Historic England

West and South Yorkshire

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 Graham Lott (British Geological Survey).

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Front cover: Reservoirs, Walshaw Dean. Addingham Edge Grit.
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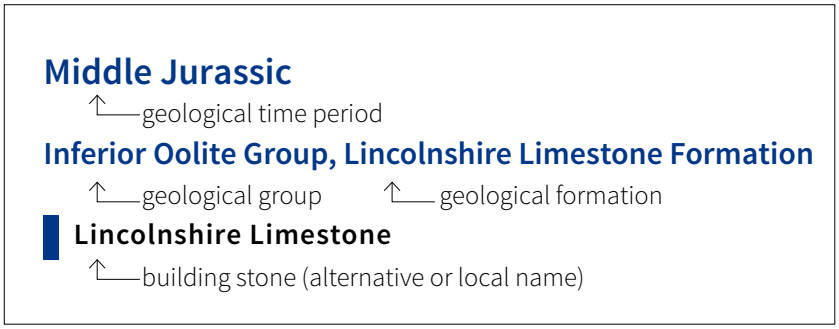
How to Use this Guide

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.



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 mineral planning authority and metropolitan authority areas of the City of Bradford, Calderdale, Kirklees, the City of Leeds, the City of Wakefield, Barnsley, Doncaster, Rotherham, and Sheffield.

Parts of West Yorkshire and South Yorkshire lie in the Peak District National Park and these areas are covered in the *Derbyshire and the Peak District* guide.

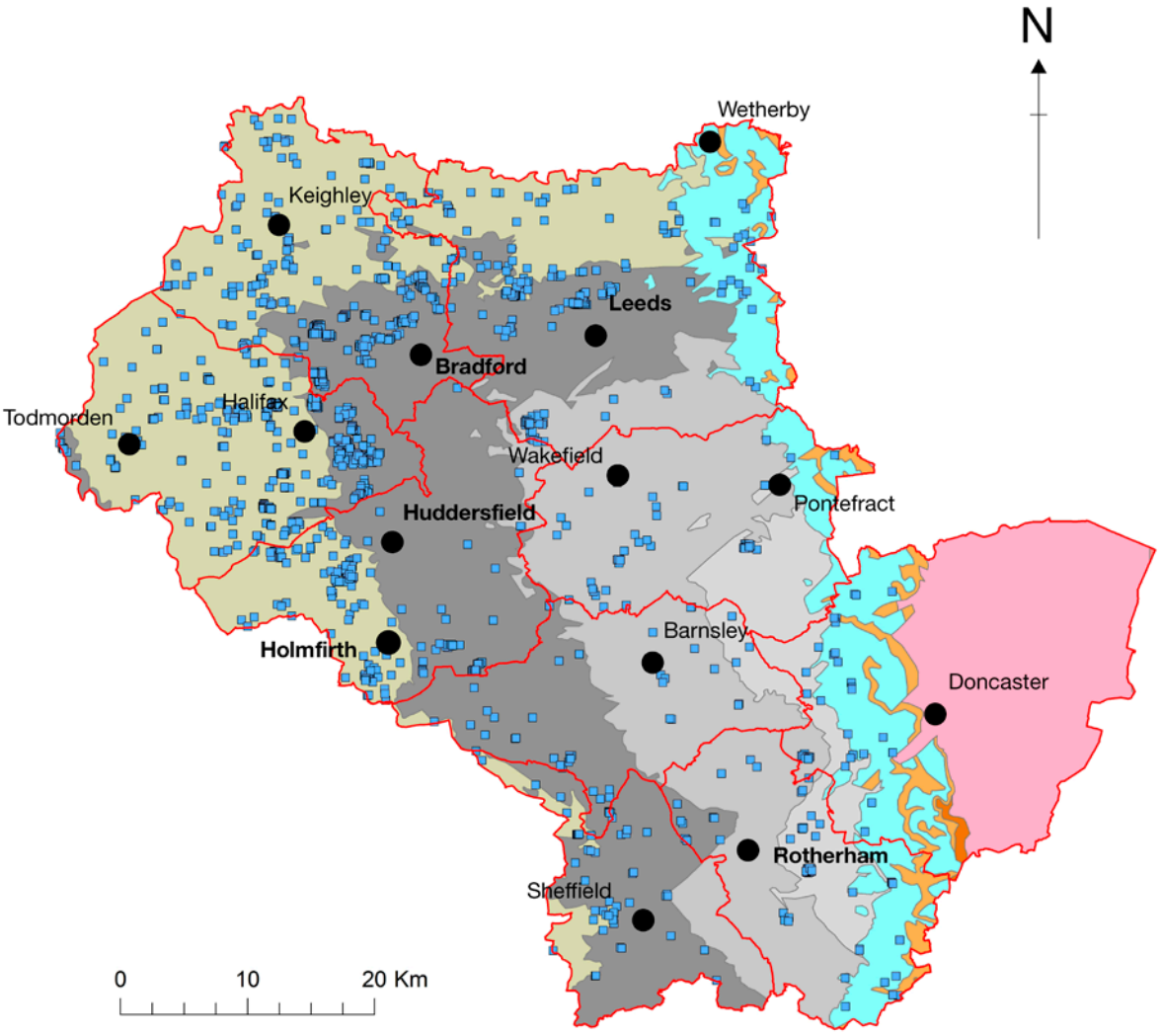
Contents

1 Introduction

Topographically, the two metropolitan counties of West Yorkshire and South Yorkshire can be divided relatively simply into northern and western areas of high moorland, underlain by the coarse-grained, sandstone-dominated succession of the Millstone Grit Group. A central area of low-lying ground is underlain by the mudstones, finer grained sandstones and coals of the Pennine Coal Measures Group (forming the Yorkshire Coalfield) and, along its eastern margin, a relatively narrow north to south strip of red sandstones, mudstones and pale yellow-coloured dolostones (dolomitic limestones) of Permian and Triassic age. The area is cross-cut by a series of river valleys, the Aire, Calder and Don, draining from west to east into the Humber estuary. These valleys have long provided the major communication and transportation routes across the area and, consequently, they form the major population centres of the region. Buildings within these centres, both domestic and industrial, are still largely characterised by their use of locally quarried building stones.

The varied geological succession in West Yorkshire and South Yorkshire has long been exploited to provide a wide range of sandstone for local vernacular building purposes and it still supports an important UK and export trade, supplying sandstone to many cities and towns throughout the UK, and overseas. Even a cursory examination of the buildings in the villages, towns and cities of the region shows not only how important stone quarrying has been to the local economy, but also how the resultant distinctive architecture forms an inescapable part of the landscape. There are few settlements in the region where local stone has not been used in the construction of principal buildings since earliest times.

