

Per. forest 4 (local history) 06 106/05 @ 1248 pm 50/21/70

GEOLOGY and BUILDING MATERIALS

Alison C Armstrong

06/11 1150 a
09/11 1550 p This was e-mailed

The West Riding North is an area of good building stone, which is explained by description of the geology, but brick too is important and timber structures also survive. The area extends approximately from the Aire-Calder watershed northwards and stretches for some 70 kilometres from north to south and 94 kilometres from west to east. The ancient, historic boundary follows natural features such as rivers and their watersheds along the highest fell summits. The far north-west, around Sedbergh, is less well defined and geologically alien and became part of the West Riding over 900 years ago.

The West Riding landscape is diverse and varies from high Pennine fells and deep dales in the upland west to arable lowland and river floodplains of the Vale of York in the east. There are fine old market towns too such as Ripon, Knaresborough, Otley and Skipton whilst Harrogate and Ilkley developed as popular spa towns. Urban conurbations are concentrated in the south around the mid and lower Aire valley. Keighley, Shipley, Bradford and Leeds expanded rapidly as 19th century industrial towns where local Carboniferous sandstones provided the building material characteristic of the textile mills, chapels, bridges, town halls, terraced houses and yeoman farmhouses. Most of the region however is still rural with scattered settlements and areas designated for their unique landscape value, such as the Yorkshire Dales National Park.

The landscape has been shaped by geological events spanning 490 million years ranging from Ordovician times to the scouring effects of the Ice Age which ended a mere 10,000 years ago. The underlying shales, sandstones and limestones are all sedimentary rocks that

formed from the hardening of muddy, sandy and limy layers deposited in the waters of ancient tropical seas, rivers or swamps. Periodic disturbances within Earth's crust have lifted up the rock layers into hills, causing folding and faulting and some alteration of the oldest rocks. Millions of years of erosion have subsequently worn away the landscape with the final sculpting by great ice sheets, leaving natural topographical areas closely linked to the geology.

The oldest rocks are marine sandstones and mudstones of Ordovician and Silurian age. By the end of Silurian times, 409 million years ago, these layers were lifted up, folded and altered as pressure imposed a slaty cleavage on the rocks. During Devonian times the land and rocks were weathered away. In Carboniferous times seas and then rivers covered the region and the sediments left behind now form the rocks underlying three quarters of the West Riding North landscape today. Three Carboniferous rock divisions give rise to three distinct topographies. In the Lower Carboniferous are the marine limestones and sandstones that make up the Carboniferous Limestone rock series. Above that, in the Upper Carboniferous, riverine sandstones and shales form the Millstone Grit series and finally shales, coals and sandstones make up the Coal Measures. At the end of Carboniferous times, 290 million years ago, major tectonic disturbances forced up these layered Carboniferous rocks into a long north-south arched ridge and the Pennine hills formed. The ridge was cut off in the north-west by the great fracture of the Dent fault and broken across by the Craven faults, between Ingleton and Airedale. The latter now forms a major west-east route through the Pennines. By early Permian times the new Pennines began to be eroded away and the rivers of the Yorkshire Dales carved out their first courses. Warm shallow Permian seas reached the eastern side of the Pennines leaving limestones, some of them magnesian limestones and rich in dolomite or magnesium carbonate. In the arid deserts of Triassic times sands and marls were deposited on the low land as the hills were eroded away. Hundreds of metres of rock were removed from the Pennines in following

eras with further tilting of the upland in the last 20 million years. Finally, ice sheets modified the contours in the last two million years, leaving deep and wide dales with glacial debris covering the valley floors and Vale of York lowland.

Several natural areas can be recognised in the region, based on their geology. These areas are the Far North-west and the older rocks of the Howgills, the limestone regions of the Yorkshire Dales and Craven lowlands, the Millstone Grit uplands of the Pennines and Bowland Fells, Coal Measures country around Leeds and Bradford, the Permian ridge and finally the Vale of York lowland.

