SPAB Conference Report

The use of Horsham stone slate in historic buildings

Forum convened by the SPAB
Thursday 21 June 2018
The SPAB, 37 Spital Square, London, E1 9DY
Chaired by Philip Hughes, chair of SPAB technical panel

Contents

The Society for the Protection of Ancient Buildings
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Cover Images: (top, left, right) Double-lapped roof at Coombes Church, West Sussex (Richard Crook); Horsham stone slate and plain clay tiles at the Church of the Holy Sepulchre, Warminghurst, West Sussex (Nicola Westbury); Horsham stone slates stacked for re-use (Maggie Goodall).

Forum Aims

The declining availability of new Horsham stone slate as a traditional roofing material, and the impact of using salvaged material in historic building repair projects, has been identified as an issue by conservation bodies, local authorities, practitioners, specifiers and building owners/clients.

In bringing together a range of interested parties for this forum, the Society for the Protection of Ancient Buildings (SPAB) aimed to facilitate and contribute to debate on how these issues might be addressed and how similar problems of supply and use have been tackled elsewhere.

The intention was to examine the challenges, review existing guidance and explore current principles and techniques, with the objective of identifying good practice and working towards an agreed approach to the repair and conservation of historic Horsham stone slate roofs.

The aims of the forum were to:

- Understand problems and opportunities and update on recent developments
- Share perspectives from those working in different capacities with Horsham stone slate
- Identify where new or updated guidance is needed
- Work towards an agreed policy or good-practice-based approach to future projects

These notes provide a summary - rather than a comprehensive record - of the forum discussions and conclusions.

Attendance

Anderson	Mark	John D Clarke Architects	Partner
Barker-Mills	Peter	Mole Valley District Council	Historic environment officer
Bone	David	West Sussex Geology	Geological consultant
Brook	Anthony	Building Stone Atlas of Sussex	Geologist / author
Burrell	Andy	Chichester Diocesan Advisory Committee	DAC architect member
Collins	Phil	Geckoella Ltd	Heritage specialist
Cordiner	Roger	Building Stone Atlas of Sussex	Geologist / author
Crook	Richard	John D Clarke Architects	Architect
Dick-Cleland	Alastair	Landmark Trust	Conservation manager
Harris	Wendy	Guildford Diocesan Advisory Committee	DAC secretary
Higgins	Martin	Surrey County Council	Conservation officer
Hughes	Terry	Stone Roofing Association Slate and Stone Consultants	Chairman
John	David	Historic England - SE Region	Architect
Jordan	Richard	Jordan Heritage Roofing	Contractor / trainer
Knight	David	Cathedral and Church Buildings Division Church of England	Senior church buildings officer
Mason	Nicola	Horsham District Council	Conservation officer
McInally	John	Reigate and Banstead Borough Council	Conservation officer
Misuriello	Gabriella	Churches Conservation Trust	Head of SE region
Morris	Russell	Waverley Borough Council	Historic buildings officer
Rix	Seán	Horsham District Council	Senior conservation officer
Wade	Emily	Mid Sussex District Council	Conservation officer
Westbury	Nicola	Nicola Westbury Architect	architect
Wood	Chris	Historic England - Buildings Conservation Research Team	Head of BCRT
SPAB			
Goodall	Maggie	SPAB	Education and training manager
Hughes	Philip	SPAB technical panel	Chairman
Kent	Douglas	SPAB	Technical and research director
Slocombe	Matthew	SPAB	Director

Introduction

Matthew Slocombe – Director of the SPAB

Philip Hughes - Chair of the SPAB technical panel

The SPAB was founded in 1877 to campaign for the protection of historic buildings from needless demolition and unsympathetic restoration, with its principles set out in a published Manifesto. These have been re-stated for the current era in The SPAB Approach (2017). The Society has always been – and remains - concerned with traditional materials and their use, the regular maintenance of buildings, sustaining building and craft skills, and training. The SPAB's co-founder (with William Morris), architect Philip Webb, took a practical approach to buildings, recognising the necessity of managing water effectively and so the importance of roofs - their materials, detailing and function. Webb was also sensitive to the way vernacular materials and regional styles of building contributed to local distinctiveness. For example, in his design for Standen House, West Sussex, the use of plain clay tiles to roof the new house complemented, but distinguished it from, the earlier farmhouse which had been retained and incorporated, and which is roofed in Horsham stone slates.

Standen House, incorporating Hollybush farmhouse, West Sussex. Photo credit: Maggie Goodall.

Perspectives: Sharing views on using traditional stone slate for roofing

Short introductory pieces set the context for the day's discussions and highlighted some key issues observed by those who work in different capacities with Horsham stone slate (hereafter 'HSS').

1. Specifier

Nicola Westbury – architect

Nicola's observations followed the stages an architect works through when assessing a historic HSS roof and specifying works of repair or renewal of roof coverings* - from understanding the form and composition of a roof, assessing its condition and reasons for failure, observation and recording as the roof is opened up or uncovered, understanding the structural implications of unloading the roof and identifying material to set aside and reuse; through to specifying the roof build-up (including battening and any underlay) and workmanship (mortars, insertion of shadow slate courses in the single-lapped system of using HSS, and detailing of eaves, ridges, hips, verges and abutments). In her experience, failures in HSS most commonly become apparent externally, with laminated, cracked, chipped or missing slates and loss of bedding mortar, and at ridges and verges. Holes can also develop in the middle of slates. It is difficult to access individual slates to carry out repair in situ – particularly where the roof is single-lapped and the alternating HSS and Welsh slate soaker courses are mortared in. Internally, visible water ingress may be difficult to relate directly to a particular area of failure. Trapped moisture leads to or accelerates decay of roof timbers.

Horsham stone slate roof repairs are also complicated by the variable nature of the roof build-ups found – in terms of number and size of battens, and the presence / absence of sarking board or underlay - and the effects of previous interventions or running repairs. The parts of Surrey and Sussex where HSS roofs are found are also rich in wildlife, so the presence of bats is always a consideration. Scaffold costs are substantial as material set aside for assessment and reuse must be kept at high level, because it is both heavy and difficult to handle, and at risk of theft due to its value. HSS tends to be used on the principal roof slope or on the most prominent elevation of a building, with other (lighter) materials elsewhere, creating differential structural loads on the building. For example, churches may have HSS on the south slope and another material on the north, creating an asymmetrical loading. This may cause structural problems, and these issues must be taken into account when planning and carrying out work to unload a roof.