Bedrock Geology Map



Key

Building stone sources

Bedrock geology

- Triassic Rocks (undifferentiated) — mudstone, siltstone and sandstone
- Triassic Rocks (undifferentiated) — sandstone and conglomerate, interbedded
- Zechstein Group (Cadeby and Brotherton Formation) — dolomitised limestone and dolomite
- Permian Rocks (undifferentiated) — mudstone, siltstone and sandstone
- Permian Rocks (undifferentiated) — sandstone and conglomerate, interbedded
- Pennine Upper Coal Measures Formation — mudstone, siltstone, sandstone, coal, ironstone and ferricrete
- Pennine Middle Coal Measures Formation and South Wales Middle Coal Measures Formation (undifferentiated)
- Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (undifferentiated)
- Millstone Grit Group — mudstone, siltstone and sandstone

Stratigraphic Table

Geological timescale	Group	Formation	Building stone	Page
Permian	Zechstein	Brotherton Formation		
		Cadeby Formation	Dolomitic Limestones (Magnesium LImestones, Dolostones)	26
Carboniferous	Pennine Coal Measures Group	Pennine Upper Coal Measures Formation	Ravenfield Rock	25
			Wickersley Rock	25
			Brierly Rock	25
			Dalton Rock	25
			Newstead (Pontefract) Rock	25
			Ackworth Rock	25
		Pennine Middle Coal Measures Formation	Oaks Rock	24
			Mexborough (Royston) Rock (Rotherham Red)	24
			Horbury Rock	24
			Woolley Edge Rock	24
		Pennine Lower Coal Measures Formation	Thornhill Rock (Woodkirk Blue and Brown, Robin Hood Blue and Brown)	21
			Oakenshaw (Clifton) Rock	21
			Grenoside Rock	21
			Greenmoor Rock	21
			Bolton Woods Stone (Gaisby Rock)	21
			Elland Flags	21
			Loxley Edge Rock	21
			Crawsham Sandstone	21
	Millstone Grit Group	Rossendale Formation	Rough Rock, Rawden Hill Stone, Bramley Fall Stone, Spinkwell Stone	19
			Rough Rock Flags	19
		Marsden Formation	Huddersfield White Rock (Warley Rock, Barkisland Flags, Golcar Rock)	17
			Chatsworth Grit (Rivelin Grit)	17
			Guiseley Grit (Nab End Sandstone, Beacon Hill Flags)	16
			Midgely Grit (Woodhouse Grit, Pule Hill Grit, Heyden Rock, Rivelin Grit)	16
			Woodhouse Flags (Scotland Flags)	16
			East Carlton Grit (Readycon Dean Flags, Middle Grits)	16
		Hebden Formation	Addingham Edge Grit	14
			Upper and Lower Kinderscout Grits	14
		Samlesbury Formation	Plompton Grit	14
			Upper Follifoot Grit	14
		Silsden Formation	Lower Follifoot Grit	14
			Nesfield Sandstone	14
			Red Scar Grit	14
			Marchup Grit	14
		Pendleton Formation	Bradley Flags	14

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

2 The Use of Stone in West and South Yorkshire Buildings

The value of the local stones for building has been recognised since at least Roman times, and Roman forts were built at Ilkley (Middleton Grit), Slack and Adel (both Huddersfield White Rock), for example. Norman stonework also survives in many church buildings across the area, often obscured beneath numerous later extensions and reconstructions, particularly those carried out in the 19th century. The ancient Anglo-Saxon core of All Hallows Church at Bardsey is constructed of local Carboniferous sandstone (Plompton and East Carlton Grit) and some Permian Cadeby Formation limestone. It is largely obscured by later additions and 19th-century Victorian restoration work. During the medieval period, castles, abbeys and priories were all built of local stone. Examples include Conisbrough Castle and Roche Abbey, both of Magnesian Limestone from the Cadeby Formation, as well as Pontefract Castle, Sandal Castle and Kirkstall Abbey, all of local Millstone Grit sandstones. Perhaps the most evocative buildings of West Yorkshire's stone-built heritage are the many surviving 17th and 18th-century manor houses and halls, particularly in the Calderdale area.

Figure 1: All Hallows Church, Bardsey. Plumpton Grit, East Charlton Grit and Cadeby Formation Limestone.

These elaborately designed and constructed houses and halls, many originally timber framed, but subsequently encased in local dressed or ashlared sandstones. The 17th-century East Riddlesden Hall in Keighley is constructed from the local Millstone Grit sandstone. With its distinctive rose window and crenellated tower with Gothic-style pinnacles, it is typical of many large houses and halls of a similar age in this area. Most of them were constructed on the wealth of the growing wool trade. Many of the halls are found in isolated high moorland areas of the Millstone Grit, where sheep farming was the principal occupation. As the woollen industry expanded, it moved from its moorland farm and cottage bases into valley bottoms to take advantage of water power. Here, new towns and communities, such as Todmorden, Hebden Bridge, Heptonstall and Otley, for example, continued to expand, working the local sandstones at numerous quarries for new mill buildings, workers' houses, civic centres, bridges and canal networks. The ubiquitous weavers' cottages at Hepworth, one of the many local industrial areas, are all constructed of locally quarried Carboniferous Millstone Grit (Rough Rock) sandstones.

Figure 2: East Riddlesden Hall, Keighley. Millstone Grit Group sandstone.

Figure 3: Weavers' cottages, Hepworth. Millstone Grit.

In the late 18th and early 19th centuries, a further major change in land ownership was initiated by a series of Land Enclosure Acts. This enclosure of former open moorland areas was facilitated by the construction of thousands of kilometres of drystone walling. Much of the stone was probably locally gathered fieldstones, but a proliferation of small new sandstone pits was inevitable to service this surge in wall building. At the same time, these enclosures initiated a gradual movement of a largely agriculture-based labour force to the new industrial centres across west and south Yorkshire.

By the late 19th century, these industrial communities were outgrowing the confines of the narrow valleys and they began to establish larger new mills in the wider valley bottoms around the towns and cities of Halifax, Huddersfield, Bradford and Leeds. The impact of the textile industry, in particular, on the built landscape was immense. New buildings, terraced houses, churches, schools and so forth, were funded and built by local industrialists. Some benevolent industrialists even developed completely new towns, such as Saltaire. This town is a UNESCO World Heritage site and was built by Titus Salt in the mid-19th century using locally quarried Millstone Grit sandstones of the Rough Rock. Local sandstone quarries developed and expanded further, using the canals and new rail networks to supply greater volumes of stone for building.

Figure 4: Houses, Saltaire. Millstone Grit.

The expanding major population centres also required new buildings to demonstrate their growing wealth and financial power. A new town hall was built at Leeds, using Rawden Hill Stone and several others. Other town halls built of local stones include those at Bradford (Bolton Woods Stone), Huddersfield (Crosland Moor Stone), Halifax (Ringby Stone) and Wakefield (Spinkwell Stone). A whole range of other buildings followed, most of which were constructed using locally quarried sandstones.

Figure 5: Town Hall, Leeds. Millstone Grit.

'York Stone' and the diversity of local building sandstones

In broad terms, the many building sandstones that have been quarried in the area, and that have been widely marketed outside the region, have commonly been described as Yorkshire Stone or York Stone. As there is such natural variability between the many sandstone beds that occur in the region, the grouping of all these building stones under one name is misleading.

In fact, the term 'York Stone' is still in common use by architects and marketing companies, despite it being generally well known that there are no Carboniferous sandstones cropping out around the city of York. Clearly, there is little merit in using the term 'York Stone' today, particularly as it is often

used to describe both the coarse-grained Millstone Grit sandstones and the finer grained sandstones of the Pennine Coal Measures without distinction. In recent times, there have even been attempts to apply the term to imported sandstone varieties.