(See map)

THE FAR NORTH-WEST of the Riding extends beyond the Dent fault where the Pennine hills butt against the older rocks of Cumbria. Here, the steep, high, rounded Howgill Fells reach summits of 670 metres OD and are of dark, slaty Ordovician and Silurian rocks which contrast with the flat-bedded Pennine limestones and sandstones of Dentdale. These older rocks outcrop again in small areas along the Craven faults, around **Ingleton and Horton-in-Ribblesdale**, where they are seen spectacularly up-ended in some valley sides but overlain by horizontal limestone of Carboniferous age. Although not generally prominent in the topography these slaty rocks are significant in local building.

Slaty rocks, for example, are used for local buildings around Sedbergh and the church shows quarried sandstone dressings and black slate boulder walling. Some 19th century buildings are entirely of coursed, dark slate. Large greenish roofing slates, laid in courses of reducing size, are probably from Ingleton. Around Ingleton and Horton-in-Ribblesdale, in the midst of limestone country, small outcrops of slaty rocks contribute greenish or dark

grey, fissile stone for roofing, gateposts, through-stones, field walls and paving stones. Stone slabs are used for stall partitions in agricultural buildings, rather than timber. Green thin slate is seen on houses of about 1800 at Arncliffe in Upper Littondale where roofing material was scarce and thatch probably common. The dark and thicker "Horton flags", "Silurian flags" or "blue slates" were quarried commercially in Ribblesdale from the 18th century to about 1912, first at Arcow and later at Helwith Bridge where there were water-powered saw mills. Sawn-slab cattle troughs and earlier, riven, roof-flags and paving stones are quarry products still in evidence. Other Silurian rocks are coarse-grained sandstone flags, resembling Carboniferous gritstones, used for roofs and barn lintels south of Horton.

Other kinds of slate roofing were imported from north-west England and widely used in the West Riding. In the late 19th century, green-grey "Westmorland" and "Lancashire blue" slates were imported by rail to Aire valley towns, such as Keighley and Bradford, where they replaced traditional heavy sandstone flag roofs on new buildings. Blue slate roofs are still conspicuous in Nidderdale, where the railway reached Pateley Bridge.

THE YORKSHIRE DALES lie north of the Craven faults where deeply incised valleys, shaped during the Ice Age, cut into high fells from which rise flat-topped gritstone summits such as Ingleborough (723 m. OD) and Pen-y-ghent. Except for the gritstone valley of Nidderdale, pale limestones and sandstones of the Carboniferous Limestone rock series underlie the Dales. Around Horton, Malham and Kilnsey the Great Scar Limestones form dramatic karst scenery with shelves of limestone "pavement". Further north, in upper Wharfedale, limestones form long scars in the valley sides with other limestones above. These higher limestones are interbedded with flaggy sandstones and soft shales in repetitive cycles and are known as the Yoredale beds. They give the valley sides a stepped profile but high at Ribblesdale great oval mounds of boulder clay and poorly drained, sedge-covered pastures obscure the solid rock.

In the Yorkshire Dales, limestone was often taken from nearby rocky outcrops and used with sandstone boulders in the poorly-coursed, dry-stone rubble field walls and hundreds of isolated field barns built for over-wintering a few cows. Glacial boulders were entirely used at isolated Ribblesdale farmsteads, like High Birkwith. Some limestone is blocky and forms quoins in earlier structures but it is not freestone and generally breaks as rubble lumps. By the late 17th century sandstone was preferred for all dressed work and often for walls too. Sandstone flags or "grey slates" still dominate as roofing. These materials however were brought from outcrops of Yoredale beds and gritstones on the hilltops. Accounts of 1685 for the building of Hemplands, a yeoman farmhouse in Conistone, near Kilnsey, indicate sources of stone for better houses at that time. Although lying below rocky limestone scars, walling sandstone was brought from the township quarries high on the moor above and sandstone roofing flags from Hard Rake, over in the Walden valley. In Dentdale brown, flaggy, Yoredale sandstone from the valley sides is notable as building stone, as well as for roofing flags, rather than limestone. Carved sandstone door lintels provide the main decorative element on many Dales houses, such as remote Lodge Hall (1687) above Horton. The fine vernacular frontage of The Folly in Settle (1679) has long mullioned windows and columned doorway of grey gritstone with ashlar of soft sandstone but limestone is used in the rubble rear walls. Near Grassington the domed Linton Hospital (1721-25 and supposedly based on plans by Vanbrugh) is built from gritstone brought from quarries on Thorpe Fell.