Nicola observed that it is difficult to assess material for reuse accurately until it has been removed from the roof, and that material initially judged to be sound might prove not to be when the contractor attempts to clean and, if necessary, re-dress each individual slate for re-use. The dearth of supply – of either new material or salvaged material with reliable provenance – means that there is an understandable, but regrettable, tendency to try to reuse material that otherwise might have been discarded, and to eke it out over a roof. This may lead to a shorter life expectancy for each roof covering and awkward junctions and limited laps which can be prone to failure. In addition to addressing the shortage of HSS, other areas where guidance is currently needed included suitable mortars types and mixes for use with HSS; whether Welsh slate is always to be preferred for shadow courses or whether other types / sources or different materials could be acceptable; detailing of and suitable material for roof eaves, ridges, hips and verges; and, if underlay is used, what type is suitable – for bats, and in a variety of construction types.

Note of terms, in the context of this forum:* ***re-slating:* *repairing or renewing a roof in like-for-like material;* ***re-covering****: removing existing roof covering materials (which may include the covering and its fixings, but also associated battens, underlays etc) and renewing the roof covering;* ***re-roofing****: repairing or renewing a roof, including its covering and supporting structure.*

2. Adviser

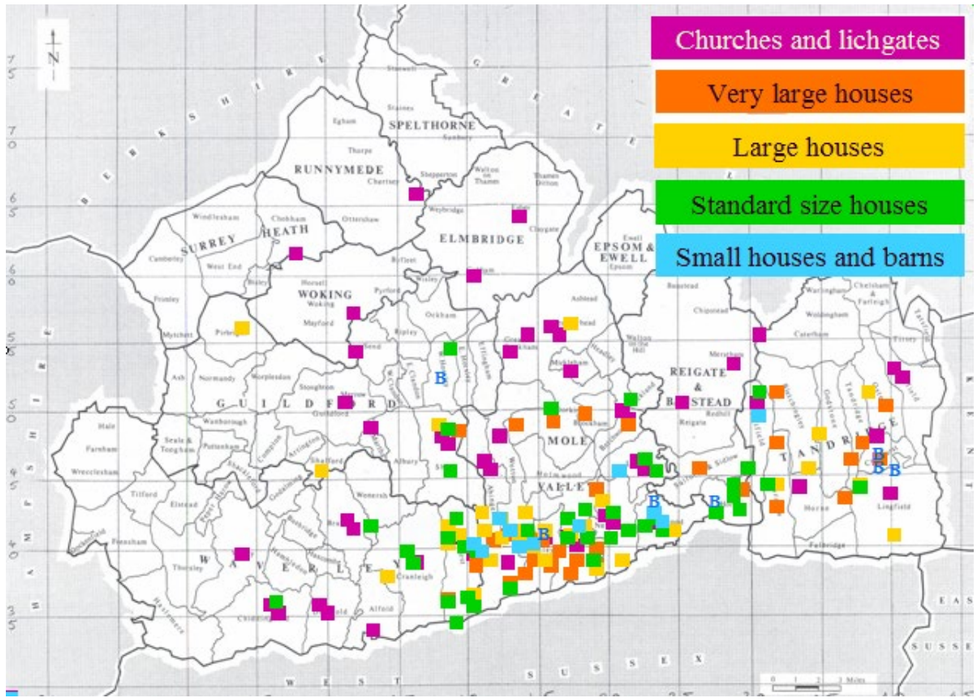
Martin Higgins – Surrey County Council

Also Surrey Historic Buildings Trust and Surrey Domestic Buildings Research Group

Martin described the process of winning Horsham Stone, which is usually extracted from small-scale delves close to the surface, rather than quarried by excavation or mined. Large pieces of stone can be cropped for walling. Although a sedimentary rock, stone from the current outcrop can seldom be split along its bedding planes and has to be used in the thickness quarried. It is used in paving (thick slabs) or for roofing (thinner slabs/tiles), dressed to the required size and shape. Historic delves and quarries have been mapped, but present-day sources of stone are very scarce. Permission was given to extract stone

at Broadbridge Heath Farm, Slinfold c2004 (and renewed for a larger area in 2017), which then seemed to promise production of thin stone suitable for roofing, but whose potential now appears limited. With reference to example buildings with HSS roofs it appears that, historically, some roofs were laid with shadows of HSS (Coldharbour Farm, Cranleigh c1683) but that combining plain clay tile in the upper part of the roof with HSS lower down is uncommon as a vernacular technique in Surrey (15 of c230 surviving examples, and seldom found in archive images). However , it has appeared over time as a method of repair/re-covering (Chobham and Charlwood churches since the 19th century). Historical sources such as Richard Neve's The City and Country Purchaser and Builder's Dictionary of 1726, indicate that HSS was seen as a desirable and prestigious material and valued for its durability, though there is evidence that it was already being reused by at least the 18th century.

Martin also discussed what can be learnt from the distribution of recorded buildings with HSS roofs in Surrey. The material's weight made it expensive to transport, so it is unsurprising that whereas it is found in smaller houses and agricultural buildings closer to Horsham, its use appears to be concentrated in higher status buildings and churches as the distance from its source increases. However, there were probably smaller local delves supplying particular villages or buildings, rather than a principal source



Distribution by type of recorded buildings with Horsham stone slate roofs in Surrey. Map prepared by Martin Higgins, Surrey County Council.

only. Some buildings show evidence in their roof structure that they were always (Ketleas Farm c1389) or once roofed in HSS even if they are no longer – it may, therefore, have been more widely seen in the past than now. Martin also argued that lower status buildings might have lost their HSS roofs over time to supply salvaged material to higher status buildings for repair (Betchworth Church in 1514) or to roof a new building (1920s examples in the east of the county). There is evidence of HSS being reused on multiple occasions and not necessarily in the same location each time.

3. Current Guidance

Terry Hughes – Chairman of the Stone Roofing Association (SRA)

Terry summarised the sources of published information and advice available to those concerned about or working with HSS roofs. Historic England's Strategic Stone Study has produced both published atlases and on-line interactive maps which link to information about buildings and known quarries, available via the British Geological Survey website. The BGS and a number of published sources (historic and contemporary) provide a wealth of geological information about the Horsham Stone outcrop. The volume on Roofs in Historic England's Practical Building Conservation series (2013) is a ready reference on roofing materials, systems and techniques, including those relating to HSS. Historic England is now in the process of updating its 2005 technical advice note on stone slate roofing, with expanded sections on regional materials and styles.