Geologically, all the sandstones quarried and used for building purposes in the West Yorkshire area were, and still are, sourced principally from the Carboniferous Millstone Grit Group and the Pennine Coal Measures Group. Generally, the very broad difference in petrological character, notably in grain size and mineralogy, helps to distinguish the sandstones quarried from these two groups. However, there are also many similarities that make the provenance of individual sandstones, out of their local context, quite difficult.

Over much of the region, many of these sandstone beds have been given local names, by which they are still commonly known and marketed. Examples include Elland Flags, Ackworth Rock, Mexborough Rock, Bolton Woods Stone and Rotherham Red.

When the British Geological Survey and other researchers first surveyed the west Yorkshire area during the 19th century, an attempt was made to rationalise the plethora of local names by mapping out and more precisely defining the beds' lateral and vertical extents, by correlating from outcrop to outcrop. The geological names chosen for these mapped sandstone units were generally based on the location of the best exposures of the stone, for example Ackworth Rock, Huddersfield White Rock, Addingham Edge Rock and so forth. However, despite more than 175 years of work, the complexity of the Carboniferous depositional system of the Pennine area still defies precise subdivision and correlation to some extent.

Consequently, the same sandstones are still commonly known by different local geological names. Although an acceptable regional stratigraphic correlation of these named sandstone units is published, there is not complete agreement in the geological community over the correlations suggested, and revisions of the nomenclature are still frequent.

Not surprisingly perhaps, in the past, quarry operators have often ignored the geological names of the sandstones. In general, most quarries from earliest times have used the location of the quarry as the principal stone name for marketing purposes, such as Bramley Fall Stone, Crosland Hill Stone, Spinkwell Stone, Meanwood Stone, Bolton Woods Stone, Rawdon Hill Stone and Rotherham Red. In other instances, the sandstone may have been simply marketed under the generic name 'gritstone'. The use of this term was not necessarily limited to sandstones from the Millstone Grit Group and included those from the equally prolific Pennine Coal Measures succession.

As noted above, while there is commonly a superficial resemblance between some of these sandstone beds, there are also many differences. These include colour (red, grey, yellow, blue, for example), grain size (fine to very coarse), bed thickness (thin-bedded or massive), sedimentary structure (laminated or cross-bedded), porosity and mineralogy (quartz or

feldspar-rich), for example. Consequently, it is not sufficient to specify the replacement sandstone simply as York Stone, Gritstone or Millstone Grit in a conservation project, without ensuring that the physical characteristics of any replacement stone are compatible with the original sandstone used. The need for matching like with like wherever possible remains important even in these generally durable sandstones, particularly now that the new sandstones are unlikely to become encrusted with the industrial soiling and pollution that once characterised even the remotest sandstone buildings of West Yorkshire and that obscured any minor colour or textural variations. Pollution-blackened stonework was, and in places still is, a common feature of the industrial buildings in West Yorkshire.

Figure 6: Industrial building with pollution-blackened stonework, Skelmanthorpe.

Carboniferous sandstones

The Carboniferous sandstones found in the buildings of west and south Yorkshire are all detrital clastic rocks whose grains are derived from the weathering and breakdown of pre-existing siliceous rocks. Silicate grains (quartz sand), therefore, make up more than 95 per cent of the framework grains. These are dominated by quartz (translucent or white with sub-conchoidal fracture surfaces), with variable amounts of feldspar grains (opaque and variegated with distinct planar cleavage planes) and lithic grains. The latter are, in essence, tiny rock fragments. Other grains commonly present include platy micas (muscovite), detrital organic fragments (particularly notable in some coalfield sandstones) and pervasive small white patches of the soft clay mineral kaolinite. These framework grains are bound together by natural cements that, in the most durable sandstones, are almost exclusively composed of silica (quartz). These natural silica cements are evident in the sparkling crystal faces exposed in the dressed surfaces of the sandstone blocks.

Many separate sandstone beds have been quarried for local building stone in the area, from both the Millstone Grit Group and the Pennine Coal Measures Group. In broad terms, however, the sandstones of the Millstone Grit Group are commonly coarser grained (granular or pebbly in some cases) and silica cemented, with strong cross-bedding. In quarried exposures, they usually form thick, lens-shaped (channelled) beds, for example Rough Rock. In contrast, the building sandstones of the Pennine Coal Measures Group are generally finer grained and more micaceous, forming thinner beds laid down in lower energy depositional settings, with bedding-parallel features such as fine lamination, as seen in Elland Flags. Although this is a broad generalisation, it does appear to hold for most of the major building stone quarry sources. However, determining the source quarry of a sandstone when it is out of context, that is, when it has been transported and used far from its local area, can be more problematic. Consequently, it is important to establish the age of the building being examined because most building stone did not travel far from its original quarry source prior to the canal and railway networks being established in the mid-18th and 19th centuries, respectively.

Sedimentary traces

In many of the sandstone buildings there are traces of an original sedimentary depositional fabric are evident, such as marked grading (coarse to fine grained), lamination or cross-lamination. In general, sandstones with strong sedimentary features would be avoided because such features could form lines of weakness along which failure could occur during dressing and/or carving of the stone. Consequently, more massively bedded sandstones were preferred. Where laminae show a low-angled relationship to the stone bedding surface, it is described as cross-bedding, which is characteristic of original deposition of the sand in a high-energy river or delta. Pronounced cross-bedding is a ubiquitous feature in many building stones, but it does not generally appear to weaken the stone. The Church of SS Peter and Leonard at Horbury, designed and built by the eminent Yorkshire architect John Carr, displays obvious cross-bedding in its locally quarried massive Carboniferous sandstone columns (Woolley Edge Rock). In some sandstones with pronounced cross-bedding, the stones have been riven along these surfaces, allowing them to be split into paving slabs or thin roofing slate. The Rough Rock Flags exposed at Crosland Hill Quarry near Halifax are currently being hand riven for both roofing slate and paving stones.

Where lamination occurs parallel to the bedding surface, lines of weakness have developed along the laminae. Parallel lamination of this type, which is also commonly associated with finer grain sizes and micaceous or carbonaceous concentrations, would suggest, quite strongly, that a source in the Pennine Coal Measures Group is more likely. Such laminated sandstones from the Pennine Lower Coal Measures (Elland Flags) have been the principal sources of fissile sandstones for roofing or paving purposes throughout the West Yorkshire area and further afield.

Figure 7: Church of SS Peter and Leonard, Horbury. Horbury Rock.

Colour range

Freshly quarried Carboniferous sandstones show a wide colour range, from grey-green and pale yellow to variegated brown, purple and red. The colour variations are principally due to changes in the composition and weathering state of the iron minerals dispersed in very small proportions throughout the rock. These colours can be effectively used to narrow down stone sources when determining the stone's provenance.

The most immediate problem, however, when examining and describing building stones in situ is the frequent discolouration of the stone surface by air-borne industrial pollutants. Consequently, it is rarely possible to determine the true colour of many of the stone surfaces, unless damage has exposed a clean fractured surface. Only on rare occasions do the stones show a colour distinctive enough to be helpful in determining the provenance of the source quarry.