Fountains Abbey worked sandstone roofing-flag quarries in the Dales in medieval times but at the end of the 18th century large-scale workings for roofing and paving began in the Yoredale beds. A number of locally important quarries were in Wensleydale in the North Riding, around Hawes and Leyburn and in Coverdale, where some workings were

underground. Raised rooflines suggest that many thatched agricultural buildings were then re-roofed in stone.

Some fossil limestones from the Yoredale beds were important as polished "marble" for interior use. Crinoidal "Nidderdale marble" was worked from a small outcrop near Lofthouse, a former grange of Fountains Abbey and slender grey shafts can be seen in the 13th century aisled infirmary hall at the Abbey and in the Chapter House of 1170. Flooring in Dent church features the fossiliferous black "Dent marble" as well as other north of England fossil marbles in grey and buff. By the early 19th century it was worked from several small quarries in Dentdale, and sawn and polished in water-powered mills. It gained popularity for Victorian fireplace surrounds and was sent to London and Newcastle.

THE CRAVEN LOWLANDS with the Aire-Ribble gap are separated from the upland Yorkshire Dales by the Craven faults and are an area of hedged fields and lower pastoral land reaching about 200 metres OD. Around the mid Ribble valley, a drumlin field of great oval mounds of glacial debris mostly conceals the limestone. It is highly folded rock, dark and well bedded, sometimes sandy, but is exposed only in small knolls.

In the Craven lowlands, tall, three-storey Craven houses seen in the main street in Gisburn and cottages and barns in Gargrave have walls of mixed quarried limestone rubble and field cobbles with sandstone dressings. Many such walls were originally rendered. Well-carved, dated door lintels feature in Bolton-by-Bowland, Slaidburn and villages with their historic churches along the wooded valleys near the Forest of Bowland. Lintels of 1716 in Bolton and 1720 in Sawley may have come from the workshop that produced earlier lintels in Ingleton and Clapham.

THE MILLSTONE GRIT UPLANDS are landscapes of high heather or cotton grass moors, craggy gritstone escarpments and rock stacks and numerous old quarries or delfs. On the lower slopes pastures enclosed by stone walls and old hedges surround many of the larger settlements in mid-Wharfedale, such as Ilkley and Otley, and mid-Airedale from Skipton to Saltaire and south towards Haworth. The hill country extends northwards above Pateley Bridge to Lofthouse in the deep valley of upper Nidderdale beneath the summit of Great Whernside. The underlying rocks are soft shales and hard sandstones, many of them coarse-grained gritstones. The stepped landscape formed by the weathering of the gently tilted strata is particularly apparent in Airedale and Wharfedale. On the eastern fringe, such as around Fountains Abbey, Ripley Castle and Harrogate spa, the Pennine foothills form a broad band of softer, more wooded country sloping away to the east. There are nucleated villages but many scattered settlements originating from the break-up of monastic estates and the large Forest of Knaresborough. On the Lancashire and West Riding boundary, the Bowland Fells reach 544 metres OD.

Millstone Grit sandstones have been widely used in local building but the products of some 19th century commercial quarries became renowned. The finer-grained, fissile, sandstones of the Millstone Grit, together with sandstones from the overlying Coal Measures, were generally known by the trade name "York Stone" and "York Flags" and along with some of the massive sandstones were exported as far as London and abroad. There are still a number of active quarries remaining in the West Riding such as near Keighley.

