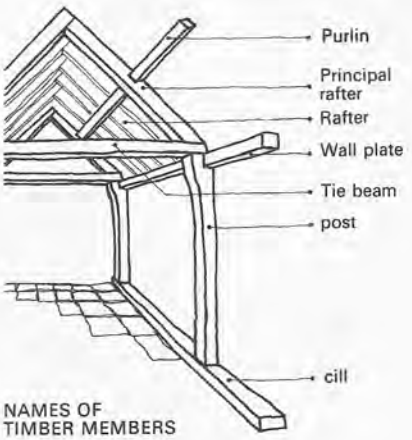
Society for the Protection of Ancient Buildings: Information Sheet 7
37 Spital Square, London E1 6DY: 01 377 1644

FIRST AID REPAIR TO TRADITIONAL FARM BUILDINGS

By John Sell



NAMES OF TIMBER MEMBERS

Left: Coakham Barn: unskilled volunteers replacing weatherboarding.

The intention of this information sheet is to provide advice to building owners on ways of undertaking simple repairs to buildings which they can either carry out themselves or with unskilled labour. Dealing with old buildings in poor repair can be dangerous and owners should satisfy themselves that the proposed work is safe before undertaking it or instructing others to carry out work under their direction; owners should also ensure that they have adequate employers and public liability insurance cover.

The object of first aid repair to a building is to prevent further deterioration so that at some future date more permanent repairs can be carried out. First aid repair is not a substitute for full repair where this is necessary; professional advice should be sought to determine the urgency for full repairs.

Before starting work careful thought should be given to the purpose of the repair and to the consequences of any proposed action. This may sound obvious but the whole principle of the repair may be negated if unforeseen problems are encountered, particularly in different working conditions.

Repairs to old buildings should be done in a way that does not preclude future work; in the case of first aid repair this is a fundamental principle. There is no point in carrying out temporary and expedient work if this prevents a proper job in the future when greater resources are available.

Our traditional buildings are valuable to us in many ways; aesthetically, socially and historically. First aid repair is just one weapon in the battle to save them for the future.

Problems and causes

The two great dangers are structural movement and water penetration. Condensation is not normally a problem given the well-ventilated nature of most traditional farm buildings. There are, of course, other significant problems, such as timber decay, but these are really outside the scope of this information sheet.

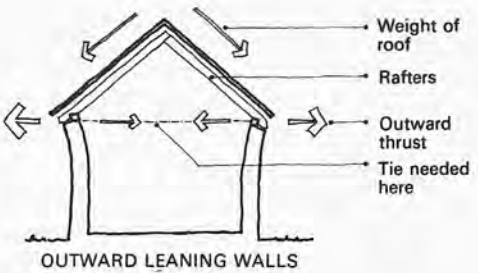
Problems caused by structural movement

The cause of *structural movement* is not always easy to ascertain but the following classification should enable the appropriate remedy to be found. If in doubt send a sketch and photo to the SPAB who will then be able to give technical advice.

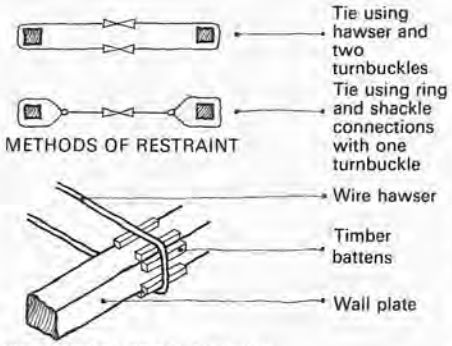
Outward leaning walls and spreading roofs

Outward leaning walls are a common sign of trouble and often indicates that the load of the roof is pushing outwards as well as downwards. If in doubt about the cause of structural movement or if movement continues then seek professional advice. First aid repair may not be appropriate in all cases and it will often be worth an hour or two of a professional's time to ensure that the causes of the problem are correctly diagnosed.

If the cause of an outward leaning wall is outward "thrust" then this thrust must be restrained. To do this a wire hawser



OUTWARD LEANING WALLS



METHODS OF RESTRAINT

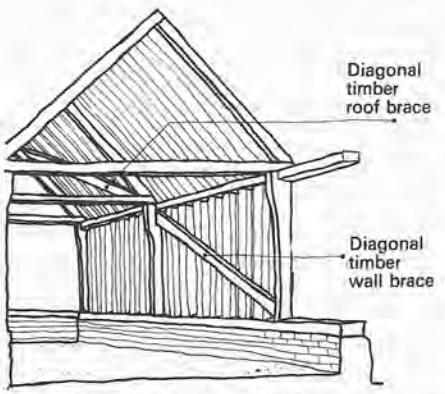
PROTECTION FROM CHAFING

can be stretched across the width of the building, attached at each end to the wall plate, the ends of the main rafters or the tops of the vertical timber posts in a timber-framed building.