In parts of the area, some Carboniferous sandstones show a distinct natural reddened or purple-red colouration, often related to their proximity to the junction with the overlying red rocks of the Permian succession. Examples of such reddened sandstones occur at a number of locations, including in the Glass Houghton Rock, Pontefract Rock, Mexborough Rock and Rotherham Red sandstone.

The building sandstone industry

The Geological Survey of Great Britain carried out a national survey of the minerals industry, including the building stone industry, between 1854 and 1858. Although the returns from the quarry companies were incomplete, the published results are surprisingly detailed and provide a valuable insight into the state of the building stone industry at that time. In Yorkshire, over 200 quarries responded with information, almost twice the number of its nearest competitor and neighbour, Lancashire. Later national surveys in 1898 and 1937 yielded similar results. Based on Ordnance Survey maps (1850–present), Geological Survey field slips and contacts within the Stone Industry, 1,671 former and current Carboniferous building sandstone workings have now been identified in the former West Riding.

The principal centre of the Millstone Grit and Coal Measures building sandstone industry in the UK has always been in the west and south Yorkshire area. This is largely because the main areas of industrial activity and associated population growth were concentrated in this part of the region. As a consequence, the demand for building stone has traditionally been very high for both domestic and industrial buildings.

Figure 8: Wellington Street, Dewsbury. Millstone Grit Group sandstone.

The principal sandstone beds of the Millstone Grit Group have all been extensively quarried. The Kinderscout Grit, for example, was quarried in the past around Todmorden and Hebden Bridge for local buildings, including the Church of St Thomas the Apostle at Heptonstall, and at Howarth, Addingham Edge, Caley Crags and Pool Bank near Otley. Stone from the Pool Bank quarries was widely used in the Leeds area, at St Anne's Roman Catholic Cathedral, for example, and it was also transported to other parts of the UK. The Pule Hill Grit (Clockface Quarry) is still quarried today in the Huddersfield area. Further south, the local quarries in the Chatsworth Grit supplied stone for many of Sheffield's sandstone buildings.

In the coalfield area, exploitation of the local coal resources initially led to an increase in local sandstone production for house building. Ultimately, though, much of the late 19th and early 20th-century house building in this area was carried out using locally made bricks, often with sandstone dressings.

Only the more prestigious buildings and engineered structures, such as railway bridges and viaducts, used local stone throughout. The local importance of the stone industry in the 19th century in the area is illustrated by the following statistics for Bradford and district:

'In 1873, 6,000 men were engaged in stone-getting and dressing in the quarries in the locality. The produce is about 450,000 tons per annum, and something like £650,000 in value...a large proportion of the stone (fully one half) is sent by rail or water to London, Manchester, Liverpool, Birmingham and other places equally distant from Bradford...ordinary coarse sandstone, known to engineers as Bramley Fall, and the white beds of Calverley (Elland Flags), and the finer qualities of ashlar such as Cliff Wood, Bolton Wood, Wrose Hill and Idle (Elland Flags), of which most of our large warehouses are built' (Neill, 1873).

Figure 9: Kildwick Hall, Keighley. Millstone Grit Group sandstone.

3 Local Building Stones

Carboniferous

Millstone Grit Group, Pendleton Formation

Bradley Flags

The thinly bedded Bradley Flags were quarried locally at Delph Farm and Bloomer Hill, to the south-west of Low Bradley, for building stone, roofing and flagstones.

Silsden Formation

Marchup Grit, Red Scar Grit, Nesfield Sandstone and Lower Follifoot Grit

The Marchup Grit was quarried and used in and around Addingham, whereas the Nesfield Sandstone and Lower Follifoot Grit were quarried and used in and around Silsden. Lower Follifoot Grit sandstone was also quarried at Cockett's Quarry for extensive use in the construction of Harewood House near Leeds and its associated village buildings in the 17th and 18th centuries. Subsequently, a new quarry in the sandstone at Rawden Hill was opened in the 19th century and it was used extensively in the construction of Leeds Town Hall.

Millstone Grit Group, Samlesbury Formation, Hebden Formation

Upper Follifoot Grit, Plompton Grit, Upper and Lower Kinderscout Grits, Addingham Edge Grit

The Samlesbury Formation and Hebden Formation grits (mostly coarse-grained sandstones) form an arcuate outcrop along the northern and western border of West Yorkshire, where much of the area is high moorland with only small population centres. As a result, despite the common occurrence of sandstones within the succession, quarrying for building stone was largely on a local scale, supplying the needs of the larger towns and villages, such as Rishworth, Hebden Bridge and Mytholmroyd. Building stone quarries along the northern sandstone outcrops of the area include those at Bardsey, Arthington, Pool Bank, Bramhope, Otley Chevin, Ilkley, Addingham, Keighley and Haworth. In the western outcrops, they include those at Hebden Bridge, Ripponden, Todmorden, and Holmebridge.

The facade of Todmorden Town Hall, constructed of local sandstone quarried nearby from the Lower Kinderscout Grit, demonstrates how striking these local sandstones can be when their pollution-stained surfaces are carefully cleaned.

Figure 10: Town Hall, Todmorden. Lower Kinderscout Grit.

The Pool Bank quarries (Addingham Edge Grit) have a particularly long history of building stone production in the local area, before expanding in the 19th century to supply stone for many major building projects, such as the Arthington Viaduct near Otley. A number of other quarries within the grits were opened in relatively remote areas to provide stone for the water reservoirs that were constructed in these high moorland areas in the late 19th and early 20th centuries at Withens Clough, Gorple, Widdop and Walshaw Dean, for example.

Figure 11: Arthington Viaduct, near Otley. Addingham Edge Grit.

Millstone Grit Group, Marsden Formation

East Carlton Grit (Readycon Dean Flags, Middle Grits)

The arcuate outcrop of this sandstone unit extends from Scarcroft near Leeds, eastwards to Bradford, and then turns southwards, continuing as far as Slaithwaite to the south-west of Huddersfield. This coarse-grained sandstone was quarried at Hetchell Crags and Pompocali, and the latter was believed to be an important source of sandstone for the Roman city of York. Further west, the grits were also quarried at East Carlton and Menston.

Woodhouse Flags (Scotland Flags)

The original name was taken from Scotland Quarries, Midgley, where about 30m of flagstones, the lower part of great commercial value, occurs. This flaggy sandstone unit is developed beneath the more massive sandstone developments of the Midgley Grit, formerly the Woodhouse Grit. The unit crops out almost exclusively in the Bradford area, where it was quarried extensively for flagstone and building stone at Micklethwaite, Branshaw Moor, Penistone Hill near Haworth, Clough Bank (Bailey Park Quarry), Braithwaite, Oakworth, Woodhouse and Oxenhope.

Midgley Grit (Woodhouse Grit, Pule Hill Grit, Heyden Rock, Rivelin Grit)

Quarries along the outcrop supplied stone for the towns and villages of Krumlin, Ripponden, Mytholmroyd and Scarcroft. The sandstone is currently worked at Naylor Hill Quarry, Haworth.