More specifically, the Stone Roofing Association (SRA) Horsham Stone Roofs guidance note of 2009 was compiled in response to the technical queries that Terry regularly received, and benefits from the input of architects, church custodians, building owners and local authority conservation staff who shared their knowledge and experience. This represented the best available knowledge at the time of publication. Many of the problems remain the same a decade later and there may be no 'right answers'. Terry identified the principal issues today being the lack of a supply of new HSS, and the need to identify the best mortar specification for the single-lapped system, as an unsympathetic mortar or badly executed work can lead to or exacerbate moisture ingress and consequent failure of a roof. (Issues surrounding ventilation and insulation of HSS roofs would be addressed in more detail in the discussion on repair techniques.)

Historic Horsham slate roofs: recognising, protecting, maintaining

The group agreed that HSS roofs are readily recognisable, due to their distinctive character – the rippled surface of the slates and the covering of black algae that they develop over time. However, the general public and some clients do not necessarily appreciate how particular to the area the material is and how rare these roofs are. Much work has been done on mapping buildings with surviving HSS roofs e.g.

- The Buildings at Risk survey for Surrey has identified HSS roofs.
- The Domestic Buildings Research Group is cataloguing buildings in Surrey (over 4000 to date).
- Anthony Brook and Roger Cordiner have mapped all Sussex churches.

But, clearly, more work is necessary to create a complete picture of surviving HSS roofs cross Surrey and Sussex. It was thought that not all buildings roofed in HSS would have statutory designation / protection (through listing) at present, and many local authorities do not keep up a Local List.

Note: The Domestic Buildings Research Group (Surrey) is an independent charity founded in 1970 whose volunteers study – by invitation – old houses, cottages and farm buildings, supplying a report to the building owner. Copies are also deposited (on closed access) with the Historic England Archive in Swindon and with the Surrey History Centre in Woking.

Lichen colonisation was considered benign, but the presence of moss was more contentious as it can get into joints, block drainage and hold water on the roof, exacerbating water ingress problems. But single-lapped HSS roofs can be fragile and getting onto the roof regularly to remove moss can carry the danger of causing damage. It was thought technically difficult to carry out running or interim repairs on a fully-bedded roof - because all the slates are mortared in, intervening with one can cause damage to adjacent slates. Mortar failure is a common cause of damage, allowing water to penetrate along the line of the joints, but contactors report that it is difficult to repoint HSS roofs – possibly because slates weather / decay along their edges, or because some practitioners are wedded to using cement or strong NHL mortars that can cause damage in themselves or do not bond well to the Welsh slate soakers.

Owners and their advisers can tend to delay substantial repair or re-slating because they are aware of the risks associated with unloading a roof; concerned that sufficient sound material (new, set aside for re-use or salvaged from elsewhere) may not be available; and wary about the cost, due to the complexity of the work and substantial outlay on scaffolding. Anecdotally, some building owners would rather realise the monetary value of their HSS roof by selling the slate as salvage and re-covering in a different material, where their building is not listed or where they can obtain permission.

New Horsham stone slate suitable for roofing: availability, issues and opportunities

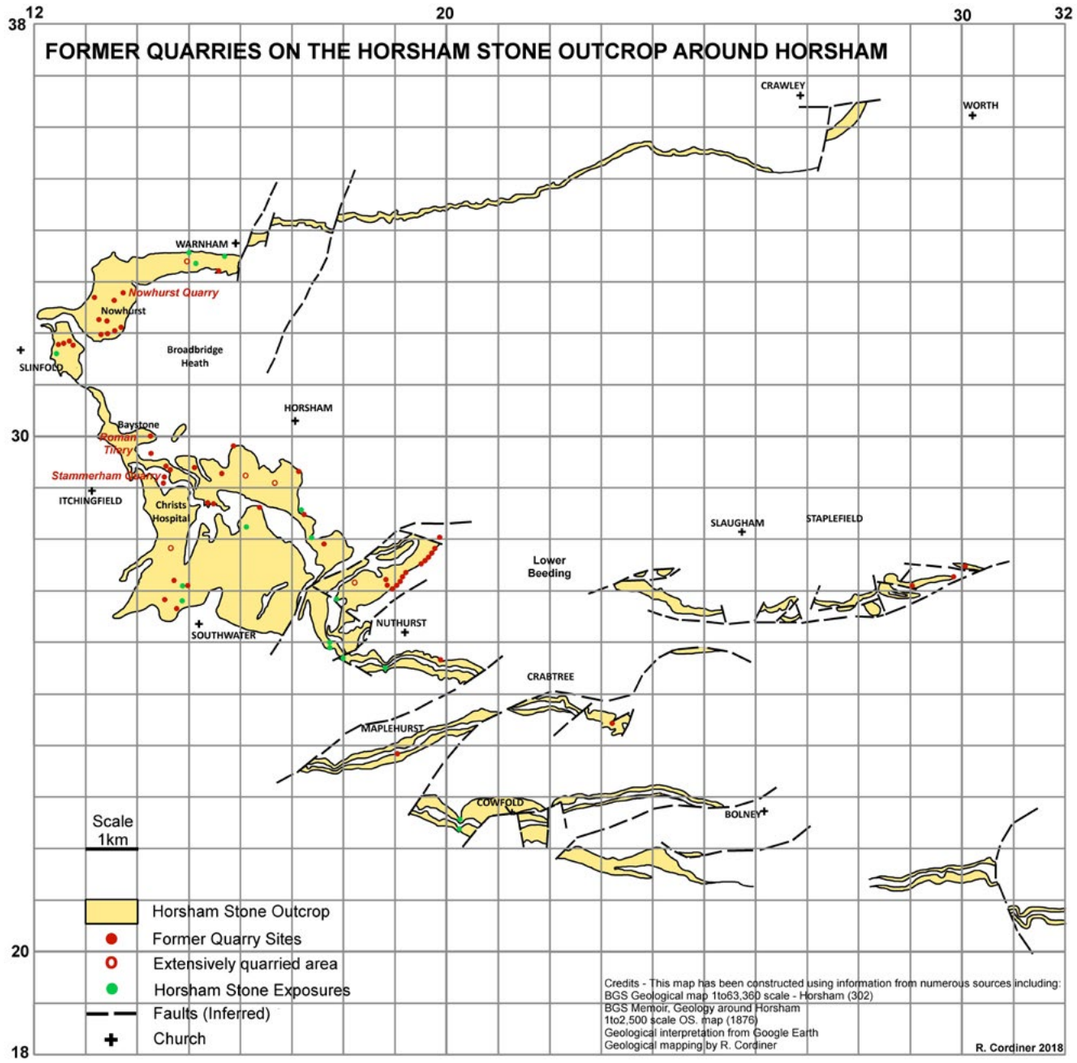
Many people present were aware of the delph at Broadbridge Heath Farm, which seemed to have produced some stone since 2004 and whose consent had been renewed in 2017. However, there was uncertainty as to whether it had, or would, produce HSS or just building stone, and about whether any new stone suitable for roofing was, in fact, available. The group observed that obtaining permission to extract stone and opening a delph would be time-consuming and costly for any potential operator (embracing the environmental impact assessment process, set up and operating costs, and site remediation) but that there was certainly a market for the stone. It noted that the Strategic Stone Study included information about former quarries, and the aims of that project included identification and safeguarding of future quarry sites e.g. to ensure that they were not built over - many are classed as 'brownfield' so are subject to considerable development pressure. It is probable that sites exist which could either 1) be opened for a limited time / scale to provide HSS for a particular project, or 2) operate as a long-term business venture. The group agreed that there was a pressing need to review what is known about the Horsham stone outcrop and investigate 1) whether any former HSS delves still contain useable stone and could be re-opened, and 2) whether potential new delph sites exist and could be brought into production.