The best attachment is to fix the hawser to a bolt in the side of the rafter. If the hawser is wrapped around the wall plates then this must be done at frequent intervals to distribute the load evenly along the length of the plate. With a post the hawser can be wrapped or attached to a bolt. If it is attached to either post or rafter then that member should be sound and properly jointed to the wall plate. The hawser should wrap right around the principal rafter and be even to overcome twisting; for this reason it should go as straight as possible across the building. Timber members should be protected from chafing by timber battens. Once attached the hawser should be tightened by means of a turnbuckle but *do not* attempt to pull the timber structure back into its original position as this can cause damage to timber joints and cause other undesirable movements in the structure. The object of the repair is simply to hold things where they are and prevent further movement.

Longitudinal racking

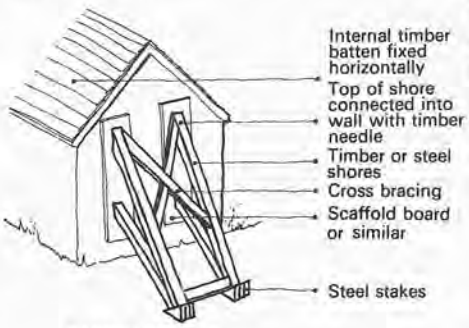
Often roofs are inadequately tied from one end to the other allowing the whole structure to lean in one direction. The movement of a whole roof in this way is known as "racking". A wire hawser can once again be used to form a diagonal tie from the apex of the roof where there is a ridge piece or otherwise from the junction of the purlin with the end rafter at the outward leaning end to the wall plate one-third to one-half of the way along the building. In a timber framed building a further diagonal tie should be made from the wall plate or post top to the cill plate at ground level further along the building. Ties should be at approximately 45°; in long buildings a series of ties may be needed. A simple way of forming a tie is with 50mm × 3mm, pre-punched, galvanised steel strapping. An alternative is to screw a timber batten to the underside of the rafters where they are level.



LONGITUDINAL RACKING

This method of restraining racking will not have any effect in roofs without either purlins or a ridge piece in which case a longitudinal timber should be screwed to the rafters as high up the roof as possible before diagonal struts and ties are provided.

Where the gable end appears to be unstable shore the outward leaning gable end externally with timber or steel shores and fix a timber batten horizontally from the propping point the whole length of the roof to prevent the rafters racking further.



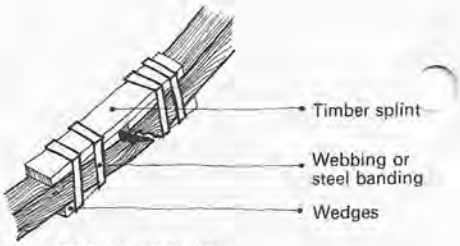
RAKING SHORES

Rotten or broken timbers

Rotten or broken principal rafters, main posts and tie beams need to be repaired if further structural movement is to be prevented; not repairing such members can lead to major structural collapse. The repair of less significant timbers such as common rafters can sometimes be delayed unless preventing other important repairs such as the replacement of roof coverings.

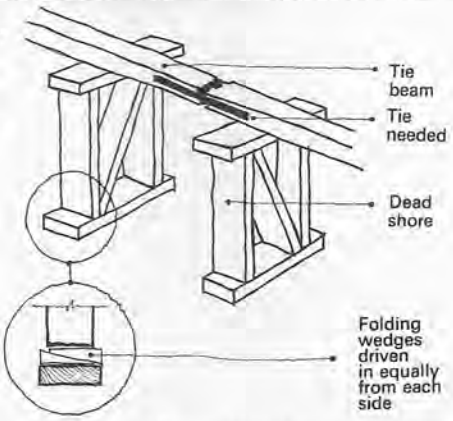
Timber members can be in compression or tension or a mixture of both (bending). Members which are in compression can only be repaired with rigid materials whereas the restraint provided by members in tension can be replaced by use of flexible materials such as hawsers. If a timber is broken it is a sign that both compression and tension are present as in rafters and many tie beams.