Guiseley Grit (Nab End Sandstone, Beacon Hill Flags)

The discontinuous arcuate outcrop of the Guiseley Grit extends from Scarcroft near Leeds, westwards to Bradford, and then continues southwards as far as Ewden near Sheffield. The sandstones have been worked locally and used for building stone at Scarcroft, Shadwell, Alwoodley and Adel in Leeds.

In the Bradford area, it is a coarse-grained sandstone up to 21m in thickness, which was quarried extensively at Guiseley itself and also at Bingley and Sugden near Haworth. In the Huddersfield area, the flaggy sandstones have been quarried extensively on Blackwood Common, Mytholmroyd, and at Sowood Green near Ripponden. In the past, the sandstones were also worked extensively for ganister (for the siliceous 'bricks' and linings used in hearths and industrial furnaces).

Chatsworth Grit (Rivelin Grit)

In West Yorkshire, this thick massive sandstone succession has only a restricted outcrop to the west of Sheffield and extends from High Bradfield in the north and southwards to the county border at Houndkirk Moor. In terms of its stratigraphic position, this sandstone is now correlated directly with the Huddersfield White Rock. The sandstone unit was worked extensively at Burbage Rocks and Houndkirk Moor for millstones.

Figure 12: St Nicholas' Church, High Bradfield. Millstone Grit Group Sandstone.

Huddersfield White Rock (Warley Rock, Barkisland Flags, Golcar Rock)

The flaggy sandstone outcrop of the Huddersfield White Rock is narrow and discontinuous in the Leeds and Bradford areas, and it was worked at only a few localities, such as Scarcroft, where it is 3 to 6m in thickness. The sandstone unit then thickens markedly (up to about 30m) and locally coarsens from Huddersfield southwards through Holmfirth to Wharncliffe Side near Stocksbridge. The Huddersfield White Rock sandstones were worked extensively around Halifax and Huddersfield and further south for building stone. At Barkisland and Outlane, either side of Black Brook Valley, the now thinly bedded sandstones were particularly important for flagstone and stone roofing slate production (Barkisland Flags). The sandstone outcrops were worked extensively in the moorland areas on both sides of the Colne Valley, around Outlane, Golcar and Linthwaite, where large disused

Figure 13: Houses, Holmfirth. Huddersfield White Rock.

quarries are a common sight. A large proportion of the older buildings in the Colne Valley are built of this cross-bedded, coarse-grained, grey-white freestone, which is known locally as Golcar Rock. Further south, there were building stone quarries at Meltham and Bradshaw. The Huddersfield White Rock has also been worked extensively for building stone and roofing slate at numerous quarries near Holmfirth, notably along the south side of the Holme Valley at Cartworth Moor. Quarrying is still active in the Huddersfield White Rock sandstones at Hillhouse Edge, Holmfirth. Again, the vernacular houses of the local villages and towns of the valley are principally built and roofed with Huddersfield White Rock sandstones. At the southernmost end of their outcrop, near Wharncliffe, the sandstones were only worked on a small scale, but they were quarried at Rocher Quarry along the northern edge of White Moor to provide stone for the construction of the Ewden Valley reservoirs.

Figure 14: Hillhouse Edge Quarry, Holmfirth. Huddersfield White Rock.

Millstone Grit Group, Rossendale Formation

The uppermost sandstone interval of the Millstone Grit Group comprises two sandstone bodies. A lower interval of thinly bedded or flaggy sandstones, the Rough Rock Flags, is separated in places by a thick mudstone bed from the upper, more massive, sandstone unit, known as the Rough Rock.

Rough Rock Flags

The Rough Rock Flags unit occurs as a series of discontinuous outcrops extending from Leeds to the Penistone area of South Yorkshire. The succession comprises a sequence of interbedded fissile mudstones and thinly bedded sandstone beds that reach up to 25m in thickness. This flagstone unit is not consistently present everywhere, and in some areas it is not thick enough to have been recognised and mapped as a separate unit.

Although worked on a small scale at many of the unit's more isolated outcrops, the sandstones were most extensively worked along larger outcrops to the west of Halifax at Greetland Moor, in the Nab Hill–Mount Tabor–Ovenden Moor area, at Black Moor (Oxenhope), Harden Moor (Keighley) and Rawdon (Leeds). The villages and hamlets all along the outcrop, including Hade Edge, Mixenden, Luddenden, Oxenhope, Cullingworth, Rawdon, Marsden and Thorner, used these local sandstones extensively. Rawden Hill Stone was used in the construction of Leeds town hall. The Rough Rock Flags, at Ferniehurst and Baildon, have provided building stones and flagstones for paving and roofing since at least the early 18th century.

Rough Rock, Rawden Hill Stone, Bramley Fall Stone, Spinkwell Stone

The Rough Rock is the most constant and uniform of all the Millstone Grit sandstones and it always constitutes a readily recognisable horizon across much of West Yorkshire. The sandstones are generally coarse grained and strongly cross-bedded, but they can vary markedly in their quality for building stone production. Extensive quarrying took place around Leeds, in the Meanwood, Horsforth, Weetwood, Hawksworth and Bramley areas, and the stone, locally called Bramley Fall Stone, was widely used in the city in the 19th century.

The most notable use of these sandstones in Leeds was in Cuthbert Brodrick's town hall and Leeds Institute and City Museum buildings and, subsequently, in St Anne's Cathedral. All of these buildings used stone from the Horsforth quarries. Some of these quarries benefited from direct links to the mainline railway network and exported stone overseas to India and South America, where it was used in large slabs for engine beds. Locally quarried Rough Rock sandstones were particularly important in the construction of Titus Salt's new town at Saltaire. Quarries near Bingley (Gilstead Moor), Harden, Cullingworth, Oxenhope and Sowerby Bridge were locally important in constructing these towns. Building stone for Halifax and its suburbs was provided by quarries at Norland Moor, Greetland and Ovenden, among

others. In the Huddersfield area, the sandstone unit thickens to almost 40m and it was extensively quarried, notably on Wholestone Moor, Longwood Edge and Crosland Moor as well as at Shooter's Nab near Meltham.

The quarries at Crosland Hill are regarded as the principal source of building stone for Huddersfield town and they were used in major structures such as the Lockwood Viaduct.

Many of the smaller towns and villages along the outcrop took their building stone from the local quarries in the Rough Rock (Honley, Holmfirth, Langsett, Stocksbridge). Locally quarried Huddersfield White Rock sandstones can be seen in buildings in the Holmfirth area. Further south in the Wharncliffe Side–Oughtibridge area, the sandstones were extensively quarried for local use. In south-west Sheffield, the Rough Rock outcrops were worked for building stone at Tapton Hill and also quite extensively at Bassett Brown Edge near Sheffield. Quarrying of the Rough Rock continues today at the Bank Top (Wilsden) and Crosland Hill quarries only.