If either of these proved to be the case, recent experience from Collyweston in Northamptonshire indicates that taking a firm line in planning and listed building consent cases can prompt and support reinstatement of a supply of traditional roofing material. In that instance, support and technical research by Historic England was also a significant factor. The Collyweston project had successfully created an economically viable production method, generating a predictable supply which could meet – and manage – demand, reducing the market for and use of salvage, and contributing to a decline in theft. The group debated whether acceptance of the continued use of single-lapping for HSS roofs, rather than

advocating a return to the 'ideal' method of double-lapping, in fact undermined arguments as to the need and urgency of identifying and obtaining new supplies of HSS, but seemed to conclude that it did not. Perpetuating single-lapping as a technique would, in itself, drive demand for adequate supplies of HSS of a suitable quality.

The current draft Minerals Local Plan for West Sussex (due to be adopted in autumn 2018) embraces finding / protecting sources of Horsham stone for building repair, but could be more explicit about HSS within that provision. Local authority conservation officers have an important role in pressing for HSS to be adequately considered in minerals planning, to create a policy context supportive of identifying and accessing new sources of the material.

The group debated whether winning new supplies of HSS could also be considered within conversations around the planning gain from development, in areas where it was known or thought to be present e.g. stone extraction as part of the work to clear and prepare the site for building. It was noted that the National Trust is a substantial landowner in Surrey and Sussex and may be amenable to exploring potential sources of HSS on its land, for the benefit both of its own properties and supplies to others. Matthew Slocombe reported that the government is increasingly interested in the supply of traditional building materials as an aspect of rural land use policy post-Brexit which might, in due course, incentivise small-scale, conservation-led quarrying. This might present opportunities for the conservation / building skills world to liaise with Natural England. Terry Hughes cited the example of a project some years ago to develop supplies of roofing stone in Herefordshire to diversify the rural economy post-BSE, from which much could be learnt (though in that instance, there were known sources of stone available to exploit).



Distribution of known former HSS quarry sites related to the Horsham Stone outcrop. Map prepared by Roger Cordiner, following the technical forum, and reproduced with his permission.

Salvaged material: supply, provenance and quality

The group broadly agreed that reliance on salvaged stone could undermine any push to find and open new HSS delves. Anecdotally, it was difficult to secure supplies which were known to have been acquired ethically and were of clear provenance. There was a widespread concern that the market for salvage also drove architectural theft and unauthorised work to old buildings, and might encourage unnecessary or unjustified demolitions. Parallel concern was expressed that there were probably buildings of listable quality with HSS roofs that had not yet been identified for designation / protection, and that humbler buildings were still at risk of losing their HSS roofs to supply materials to other buildings. Some of those who had worked with salvaged material indicated that it was often of variable or poor quality and that, where provenance was unclear, it could be used wrongly (e.g. material salvaged from a north slope could be used on a south slope, or vice versa, with implications for the longevity of the repair). Some material might have been re-set or moved multiple times during its lifetime, with a decline in its quality and durability at each re-use. Inevitably, every re-roofing project involved some degree of loss of historic material. Speakers also observed that with HSS roof repairs having been widely carried out c40-50 years ago, using cementitious mortars, much material was compromised during the salvaging or uncovering and setting aside process, as slates broke whilst being removed from the roof, or the cement could not be cleaned off without damaging the slate. Speakers cited projects where an initial expectation of reusing 70% of existing material from a roof had been reduced to 50% or lower in practice. Much salvaged or reused material had to be cut down - large eaves slates were, therefore, particularly precious and in short supply.

It appeared that some churches had conserved a stock of HSS from past work for use in future repairs and Surrey Historic Buildings Trust has considered buying and stockpiling supplies of HSS which could be legitimately acquired and whose provenance is clear and documented. Historic England might also consider this. Questions were posed as to whether this might help to stabilise demand and how best to enable quarries to prioritise stone for roofing.

Alternative stone types: is geological matching feasible?

There are variations of character and quality within what is generically described as 'Horsham Stone'. Other geologies can yield fissile sandstones suitable for roofing, close in appearance but not identical with what is generally understood to be HSS, and which will perform similarly in use. However, the rippled surface and black algae associated with HSS are not replicated, so repairs carried out in other materials will always stand out. The geologists present agreed that there was no direct geological or petrological match for HSS in the UK. Fissile sandstones also occurred in other countries such as China and India but, again, were unlikely to provide an exact match. There were significant concerns about sustainability, environmental impacts and labour conditions associated with quarrying and importing such stones. Additionally, importers may lack understanding of or have no interest in how stone is to be used and so supply material unsuited to the rigours of roofing. It may also be unclear / unknown how stone from outside the UK will perform in the climate of south east England – the physical evidence would take at least 20 years to develop in situ. The geologists reiterated that there was plenty of stone in the Horsham outcropping, but it was not known within that where HSS would occur – investigation and testing would be needed. Chris Wood of Historic England confirmed that this had been the experience with finding the new source of Collyweston.