The sandstones are particularly hard and durable but different qualities can occur in one quarry. Some are fissile, fine-grained and sparkle with mica particles and will split into flags for paving and roofing or thin walling stone. Others are massive and thick-bedded with visible quartz grains and can be used as freestone and ashlar. Many of the massive

sandstones are coarse-grained (evenly so or with some large pebbles) and are classed as gritstones. Cross-bedded structures are common which made squaring the stone difficult but it could be used as rubble and roughly dressed with a walling hammer or shaped with a punch. Since good gritstone could be shaped like freestone, splayed mullions continued for longer than in the Coal Measures areas and were relatively common in the mid 18th century. East Riddlesden Hall (1642) with well-carved label stops, porch with round windows and caved plinth is a fine example of the remarkable stone detail that can be imposed on coarse gritstone.

Sandstone was usually extracted near to where it was needed, as it was costly to transport. For large buildings such as Fountains Abbey or Barden Tower the shallow gritstone quarries adjoined the site and weathered iron compounds give the soft pink and yellow hues. Gritstone for Bolton Priory was quarried from shallow delfs on Embsay Moor two miles away and brought down on sleds whilst the escarpment of Embsay Crag was quarried for work at Skipton Castle in 1437. Rough Rock gritstone from Horsforth, Leeds, was used in medieval times for nearby Kirkstall Abbey and probably exported down the River Aire. Most settlements had township quarries on the common or moor for local use. Addingham Low Moor was enclosed in 1873 but a public or town quarry was retained. When the south wall of the village church was rebuilt in 1756-7, however, a special gritstone quarry was opened up on private land a mile away. This provided stone for the village into the 20th century.

Millstone Grit sandstone was particularly valued where it would split for roofing stone. The Bradley Flags on High Bradley moor, near Skipton, were exploited by local farmers from the early 17th century and later Bradley Quarry provided excellent roofing-flags and thin wall-stones until after 1900. A few miles away on Silsden Moor only very thick roofing sandstone was available in the 17th century. Documents show that early in the 14th century Bolton

Priory was making considerable use of sandstone flags for roofing buildings although

Barden Tower, built by Henry, Lord Clifford a century later, had thatched roofs.

In the 19th century, the fissile Rough Rock Flags were quarried and mined on a large scale for setts, flags and building stone at Baildon and at Mount Tabor in Calderdale where it was known as "Greetland Stone", whilst the Scotland Flags at Midgely were extensively used for roofing and paving.

MG quarries
Local quarries provided all the dressed gritstone for the expanding 19th century towns.

Hangingstones Quarry above the spa town of Ilkley had an inclined wagon-way that lowered stone down the hillside to the road. On Steeton Moor, enclosed in 1787, the small Brighton

quarries reached their peak from 1847-81 supplying gritstone for local manufacturer's mansions, chapels, churches and schools and windows for Bradford Exchange. Stone for

Saltaire mills and its village (built between 1851-1871) came from some twenty local quarries and from the site itself. The coarse-grained Rough Rock quarried at Bramley Fall,

Leeds, was used for Bradford's first public building, St George's Hall (1853) and for recent repairs to Ripon Cathedral and was also exported for London docks and Euston station.

Quarries at Pool provided gritstones for Leeds such as St Ann's R C cathedral and for other towns. From Haworth Moor came "Bronte freestone" exported by rail as far as Manchester.

In Nidderdale, the moors above Pateley Bridge had long been quarried but Scot Gate Ash quarries produced fine-grained flags and building stone. Between 1872 and 1912 expansion was aided by an inclined railway down to the main railway below.

Quarrying remained a labour-intensive industry using crowbars, wedges and jibs to extract huge ten-ton blocks of stone but steam-powered cranes in the later 19th century enabled deeper stone to be reached. Skilled banker-hands would cut or split great blocks of stone into smaller lumps using just a few wedges and a hammer and flag fettlers trimmed split

stones into standard sized paving flags. Quarry masons, housed under a simple shelter, would dress wall-stones or finish sills and lintels. Today, power tools replace some of the manual work in cutting and polishing. Decorative carved work however was made in mason's stone-yards, often sited near the railway.