The Rough Rock was quarried in many localities along its outcrop, and it was known and marketed using a plethora of local quarry names, including Bramley Fall, Meanwood, Spinkwell, Crosland Hill, Spout House and Brown Edge. The Bramley Fall Stone was originally quarried at Horsforth in Leeds from medieval times, and it was used by the Cistercian monks in the construction of Kirkstall Abbey near Headingley. The thick-bedded, coarse-grained, quartz-cemented Rough Rock sandstone acquired an enviable reputation for strength and durability, and it was widely used in civil engineering projects throughout the UK in the 19th century. Examples include Kirkstall Viaduct, Stanley Ferry Aqueduct piers, docks at Millwall and West India Docks, London and Hull. Subsequently, however, the name 'Bramley Fall' was applied to the sandstones produced by several other quarries in the Rough Rock outcrop of the area. The misuse of the name became more widespread in the late 18th and 19th centuries. Several

Figure 15: Kirkstall Abbey. Bramley Fall Stone.

notable Victorian architects working in the Yorkshire area specified Bramley Fall Stone for the exterior stonework, at St John's Church at Oulton, Christ Church at Hunslet and St James' Church at Baldersby, for example, but their particular quarry sources are not generally recorded. Stone from the Pool Bank quarries (Addingham Edge Grit) was apparently being described as Bramley Fall Stone in some sources in the early 19th century.

Spinkwell Stone from the Crosland Moor quarries was used in the construction of Wakefield and Manchester town halls. Sandstone from the Scot Gate quarries at Honley was supposedly used in York Castle. The quarries at Hade Edge near Holmfirth were also extensively worked for building stone, which was used widely in the town. Quarries currently working the Rough Rock include those at Bank Top, Sunny Bank and Crosland Moor.

Pennine Coal Measures Group, Pennine Lower Coal Measures Formation

Crawshaw Sandstone, Loxley Edge Rock, Elland Flags, Boloton Woods Stone (Gaisby Rock), Greenmoor Rock, Grenoside Rock, Oakenshaw (Clifton) Rock, Thornhill Rock (Woodkirk Blue and Brown, Robin Hood Blue and Brown)

Like much of the Pennine Coal Measures Group sequence, the lowest part of the succession is dominated by thick mudstones and siltstone units, with subordinate coals and sandstone beds. Cropping out almost entirely within West Yorkshire, many of the numerous sandstone units that occur in the group have been worked at least locally for building stone. Sandstone development within the Coal Measures facies is very variable: some sandstone units are locally quite thick, whereas others are relatively thin. Only a few of these sandstones provided building stone for wider UK markets. The oldest sandstones in the Pennine Lower Coal Measures succession include the relatively coarse-grained Crawshaw Sandstone, which crops out only along the southern border of the county and extends into Derbyshire.

The Crawshaw Sandstone was quarried locally in the west of Sheffield for building purposes at Ranmoor. Also present in this southern area of West Yorkshire is the Loxley Edge Rock, which was again only worked for local building stone use. In Gledholt, Huddersfield, the equivalent basal Pennine Lower Coal Measures beds (Soft Bed Flags) were worked extensively for flags and general building stone.

The most extensive building sandstone workings in the Pennine Lower Coal Measures are within the Elland Flags interval, whose outcrop lies further north, extending from Huddersfield to Leeds. The flagstone interval is characterised by the thin-bedded, sandstone-dominated successions, which are probably the most famous and heavily exploited of all the many Coal Measures sandstones in Yorkshire. There were several centres of concentrated production, most notably at Elland itself and near Halifax, as well as at Queensbury, Thornton, Scholemoor, Clayton and Idle (Bradford area) and Woodhouse, Bramley, Potternewton and Gipton Wood (Leeds area).

Figure 16: Ellistones Farmhouse, Elland. Elland Flags and sandstone slate roof.

In Halifax, the Elland Flags are known to have been quarried since the 12th century, but their heyday in terms of production was during the late 19th century.

By 1900, there were at least 40 flagstone quarries in operation in the area around Northowram, Southowram, Hipperholme and Brighouse. These quarries and others provided stone walling, roofing slates and paving for the cities of Halifax, Huddersfield, Leeds and Bradford, as well as for many other local towns and villages. These Elland Flag quarries became major exporters of paving sandstones to other parts of the UK, notably to the burgeoning London market in the 19th century. After the First World War, although the quarrying industry in general went into a comparatively rapid decline, the Elland Flags still remained by far the most important source of building sandstones in the West Yorkshire area, with 19 active quarries in operation.

Figure 17: A public house, Elland. Elland Flags and sandstone slate roof.

In some areas, such as Hipperholme and Thornton, the remnants of this former flagstone industry are characterised not only by numerous small partially infilled quarries but also by impressive retaining or 'judd' walls.

These drystone walls were constructed using waste block from the quarry. They were built several metres high to protect the access roads to and from the massive waste accumulations from the many small quarries in the area. South of Shipley, the Elland Flags include the coarse-grained sandstone bed, formerly known as the Gaisby Rock, that is perhaps more commonly known in the stone trade as Bolton Woods Stone. This sandstone has long been exploited for dimension stone and it was used widely for building in the city of Bradford. Examples include the town hall, St George's Hall, the Wool Exchange and the Law Courts. The Gaisby Rock quarried at Spinkwell Quarry was used in the construction of the town hall Wakefield. At Idle Moor, the sandstone becomes more flaggy in character and it was mined underground, as at Elland Edge.

Elsewhere, other thicker sandstone developments from the Pennine Lower Coal Measures succession are still quarried. These include the Greenmoor Rock (quarried and used at Shepley, Hepworth, Greenmoor, Greno Wood and Brincliffe); Grenoside Rock (quarried and used at Horton Bank, Penistone, Huthwaite and Grenoside); the Clifton or Oakenshaw Rock (quarried and used locally) and Thornhill Rock (quarried and used at Thornhill, Morley, Woodkirk, Woodlesford and Thorpe on the Hill).

In the past, the Thornhill Rock sandstone quarried at Woodlesford was marketed as Woodkirk Blue and Brown and Robin Hood Blue and Brown, which added to the confusion in the marketplace. The early Cloth Hall building at Penistone, like most of the town, is constructed of local Grenoside Rock sandstone.

Figure 18: Cloth Hall, Penistone. Grenoside Rock.

Figure 19: Market Street, Penistone. Grenoside Rock.

Pennine Coal Measures Group, Pennine Middle Coal Measures Formation

Woolley Edge Rock, Horbury Rock, Mexborough (Royston) Rock (Rotherham Red), Oaks Rock

A number of sandstones that are developed within this part of the Coal Measures succession have been worked for local building stone quite extensively. Horbury Rock was worked around Ossett and Horbury. The Woolley Edge Rock was quarried at Woolley Edge, Newmillerdam and Normanton as well as at the Oaks Rock at Barnsley. At Newmillerdam, the sandstone was quarried for use in the conservation repairs at Wakefield Cathedral. The overlying Mexborough Rock (Royston Rock), characterised by its distinctive purple-red colouration, was quarried and used for building extensively at and around Darfield, Mexborough, Denaby, Hooton Roberts and Canklow. It is still worked at Ulley. The sandstone was also used locally in houses, schools and other buildings around Rotherham and Masbrough.

Figure 20: House, Hooton Pagnell. Mexborough Rock.