Martin Higgins asked whether anyone present was aware of any experimentation with good quality artificial HSS slates (e.g. of a similar type to those sometimes seen in the Cotswolds) and whether their use could provide an acceptable alternative to plain clay tiles. There did not seem to have been any such exploratory work and whilst some who commented saw the potential (e.g. to return to double-lapped roofs, or to create new large eaves slates) others would prefer to see continued use of sympathetic but contrasting materials rather than artificial slates. There was concern that imitations would be too regular in appearance, even if cast from multiple different moulds within a batch, and would not develop the distinctive black algae that colonises natural HSS.

Supplementary and contrasting materials

The group discussed repair philosophy for HSS roofs, debating the merits of, for example, like-for-like repair (as found) or a return to 'correct' historical detailing (e.g. removing a different, more recent, roofing material and re-covering in HSS when evidence exists that the building had had such a roof originally or historically). But, what does this actually mean for a roof that may have been repaired or re-slated / re-covered a number of times? The group noted that there are practical and engineering considerations: for example, removing a roof covering of a lighter material and returning to a full covering of HSS, which is heavier, would have structural implications. They considered whether - if a new source of reliable HSS was to be identified – there would be a return to double-lapping, even where a building had had a single-lapped roof for a considerable period of time (and perhaps for longer than it had had a double-lapped roof at an earlier stage). The single-lapping technique is historical in its own right and, a number of people argued, can be aesthetically pleasing and functionally effective.

Combining HSS with plain clay tiles can also be historical in its own right – certain buildings might have been covered in this manner at construction; other roofs have had courses of tiles for a long time, and the proportion of tiles might have increased over time through successive re-coverings. Is it legitimate/desirable for the proportion to increase again if the amount of HSS set aside and capable of re-use, or available from other sources, is reduced? Is it legitimate/desirable to introduce plain clay tiles to a roof now, where there is insufficient HSS available to complete the whole area, given that this has become an established method in the region?

Horsham stone slate in combination with plain clay tiles at Anne of Cleves House, Lewes, East Sussex. Photo credit: Matthew Slocombe.

The group broadly agreed that decisions should be made on a site-specific and case-by-case basis, taking into account the history and character of the building in question. In reality, there was often a balance to be struck between maintaining the historic roof's form and appearance on the one hand and its effective performance on the other. Some contributors were strongly of the view that owners and custodians - either spending their own money or having to fund-raise for a project - need advice that encourages best practice but is also grounded in what is realistic, rather than to be set an 'ideal' which is unattainable given the current state of resources. In any cases, recording is vital for the historical record and future understanding of the building.

Techniques for and detailing of repairs to historic roofs

Architect Richard Crook described his repair of a double-lapped HSS roof at Coombes Church near Lancing, West Sussex in 2008, indicating that it is still possible to use this technique effectively. However, as discussed above, 'compromise' repair or roofing techniques such as introducing courses of plain clay tiles towards the ridge, and use of a version of the single-lapped roofing method using shadow slates, had been in use for some time.

Given the difficulty of obtaining HSS, there is a potential need for holding repairs. It was accepted that this was difficult to effect, although possible techniques (applicable to most building types) were set out in the SPAB's Information Sheet 7 (IS 7) First Aid Repair to Traditional Farm Buildings. Examples included wire ties to secure slipped stone slates; and temporary support to battens where nail fixings have corroded.

Repointing was, apparently, more difficult to execute in HSS roofs. In the group's experience there are a limited number of contractors willing or able to undertake work to HSS roofs. These are often small firms where expertise was generated through practical experience and skills could be lost when a key member of the team left or retired. Architects respected practitioners' accumulated knowledge and experience and stressed that some contractors did work of a high standard in close collaboration with them. However, other contractors appeared wedded to particular ways of working which sometimes meant they were less willing or able to execute work to specification.

Usually, in the single-lapped system, the shadow slates are nailed to a narrow batten with the HSS nailed to a more substantial batten to get the soakers to lie flat between the HSS courses. As these soakers bear the weight of the HSS, transmitted through the mortar, it is important both that those slates are durable and that the mortar is able to flex. It was, therefore, of concern that some contractors seemed reluctant to embrace lime rather than cement for bedding mortar (despite, for example, Historic England having devised a straightforward NHL-based specification suitable for roofing, published in its Practical Conservation volume on Roofs). Historic England is currently carrying out detailed research on the curing strengths of NHLs, as there has been a realisation recently that over-hard NHL mortars may be problematic. Many of those present had also been following the current debate around the use of hot-mixed mortars and consequent developments in mortar specification, but there was no consensus on the adoption of hot lime – for HSS roofing or more widely. Richard Jordan reported successful use of hot lime in a number of projects but stressed that highly significant historic roofs or large-scale work were not really the place for experiment. There was broad agreement that finding the 'right' mortar for use with HSS was essential to the long-term success of roof projects – further research, and monitoring the performance of recent work over time, would be instructive. A softer mortar could perform sacrificially and enable periodic repointing. The group agreed that whatever mortar is used, it is advisable for one person to oversee mixing for the duration of a project, to ensure consistency and control quality.

The use of insulation, felts and vapour-permeable membranes in single-lapped HSS-roofed buildings was discussed. Bedding roof coverings in mortar inhibits ventilation of the roof void. This increases the risk of a build-up of moisture in the batten space (that arises from any minor defects, or from the building interior) leading to or hastening decay in timber battens and elements of the roof structure, resulting in the type of problem illustrated by Nicola Westbury in her presentation. The lack of ventilation also means that condensation is not cleared from the roof void, and Terry Hughes set out the issues surrounding retro-fitting insulation in such roofs. The presence of insulation means that the roof void is colder and that consequently a greater amount of condensation is likely to occur on the underside of the roof covering. This has to be dealt with by increasing ventilation, but the presence of mortar bedding can make this especially challenging. The question of using insulation must, therefore, be approached with great caution. It is in any case essential to ensure when intervening that a roof is detailed to allow effective ventilation.

