of Bow Creek, near Cornworthy on the Dart.

## Where can I visit lime kilns in the South Hams?

There are many lime kilns in the South Hams, but only a few of them are publicly accessible. The following is one good example;

### ■ Perchwood Lime Kilns, Tuckenhay

**Grid Reference SX 815 563**

These fine mid to late 18th century kilns have been recently cleared and consolidated by Cornworthy Local History Society. They are quite small and of a classic D shaped form, one of which is clearly added to the other. An illustrated board explains the history of the kilns and how they worked.

### How to get there

The kilns are alongside the lane which leads from Bow Bridge to Tuckenhay, 3km south of Totnes. Park beside the road where it widens near the kilns.



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## Where can I find out more?

There is no book on Devon's lime kilns, but fortunately an excellent book: *Lime Kilns and Limeburners in Cornwall*, by Ken Isham, was published in 2000 by Cornish Hillside Publications. An excellent overall view of the history of lime burning in Britain is given in Chapters 1-4 of *Limestone Industries of the Yorkshire Dales*, by David Johnson, published by Tempus in 2002.

## Author

This factsheet was produced by Robert Waterhouse, BA, AIFA. He is a freelance archaeologist and has lived and worked in South Devon for most of his life.

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