From about 1860 huge powered frame saws worked day and night slicing ten-ton blocks of stone into slabs by the abrasive use of water and sand or steel shot poured on to swinging blades. Long, straight door and window surrounds of about 1840 have been noted in Haworth, possibly indicating earlier mechanised sawing.

From Haworth to Middlesmoor, to the Forest of Bowland and towns like Harrogate, Otley or Skipton many kinds of stone finish may be observed that were produced from a variety of punches and wide-bladed, chisel-like tools. Tooling was dependant on cost and "broached ashlar" specified for Addingham church in 1756 is a typical fine finish on gritstone where the squared wall stones received a fine pecking using a broaching pick. The Georgian "broad tool", a very wide chisel, produced careful rows of vertical or horizontal tooling, often with chisel-drafted margins, whilst the narrower "boaster" of the later 19th century was often used in rows of diagonal tooling. Rougher dressing using a punch is seen on many gritstone quoins. In the late 19th century "pitch-faced" or "rock-faced" stone, exhibiting the scalloped gouges of the pitching-tool, was typical of massive masonry blocks used in railway viaducts and textile mills. Many river bridges from Sedbergh to Silsden are recognised by parapets of large ashlar blocks and domed end-piers and often bold horizontal tooling. They are probably from designs by three generations of the Hartley family, all Surveyors of Bridges to the West Riding from 1797-1882.

The quarry industry reached a peak in the 19th century but declined after the First World War with the shortage of labour and competition from other materials such as concrete and steel, brick and imported roofing slate.

Bricks began to be made from machine-crushed Millstone Grit shales after the brick tax ended in 1850 and became widely used for interior walls. Large brick pits with continuous kilns opened on hillsides near mid-Airedale towns such as Skipton and Keighley continuing to the 20th century with bricks often stamped with the maker's name.

COAL MEASURES COUNTRY fringes the east side of the Pennines where pastures rise above 340 metres OD around Bradford and dip away eastward to undulating once-wooded lower ground and the urban spread around Leeds. Sandstones between the shales form prominent escarpment features and mineral resources, particularly coal, have long contributed to the local economy and urban growth. The ironworks at Low Moor in south Bradford began casting fireplaces and domestic items in 1788. A string of rural potteries worked coal and clay seams along the edge of the Coal Measures.

West of the Pennines a small area of Coal Measures rocks occurs around Burton-in-Lonsdale, where coal and pottery clay were worked. Sandstone was the main building material in all these areas but with split granite and sandstone glacial boulders additionally used in Burton and brick featuring around Leeds.

The Lower and Middle Coal Measures include more shale, coals and ironstones, than the Millstone Grit strata, but have yielded some excellent building sandstone including "York Stone" mentioned above. The Elland Flags are a heavily quarried escarpment in the upland pastures above Bradford, near Queensbury, Clayton, Denholme and Brighouse and east of Halifax and Huddersfield. The stone provided hard, fine or coarse-grained, ashlar freestone, roofing and "York Stone" paving flags and thin-bedded wall-stones and was extensively used in Leeds and Bradford and in the work of architects such as Lockwood and Mawson. Well-known quarries around Bradford include Egypt and Bell Dean, near Thornton, and

quarries in Fagley (Radcliffe Quarry), Eccleshill, Idle Moor, Northowram and Bramley near Leeds (Park Spring Quarry). The Gaisby Rock in the Elland Flags was worked along the entire hillside north of Bradford after the estate at Bolton Hall was sold in 1867. As demand for "Bolton Woods stone" and "Spinkwell blue" or "Spinkwell brown" grew, older delfs at Cliffe Wood and Spinkwell were themselves quarried away and the land backfilled. In 1872, quarry owners supported the re-opening of the Bradford canal, essential for exporting the stone. At Allerton and on Idle Moor the Elland Flags were mined underground. In the Middle Coal Measures south of Leeds, the ridge of the Birstall Rock has been much quarried, along with the smaller outcrop of Thornhill Rock. "Morley Blue" sandstone alters to an orange colour and, along with stone from Guiseley, is said to be the reddish stone used for Edwin Lutyens's Heathcote House in Ilkley, designed in 1906. Some sandstones around Leeds and Wakefield are soft and become hollowed by "honeycomb weathering".