The group discussed the choice of slate for soakers in the single-lapped system and there was broad agreement that whilst Welsh slate might be more expensive, it was of better quality and consistency than other types. However, alternatives to shadow slates were also discussed and the group wondered whether it might be possible to experiment with, for example, a lead under-cloak, or lead with welted edges formed to mimic shadow slates. Some within the group also debated use of a highly durable pitch polymer damp proof course material (such as Hyload). These alternatives would not need to be mortared in, so would allow ventilation of the roof void – and open up the possibility of insulating such roofs safely.

Horsham stone slate single-lapped with Welsh slate soakers at Botolphs Church, West Sussex (view angled to show technique). Photo credit: Rachel Morley.

Creating informed clients

The architects present reported that it can be difficult for them to adequately convey the complexity of repairing or re-slating in HSS to even well-informed clients who love their buildings. They, and the Church of England representatives, thought that Parochial Church Councils (PCCs) do tend to be aware of the significance of HSS roofs at their buildings and willing to seek help through their professional advisers and / or Diocesan Advisory Committee (DAC). However, outside the planning and listed building consent process, many homeowners may not come into contact with – or know how to access - information and advice about their building. Many present discerned an appetite for information – about what HSS is, how it performs, what the owner of a building with a HSS roof can reasonably expect, key questions to ask of a professional adviser or contractor, and how to choose the right one. Publications, exhibitions and trade shows, and television programmes on property or e.g. the BBC4 series on vernacular building materials, can convey information direct to interested homeowners.

Supporting and sustaining skilled contractors; training opportunities

All present were conscious that a reliable supply of roofing material would result in demand for skilled practitioners to carry out repair and re-slating projects and that this, in turn, could encourage contractors to train and develop skills. The NVQ training process did not necessarily produce potential specialists at present – for example, the level of technical skill might be high but gained through using modern materials which perform differently from traditional. The NVQ for Heritage Roofing is limited in its scope and does not take adequate account of regional forms, patterns, materials and techniques; practitioners may not be versed in the need to analyse and understand a roof before intervening, or appreciate how water moves around a building. As approaches and expertise levels were so variable currently, it would be helpful to work with contractors to establish a baseline for skills, or common ground with regard to methods, and build an agreed approach from there. However, there was uncertainty as to how best to engage with contractors – many small operators cannot spare time to attend discussions or do not see training opportunities as relevant or advantageous to them. West Dean College teaches a course in traditional stone roofing, which includes an element of HSS, but this mostly attracts other types of professional rather than craftspeople. Contractors would be more inclined to attend hands-on training attached to a live project than a 'classroom' session. The HLF grant framework encourages development of training initiatives alongside building works but it can be difficult to incorporate formal skills training with sustained benefits even in larger projects. (The Churches Conservation Trust's project at All Souls, Bolton is often held up as an exemplar, but its success is hard to replicate at a smaller scale.)

Advisers and decision-makers: achieving good practice guidance and informed decisions

Some present observed that advice to building owners / applicants for planning or historic building consents might not be consistent across local authorities in the area where HSS appears and wondered if conservation advisers in different councils could network or liaise more closely on good practice. Is this true of Dioceses too? It was noted that the Institute of Historic Buildings Conservation (IHBC) south east branch would be holding a seminar on consistency of local authority advice in the near future. There is likely to be an appetite for training or updating knowledge among architects engaged to inspect or specify work to HSS roofs (including those carrying out Quinquennial Inspections at Anglican parish churches).

More generally – for building owners, professional advisers, contractors and the general public - HSS roofing projects (whether repair or re-slating) can provide valuable opportunities to engage people with the material, and offer chances to see it close-up and work in progress on a live site. Nicola Westbury described the outreach activities offered alongside the re-roofing of the Church of the Holy Sepulchre, Warminghurst, West Sussex (Churches Conservation Trust) in 2016, which included a site visit for delegates on the SPAB's Repair of Old Buildings Course (including architects, craftspeople, conservation advisers and building managers). Members of the public often responded well to initiatives to increase knowledge and enjoyment of old buildings. Nicola Westbury and Richard Jordan were strongly of the view that historic roofs should be appreciated and valued for their historic and aesthetic qualities as well as their performance – they are not merely functional 'lids' to keep the weather out.

Other points: financial

All agreed that the availability of grant funding could be instrumental in enabling necessary work to be put in hand and to ensuring that current good practice was followed. Whereas grants were most likely to be available to churches and other significant public or community buildings, Surrey Historic Buildings Trust does have a small scheme that can now offer 10% on works to HSS roofs, which might be of some help to owners of domestic buildings. There appeared to be little likelihood of substantial grant funding via Historic England, though some support for Buildings at Risk was possible. This is decided on a case-by-case basis and the percentages offered can be flexible. This leaves the Heritage Lottery Fund (HLF) as the main source of financial assistance, though it is reviewing its policy for 2020 onwards at present. In the meantime, it would be worthwhile flagging the significance of HSS roofs, current issues and good practice with HLF grant officers in the south east region.

The Listed Places of Worship Roof Repair Fund grant scheme had been a welcome supplementary source of funding, targeted at making historic faith buildings weathertight. However, schemes of limited duration, such as this, tend to disadvantage less dynamic custodian bodies who may take longer to draw a project and funding application together, and to create considerable pressure on professional advisers, material supplies and skilled contractors by prompting a surge in demand over a short period. They may also encourage more work than is actually necessary (to take advantage of a once-in-a-generation

funding opportunity) or work that is rushed or curtailed to meet a deadline. There was considerable support for longer-term funding (even at a lower level) to help custodians / owners to address vital works of maintenance and repair in a well-considered and well-executed way. This is an issue that church bodies, the IHBC and the Joint Committee of National Amenity Societies could usefully raise with government and the HLF.