Pennine Coal Measures Group, Pennine Upper Coal Measures Formation

Ackworth Rock, Newstead (Pontefract) Rock, Dalton Rock, Brierly Rock, Wickersley Rock, Ravenfield Rock

In this uppermost part of the Coal Measures succession, well-developed sandstones suitable for building stone are comparatively rare. The best known are the Ackworth, Dalton, Wickersley and Ravenfield rocks. Despite their relative continuity, only the thickest sandstones were worked. This was principally at Ackworth, where the village and local farm buildings are all constructed of this pale yellow-brown (when weathered), fine-grained sandstone. The Dalton Rock (also known as Brierley Rock) was worked at Dalton, Brierley and Great Houghton for building use in the local villages. The quarries in the Wickersley Rock, Rotherham, were perhaps more noted for their grindstone production for the Sheffield cutlery industry, but they also produced the building stone used in the older houses and walls at Wickersley.

The Wickersley Rock is a thick-bedded, yellow-brown, micaceous and felspathic sandstone of medium grain size. Brown ironstone nodules several centimetres across commonly occur, generally oriented parallel to the bedding. The strong joints of the rock are sometimes stained red.

The use of these sandstones by the Sheffield cutlery trade was prodigious, with at least 23 sandstone quarries at Wickersley and many others at Listerdale and Silverwood in the Wickersley Rock, and subsequently around Ackworth in the Ackworth Rock. At Pontefract, the medieval castle is built of a reddened Carboniferous sandstone, locally termed the Newstead or Pontefract Rock, with some decorative stonework of Cadeby Formation limestone. The sandstone was exposed and quarried along the outcrop to the south-west of the castle site at Priory Wood.

Figure 21: Pontefract Castle. Newstead Rock.

Permian

The nomenclature of the Permian succession has received constant revision since it was first described in detail by Adam Sedgwick in 1829. The succession was originally divided into a basal unit of Permian coarse-grained clastic rocks, which include breccias and sandstones (red), overlain by two dolomitic limestone (or dolostone) units, the Lower and Upper Magnesian (Cadeby Formation and Brotherton Formation) limestones, separated and overlain by two calcareous red mudstone units (Middle and Upper Permian Marls). The poorly cemented basal clastic rocks have been used occasionally as a local source of building stone, but the principal sources of Permian building stone are the two dolostone units. Of these, the Cadeby Formation is of greatest significance, with the softer Brotherton Formation having been used only locally for rough wall stones.

Zechstein Group, Cadeby Formation

Dolomitic Limestones (Magnesian Limestones, Dolostones)

The dolomitic limestones (magnesian limestones or dolostones) of this formation crop out in a narrow north to south strip that extends along the eastern margin of West Yorkshire, forming a low topographical ridge marginal to the Vale of York. Despite the relatively restricted extent of their outcrop, these dolomitic limestones have been quarried and used extensively for building stone in many towns and villages, on and adjacent to their outcrop. Examples include churches and houses at Conisbrough, Anston, Maltby, Doncaster, High Melton, Cadeby, Hooton Pagnell, Ledsham, Clifford, Boston Spa and Wetherby.

As with the Carboniferous sandstones, the Cadeby Formation limestones can be found in numerous forms when used as a building stone, ranging from small and large uncoursed rubblestone blocks to coursed, rough-dressed or pitched-faced stones. These creamy white and/or pale yellow dolostones are also found in many high-status buildings as large coursed blocks of finely wrought ashlar stone. Sometimes, they are used as paving or even for roof slates, and they are also frequently used for carved stone decoration in many churches.

Lithologically, the limestones of the Permian succession are superficially similar in character throughout much of their outcrop. They have a narrow colour range from pale yellow to white, with occasional reddened varieties. However, detailed petrological studies have shown that they exhibit considerable variation across the area in their mineralogy and textural characteristics: features that can have a particular influence on their durability. The limestones of the Cadeby Formation include fine to coarse-grained, ooidal, peloidal and fossiliferous lithologies, and also a variety of fine to coarsely recrystallised fabrics. All have undergone pervasive dolomitization (conversion from limestone to dolomite) and are all now magnesium-rich limestones. The dolomitization can also cause a significant redistribution of the porosity within the limestone fabric. This diagenetic

process is important, therefore, in determining the physical properties of these limestones and it must be fully considered when selecting replacement stones for use in conservation work.

The Cadeby Formation limestone was quarried for building stone at numerous locations along its outcrop, which extends from Wetherby in the north to Steetley in the south. It was used extensively by the Romans for some of the military and civilian structures at York (Eboracum), Aldborough (Isurium) and elsewhere. Subsequently, the formation provided the principal building stone source for the great medieval cathedral of York (from Jackdaw Crag and several other Tadcaster quarries in North Yorkshire), Beverley Minster (from Smawse and Bramham Moor quarries). The abbeys at Selby (Park Nook Quarry), Roche and Welbeck, as well as the Norman castle at Conisbrough, are all constructed of locally quarried dolomitic limestone from the Cadeby Formation.

Numerous medieval churches, such as St Mary's Church at Tickhill, were constructed of these pale-coloured, easily worked limestones. Quarries at Steetley supplied stone for many buildings in the Doncaster area, including St George's Church. Cadeby Formation limestone was extensively quarried at North Anston in South Yorkshire, and this limestone was used to build the present Houses of Parliament.

Cadeby is the only quarry currently still active in West Yorkshire, but in the past, numerous quarries supplied building stone for local use in towns and villages all along the outcrop, at Wetherby, Boston Spa, Aberford, Laughton

Figure 22: Conisborough Castle. Dolomitic Limestone.

Figure 23: Gascoigne Almshouses, Aberford. Dolomitic Limestone.

en le Morthen, North Anston and Conisbrough, for example. Along the western edge of the outcrop, it is common to see a mix of Carboniferous sandstones and paler Cadeby Formation limestones used in many churches of Norman or medieval origin, including All Saints' Church at Sherburn in Elmet, All Saints' Church at Ledsham, St Mary's Church at Swillington and St Luke and All Saints' Church at Darrington. The absence of good stone sources in the Triassic succession to the east of the Cadeby limestone outcrop has meant that these 'white limestones' were also widely used for prestigious buildings in East Yorkshire, at Beverley Minster, for example.

Some quarries not only produced stone for local use but also exported stone far outside their local areas. Cadeby Formation limestones were used in the construction of Liverpool Lime Street station and in various warehouses and other buildings in Manchester and Sheffield.

Figure 24: All Saints' Church, Sherburn. Dolomitic Limestone.

Figure 25: All Saints Church, Ledsham. Thornhill Rock Sandstone and Dolomitic Limestone.

4 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.