The method of extracting the stone was much the same as for Millstone Grit sandstones but many of the deep quarries are set amidst enclosed pastures rather than on common moors. The tooled surface applied to flaggy sandstone exhibits less variety and wall-stones and door/window surrounds are typically dressed in lines across the stone bedding plane. The best freestone used in Victorian city centre buildings has retained crisp carved detail.

Brick became an important material around Leeds from the 17th century with production concentrated near Normanton and Castleford. Pymont House in Lofthouse, near Leeds, is a small timber-framed house with original internal brick walls whilst Temple Newsam Hall, a Tudor house with diaper brickwork, was enlarged about 1630 with materials made locally by a brickmaker from York. In Bradford brick buildings are uncommon but pedimented Tong Hall begun in 1702 and the single cell Brick House of c1800 on Little Horton Green are exceptions.

Bricks were made where they were needed and in the Park Square area of Georgian Leeds, clay removed for house foundations was burnt in kilns in neighbouring fields. Over two million bricks were made between 1793-1803 by Benjamin Wilson. In the late 18th century potteries were established around Leeds and along the edge of the Coal Measures above Bradford and Halifax. The 19th century building boom however encouraged production of constructional materials and Manor House Potteries at Eccleshill, for example, switched to bricks and chimney pots. Burmantofts pottery, Leeds, contributed greatly to the architectural materials of the city centre from about 1904. Glossy, faience bricks and elaborately moulded, coloured plaques in whites, greens, blues and browns decorate some entire frontages.

In the later 19th century, brick works such as at Wrose and Shipley in the Aire valley exploited fireclays and coal. The fireclay works at Clayton included a variety of glazed chimney-pots, decorative ventilator grilles, roof finials and garden wares.

THE PERMIAN RIDGE is a low five-mile wide plateau of gently dipping limestone rocks that extends in a north-south direction, approximately from around Ripon down to Tadcaster and Pontefract. The land rises to 108 metres OD near Collingham but in the north around Ripon and in the east the limestone outcrop disappears under the covering of Ice Age moraines and clays. The ridge is deeply cut by the River Nidd at Knaresborough and the Wharfe at Wetherby and is crossed by many small wooded streams. It is excellent farmland with hedged arable fields and scattered villages and small country houses built of the white, grey or yellow magnesian limestones. The best magnesian limestone was dolomite, worked from some historically important quarries that supplied stone for York Minster and other medieval buildings in England.

The Permian limestones were widely used locally but the magnesian limestones or dolomites gave the best freestone and an important building material exported to the stoneless Vale of York. In the older houses around Monk Fryston or in Lotherton Hall Chapel flaggy, rubble limestone is seen; at Knaresborough Castle the stone sparkles with vugs or crystalline hollows and around Collingham it is sandy and regular-bedded ashlar. Grey, wavy-bedded limestone is seen in Ripon and cream-white ashlar features in the polite architecture of Tadcaster, Boston Spa and Wetherby. At Temple Newsam Hall, Leeds, white limestone dressings contrast with 17th century red brick. The limestone however tends to weather and historic patching and modern repairs are evident for example at Ripon Cathedral.

The best and hardest freestone is the cream, well-bedded dolomite from the Cadeby Formation (former Lower Magnesian Limestone), quarried in Roman and Medieval times and used for many Vale of York churches. Jackdaw Crag or Tadcaster limestone from Thevesdale, near Tadcaster, provided fine freestone for medieval York Minster from 1225 or earlier whilst Smaws Quarry on Bramham Moor supplied Beverley Minster. In 1415 dolomite for York Minster came from Huddleston Quarry near Sherburn and was transported up the River Ouse. Huddleston stone was exported in the 15th century to Westminster and Cambridge (Kings College Chapel). South of Pontefract, quarries near Stapleton, supplied stone after about 1400 to York and also for St Stephen's Chapel Westminster.