The imposition of VAT on works of repair, but not on new work, remained a concern across the conservation sector. The Listed Places of Worship Grant (i.e. VAT rebate) Scheme provided by the Department of Digital, Culture, Media and Sport (DDCMS) since 2001 helps to offset the VAT incurred in repairing listed buildings of all denominations and faiths – both on eligible works and on certain elements of associated professional fees. However, the scheme has a fixed annual budget and its continuation has not been confirmed beyond March 2020: http://www.lpwscheme.org.uk/

Note: The Listed Places of Worship Roof Repair Fund grant scheme was administered by the National Heritage Memorial Fund (NHMF) on behalf of the then Department of Culture, Media and Sport (DCMS) between 2014 and 2016. Two rounds of grants of between £10,000 and £100,000 were made to over 400 projects to repair or improve roofs and rainwater dispersal systems at historic faith buildings across the UK, with the aim of making them weathertight. An evaluation report on the effectiveness of the scheme was published in April 2017: http://www.lpowroof.org.uk

Conclusions

Participants reviewed the day's discussions and identified a need to:

- Map the buildings resource across Surrey and Sussex (i.e. buildings of all types with an extant HSS roof) to create up-to-date and comprehensive information available to share.
- Map and quantify the need for new HSS – clarifying how many buildings, what area of roof covering, the current and expected repair needs – within the Horsham Stone area but across local authority boundaries.
- Foster mineral plan policies that recognise HSS as a scarce and diminishing resource and safeguard / facilitate investigation and use of potential new sources. Could there be a presumption in favour of approval of small-scale delves outside Sites of Special Scientific Interest (SSSIs)?
- Review knowledge about the Horsham Stone outcrop and identify areas of possible HSS presence – subsequently sampling and testing the stone in the areas of most potential.
- Establish a preferred mortar specification.
- Network to share knowledge, experience and good practice – and, ideally, apply principles consistently in adjacent local authority areas, or produce guidance on best practice to guide specifiers on what is most likely to be acceptable, in the absence of a current source of new HSS.
- Disseminate information and increase appreciation of the special qualities and historic significance of HSS roofs among building owners and the general public e.g. info sheets, events.
- Provide training opportunities that engage both professional advisers (architects, engineers, conservation consultants) and contractors.
- Raise awareness about the significance of HSS and good practice with grants officers at HLF and encourage them to guide applicants towards incorporating real training gains in the outreach elements of a project's activity plan.
- Encourage conservation officers and ecclesiastical advisers / decision makers to protect surviving HSS roofs through the approvals process and to seek to influence the Minerals Local Plan process to safeguard locations of HSS potential and enable stone getting.
- Explore scope for e.g. an integrated grant-funded project in the HSS area to understand historic and potential sources of material; understand the buildings; research and understand effective repair techniques; and carry out associated outreach and training activities.

Next steps

Make enquiries as to the nature and amount of new stone (be it building stone or HSS) currently being / likely to be produced at Theale Farm / Broadbridge Heath Farm during the period of the new consent (granted 2017). Seán Rix, Senior Conservation Officer at Horsham District Council undertook to do this and feed back to Terry Hughes and the SPAB.

Note: Following the technical forum, Seán Rix and Nicola Mason visited Theale Farm / Broadbridge Heath Farm (operated by Historic Horsham Stone) and met the owner, who showed them the stock of reclaimed roofing stone and new stone from the delph. He indicated that the delph was producing stone suitable for roofing, but the majority of new stone seen appeared to be walling and paving stone, and potential roofing slate was as yet unsplit. It may be that the cost of splitting and dressing new slates would be a factor influencing how stone was to be processed and sold. Seán and Nicola will visit again shortly to see the delph in operation.

Seán Rix also agreed to raise questions relating to the West Sussex Minerals Local Plan with the relevant colleagues at the County Council and to try to have the safeguarding areas identified in the current draft plan incorporated into the local authorities' GIS system so that all officers are aware of them.

When the findings of Historic England's current research into mortars is available, explore their applicability to roofing work and to HSS in particular. The SPAB's technical panel and other roofing specialists may be able to contribute to this and/or to a group convened to consider the issues raised at today's forum in more detail and in the light of experience in other areas.

Horsham District Council has designated 2019 its Year of Culture – festival events could be an opportunity to increase knowledge and appreciation and give local people a chance to handle HSS. The SPAB can help to publicise events via its website.

Publication of the forum notes on the SPAB website, making them freely available to anyone with an interest in this subject: https://www.spab.org.uk/advice/conference-reports

The forthcoming SPAB seminar on Roofs (22 November 2018 in Leicester) is a further opportunity to raise awareness with a professional / technical audience and invite discussion of parallels with other traditional stone roofing materials.

The planned SPAB educational focus on vernacular buildings and materials in 2019 presents the possibility of a course or other event looking at HSS, and an article in the SPAB Magazine contributing to appreciation of this and other traditional stone roofing materials.

The SPAB will try to explore with local authority colleagues in due course whether there might be scope for a small grant-funded project to supply a factsheet to owners of all buildings with a HSS roof.

Reference documents

Technical:

Stone Slate Roofing: Technical Advice Note (2005) - Historic England
https://historicengland.org.uk/images-books/publications/stone-slate-roofing-technical-advice-note/

Horsham Stone Roofs (2009) - Stone Roofing Association
http://www.stoneroof.org.uk/Horsham%20guide%20v2.pdf

Vernacular slate and stone roofs in England (2005) - Terry Hughes
In *England's Heritage in Stone,* proceedings of a conference held in York, 17 - 19 March 2005 - English Stone Forum
http://www.englishstone.org.uk/York_files/ESF%20-%20Terry%20Hughes-1.pdf

The Roofs of England: Stone Slates – Stone Roofing Association
Pamphlet now out of print, but available via the SRA website: www.stoneroof.org.uk/england.html#Top

A Glossary of Stone and Slate Roofing (2016) – Stone Roofing Association
http://www.stoneroof.org.uk/historic/Historic_Roofs/Publications_files/Glossary%20v3%205-16.pdf

Geological:

Strategic Stone Study: a building stone atlas of West Sussex (June 2015) - Historic England

Strategic Stone Study: a building stone atlas of East Sussex (November 2015) - Historic England

https://www.bgs.ac.uk/mineralsuk/buildingStones/StrategicStoneStudy/EH_atlases.html

The atlas for Surrey is due to be published in 2019.

Geology of the country around Horsham: memoir for 1:50000 geological sheet 302 (1993) – R W Gallois and B C Worssam - British Geological Survey

http://www.bgs.ac.uk/data/publications/pubs.cfc?method=viewRecord&publnId=19867943

This references a number of other published sources from the early nineteenth century onwards.

Sussex Stone: The Story of Horsham Stone and Sussex Marble (2006) – Roger Birch

Building Stones of West Sussex (2014) – Roger Birch and Roger Cordiner

Building Stone Atlas of Sussex (2017) - Roger Cordiner & Anthony Brook

General:

Historic England's Practical Building Conservation series volume on *Roofing* (2013) – Historic England

Other:

Joint Minerals Local Plan for West Sussex, submission draft (January 2017) - West Sussex County Council and South Downs National Park Authority.