West and South Yorkshire references

Ambler, L 1913 *The Old Halls and Manor Houses of Yorkshire: With Some Examples of Other Houses Built Before the Year 1700*. London: B T Batsford

Anon 1890 'Yorkshire Stone: Halifax District', *The Builder*, **LVIII** (2460), 221–4

Anon 1890 'Further notes on Yorkshire Stone: Halifax District', *The Builder*, **LVIII** (2463), 277–81

Buckland, P C 1988 'The stones of Roman York', *Geology Today*, **4** (5), 171–5

Caffyn, L 1986 *Worker's Housing in West Yorkshire 1750–1920*. London: HMSO

Dimes, F G, Mitchell, M *et al* 2006 *The Building Stone Heritage of Leeds*. Leeds: Leeds Philosophical and Literary Society

Gee, E 1981 'Stone from the medieval limestone quarries of South Yorkshire', *in* Detsicas, A (ed) *Collectiana Historica: Essays in Memory of Stuart Rigold*. Maidstone: Kent Archaeological Society, 247–55

Giles, C 1986 *Rural Houses of West Yorkshire 1400–1830*. London: HMSO

Giles, C and Goodall, I H 1992 *Yorkshire Textile Mills 1770–1930*. London: HMSO

Godwin, C G 1984 *Mining in the Elland Flags: A Forgotten Yorkshire Industry*. London: HMSO

Harry, W T 1952–3 'The geology of the Leeds–Harrogate area from its quarries', *The Quarry Managers' Journal*, 360–4; 415–23; 467–73; 527–33

Hey, D 1981 *Buildings of Britain 1550–1750: Yorkshire*. Ashbourne: Moorland Publishing

Kennett, P 1999 'The building stones of Sheffield: A geological walk in the city centre'. Sheffield City Museum

Linstrum, D 1978 *West Yorkshire Architects and Architecture*. London: Lund Humphries

Lott, G K and Cooper, A H 2008 'Field guide to the building limestones of the Upper Permian Cadeby Formation (Magnesian limestone) of Yorkshire', *in* Doyle, P (ed) *England's Heritage in Stone: Proceedings of a Conference, Tempest Anderson Hall, York, 15–17 March, 2005*. Folkestone: English Stone Forum

Lott, G K and Richardson, C 1997 'Yorkshire stone for building the Houses of Parliament (1839–c 1852)', *Proceedings of the Yorkshire Geological Society*, **51** (4), 265–71

Miller, J S and Gee, E A 1983 'The Bishop Dyke and Huddlestone Quarry', *Yorkshire Archaeological Journal*, **55**, 167–8

Mitchell, G H 1932 'Notes on the Permian rocks of the Doncaster district', *Proceedings of the Yorkshire Geological Society*, **22**, 133–41

Mitchell, M 2001 'Quarrying in the Oakwood Area (Leeds)', *Oak Leaves, Part 2*. Oakwood and District Historical Society, 5–12

Neill, A 1873 'On the Bradford building trades', *British Association for the Advancement of Science, Report of the 43rd meeting, Bradford*. London: John Murray, 196–9

Oswald, A 1959 'The White Stone of Yorkshire', *Country Life Annual*, 61–4

Ryder, P F 1982 *Medieval Buildings of Yorkshire*. Ashbourne: Moorland Publishing

Sheeran, G 1986 *Good Houses Built of Stone: The Houses and People of Leeds/ Bradford 1600–1800*. Pudsey: Allanwood Books

British Geological Survey publications

Aitkenhead, N, Barclay, W J, Brandon, A, Chadwick, R A, Chisholm, J I, Cooper, A H and Johnson, E W 2002 *British Regional Geology: The Pennines and Adjacent Areas* (4th edition). Keyworth: British Geological Survey

Bromehead, C E, Edwards, W N, Wray, D A and Stephens, J V 1933 *The Geology of the Country Around Holmfirth and Glossop*. Memoirs of the Geological Survey of Great Britain (England and Wales). London: HMSO

Eden, R A, Stevenson, I P and Edwards, W N 1950 *Geology of the Country Around Sheffield: Explanation of Sheet 100*. Memoirs of the Geological Survey of Great Britain (England and Wales). London: HMSO

Edwards, W N, Wray, D A and Mitchell, G H 1940 *Geology of the Country Around Wakefield: Explanation of Sheet 78*. Memoirs of the Geological Survey of Great Britain (England and Wales). London: HMSO

Edwards, W N, Mitchell, G H and Whitehead, T H 1950 *Geology of the District North and East of Leeds: Explanation of Sheet 70*. Memoirs of the Geological Survey of Great Britain (England and Wales). London: HMSO

Gaunt, G D 1994 *Geology of the Country Around Goole, Doncaster and the Isle of Axholme: Memoir for One-inch Sheets 79 and 88*. Memoirs of the Geological Survey of Great Britain (England and Wales). London: HMSO

Green, A H and Russell, C E 1879 *The Geology of the Neighbourhood of Wakefield and Pontefract: Explanation of Quarter Sheet 87NW*. Memoirs of the Geological Survey of England and Wales. London: HMSO

Green, A H, Russell, R, Dakyns, J R, Ward, J C, Fox-Strangways, C, Dalton, W H and Holmes, T V 1878 *The Geology of the Yorkshire Coalfield*. Memoirs of the Geological Survey (Coalfield). London: HMSO

Hunt, R 1856 *Mineral statistics of the United Kingdom of Great Britain and Ireland for the year 1855*. Memoirs of the Geological Survey of Great Britain and of the Museum of Practical Geology (Mining Records). London: Longman, Brown, Green, and Longmans.

Hunt, R 1857 *Mineral statistics of the United Kingdom of Great Britain and Ireland for the year 1856*. Memoirs of the Geological Survey of Great Britain and of the Museum of Practical Geology (Mining Records). London: Longman, Brown, Green, and Longmans.

Hunt, R 1860 *Mineral statistics of the United Kingdom of Great Britain and Ireland, being part II for 1858*. Memoirs of the Geological Survey of Great Britain and of the Museum of Practical Geology (Mining Records). London: Longman, Green, Longman, and Roberts.

Lott, G K 2002 'The building stones of the Pennines and adjacent areas', *in* Aitkenhead *et al British Regional Geology: The Pennines and Adjacent Areas* (4th edition). Keyworth: British Geological Survey

Mitchell, G H, Stephens, J V, Bromehead, C E N and Wray, D 1947 *Geology of the Country Around Barnsley: Explanation of Sheet 87*. Memoirs of the Geological Survey of Great Britain (England and Wales). London: HMSO

Stephens, J V, Mitchell, G H and Edwards, W N 1953 *Geology Around the Country Between Bradford and Skipton: Explanation of Sheet 69*. Memoirs of the Geological Survey of Great Britain (England and Wales). London: HMSO

Stevenson, I P and Gaunt, G D 1971 *Geology of the Country Around Chapel en le Frith: Explanation of Sheet 99*. Memoirs of the Geological Survey of Great Britain (England and Wales). London: HMSO

Waters, C N 1999 *Geology of the Bradford District: A Brief Explanation of the Geological Map Sheet 69 Bradford*. Keyworth: British Geological Survey.

Wray, D A, Stephens, J V, Edwards, B W N and Bromehead, C E N, 1930 *The Geology of the Country Around Huddersfield and Halifax: Explanation of Sheet 77*. Memoirs of the Geological Survey of Great Britain (England and Wales). London: HMSO

Wright, W B, Sherlock, R L, Wray, D A, Lloyd, W and Tonks, H 1927 *The Geology of the Rossendale Anticline: Explanation of Sheet 76*. Memoirs of the Geological Survey of Great Britain (England and Wales). London: HMSO

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Figures

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