Further north, grey limestone for rebuilding the nave of Ripon Minster about 1503 was found close by and probably came from the Quarry Moor area south of the town, but sandstone from Wensleydale was used for the earlier church in about 1184. Nearby, the 14th century moated manor house of Markenfield Hall is also of white limestone and interior stonework retains the distinctive fine claw-tooling resembling that used by masons at York Minster. At Fountains Abbey Permian limestone is used in a piecemeal fashion, along with local

0

gritstone, in the tower of c.1508. Fountains Hall (1611) too incorporates both new-quarried limestone and reused Abbey stone for the dressed work and some walling, with Carboniferous sandstone for quoins and other walling.

Interbedded with the Permian limestones and marls is the mineral gypsum which was extracted for making plaster. Floors of attics in the Ripon area are probably of this hard material, such as in Norton Conyers Hall, a brick-faced house now rendered. Bricks were made seasonally from local clays in the Ripon area and are seen in many Georgian boundary walls and cottages along with boulders from Ice Age clays.

The **VALE OF YORK** lowland barely rises above 40 metres OD. Low, undulating mounds of glacial gravels and moraines and alluvial flood plains of the meandering River Ouse and its tributaries mask the underlying Triassic sandstones. Scattered farmsteads, barns and granaries and villages of brick and sandstone cobble walls with red pantile roofs are seen amongst hedged, arable fields.

In the stoneless Vale, brick-making clays have been utilised since Roman times and bricks were made near York in the mid 14th century. Cawood has several houses of elaborately moulded 17th century brick. Villages like Little Ouseburn show typical 18th century tumbled brickwork on gables and eaves ornamented with diagonally set projecting brick toothings. Boulders of sandstone are also used in walling but good freestone had to be imported. Cream-coloured Permian limestone or dolomite is conspicuous in many churches and in Roman and medieval York and was brought from quarries in the west, such as near Tadcaster, using navigable rivers or overland routes.

In the West Riding North generally, other materials have been much used in the past. Stone and brick buildings conceal the evidence of timber-framing and cruck construction that was once common and sometimes used with ling or straw thatched roofs. Oak was the main constructional timber but ash was used in the limestone areas. Fold Farm, Kettlewell, is a stone-built farmhouse but it incorporates the remains of a substantial 15th century timber-framed hall with decorative posts and cusped braces, associated with Coverham Abbey. Fragmentary evidence of timber-framed houses has been found at Bradley, Skipton, and in the Ripon area where walls have been encased, although some exposed timber-framing is still to be seen. In Halifax, the three-storey, timber-framed town houses, "Woolshops", have been dated by dendro-chronology to after 1658. The aisled timbered barn at Stank Hall, Leeds produced dates of 1448-90 and the eleven-bay, hip-roofed Great Barn at Bolton Priory 1518. The aisled stone-walled barns at Upper Headley Hall, Bradford, were built in 1583 and 1605. Cruck barns and re-used crucks in the Pennines and Vale of York remain largely un-dated by dendro-chronology.

Throughout the West Riding North other imported stones are recognised from roofing slates, already mentioned, to granite paving setts brought by rail from Leicestershire, Aberdeen and Shap in Cumbria. Leeds, at the centre of the canal network, became a centre for imported stones and polished granites and "marbles" decorate many Victorian commercial and civic buildings in Airedale. In the 1920s and 1930s Portland limestone regained popularity and was chosen for Skipton war memorial, Cavendish House in Keighley (1923) and for the controversial Bradford Central Library of the 1960s. In the 20th century, polished granite slabs from around the world have been used in the modernisation of many remaining old town centre frontages.

END