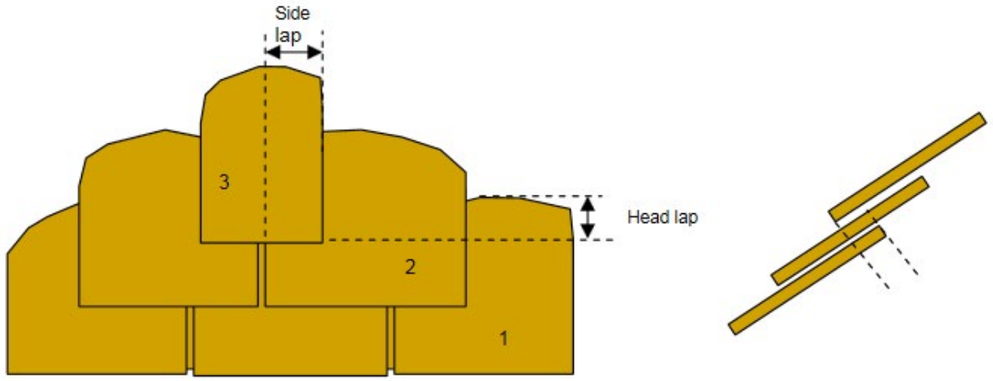
Definitions

Horsham Stone: A generally fine-grained calcareous sandstone, pale grey to greenish-olive in colour, laid down in shallow water and therefore frequently ripple-marked or showing internal deformation and slumping, and having a high calcium content due to the presence of ground-up shells. Used as a walling stone in churches and houses in the area around Horsham, West Sussex (i.e. parts of Sussex and Surrey). This stone type outcrops over a relatively limited area north, west and south of Horsham – prominent between Horsham and Crawley, but also extending towards Cowfold, Bolney and Staplesfield (south) and Wivelsfield (east). It occurs in two beds, each up to around a metre thick, near the base of the Wealden Clay. Horsham stone slate may or may not be present.

Horsham Stone Slate: A fissile variety of Horsham Stone used for roofing tiles (thin) from Roman times onwards and also for paving and flooring (thick). When used in roofing, the slates are usually laid in diminishing courses (i.e. slate size reducing over the slope of the roof: large at eaves level, growing smaller towards the ridge). HSS might be seen used in combination with plain clay tiles, with HSS at eaves level and tiles in a band towards the ridge. Historically, this might have been the effect of reusing set-aside HSS where there was insufficient material to completely re-cover the roof, requiring introduction of a contrasting but complimentary / compatible and locally available supplementary material. However, some buildings in the HSS area were designed with this roofing style (such as Goddards at Abinger Common, 1889-1900 by Sir Edwin Lutyens).

Double-lapped method: In common with other vernacular stone slate roofing materials in the UK and worldwide, this is understood to be the 'normal' or traditional method of roofing in Horsham stone slates. The slates were laid so that the perpendicular joints in one course were substantially under- and over-lain by the slates in the courses below and above. Thus each course of slate acted both as a soaker for the overlying course, and a cover flashing for the underlying one - effectively keeping water out of the roof.

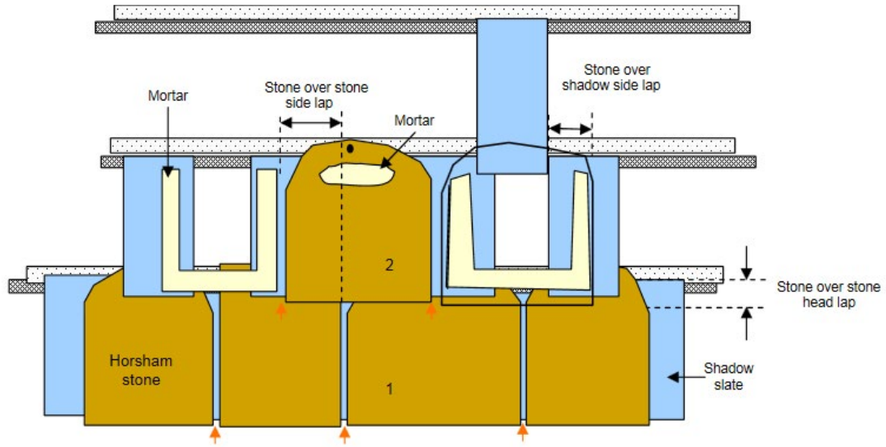
Double-lapped method



Lapping diagram from *Horsham Stone Roofs* (2009) by the Stone Roofing Association. Reproduced with SRA permission.

Work in progress at Coombes Church, West Sussex (repaired 2008). Photo credit: Richard Crook.

Single-lapped method: A regional variant on the single-lapped method of setting out a roof covering has become a widely-seen and accepted way of re-slating HSS roofs. It is understood to have evolved in response to the reliance on set-aside or salvaged slates as new material became scarce: the batten gauge became wider to eke out the HSS over the roof, leaving the slates single-lapped i.e. one course only overlaps slightly with adjacent courses, leaving the perpendicular joints prone to water ingress. To improve water-tightness, it is now usual to see Welsh slate 'soakers' or 'shadow slates' inserted between the HSS courses at each perpendicular joint, and the whole system bedded in mortar.



Lapping diagram from *Horsham Stone Roofs* (2009) by the Stone Roofing Association. Reproduced with SRA permission.

Work in progress at the Church of the Holy Sepulchre, Warminghurst, West Sussex (repaired 2016). Photo credit: Nicola Westbury.

Hydraulic lime / NHLs: Natural hydraulic limes are prepared from limestone with reactive silica and alumina impurities. The impurities contribute to the hardening process. They are classified as NHL 2, 3.5 or 5, in order of increasing strength, though the bands overlap. Before 1995 lime could be classed as feebly, moderately or eminently hydraulic, though this does not correspond directly with the current natural hydraulic limes (NHL) classification system.

Hot Lime / Hot mix: Prepared by slaking quicklime in aggregates or earth and mixing the ingredients in the hot state as the lime slakes. Quicklime is Calcium Oxide (CaO) - the unstable material produced when limestone has been burnt but not slaked (i.e. hydrated by immersion in water).