If a principal rafter has broken then it will usually be necessary to repair it with splints on each side of the rafter. Such splints can either be timbers bolted to each other or fixed in place by webbing and buckles; when the timber is rotten then splints must be bolted to a sound section. Similar splints can be provided



BROKEN TIMBERS

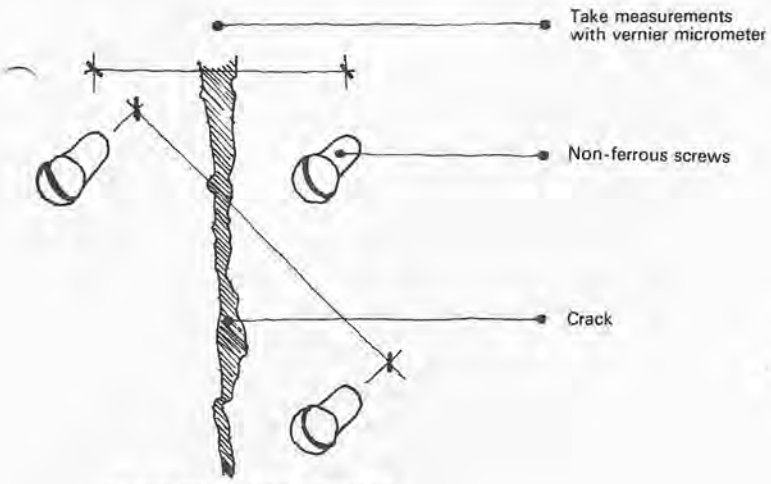
to strengthen broken tie beams or renew the rotten bottom ends of posts. This latter repair should never be carried out, as is sometimes done, by casing in concrete. Dampness will be in contact with the post leading to further rot and allowing the post to drop. Often the need for any temporary repair to the bottoms of posts can be overcome by propping up the tie beam and wall plate to take the load of the post. Props must have lateral stability in case of further movement of the building. Broken tie beams and wall plates can similarly be propped up either with timbers with folding wedges at their feet or with adjustable steel prop Tie beams, however cannot simply b propped, but must have their tying action reinstated. All props should have spreader timbers at top and bottom to prevent damage at the support points.



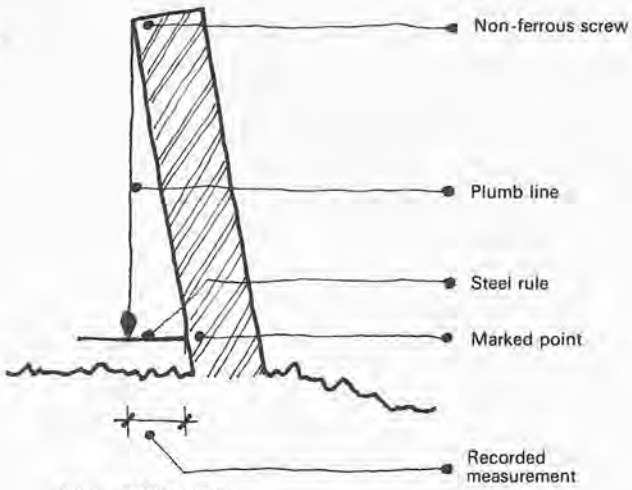
Broken purlins and broken or saggin ridge pieces can be propped with ne members below the old. All timbers should be preservative treated against fungus and beetle attack.

Cracks in brickwork, stonework, etc.

Cracks in masonry walls are a sure sign that the structure has moved. Common causes of movement include thrusts from roofs forcing walls outward, destabilisation of foundations by concentrations of ground water (often from leaking gutters, downpipes and other drains), and decay of timber plates and lintols. If the structure is no longer moving then repair is not needed unless to prevent damp penetration through the crack. If cracks are more then hair-line their movement should be monitored over a period of time (usually at least 12 months); larger cracks which have recently appeared or significantly widened should be repaired as soon as possible.



SIMPLE CRACK MEASUREMENT (RECORD MONTHLY)



WALL MOVEMENT

is not possible to say when a building *must* be repaired and specialist advice can often help save wasted effort and the building itself. The SPAB can advise on this.

Movements in the same plane as the wall can be measured by using graduated proprietary tell-tales (e.g. "Avonguard") or by measuring against marks on zinc strips screwed either side of the crack. A slightly more accurate system is to measure between three non-ferrous screws disposed on either side of the crack, with a Vernier gauge. Glass tell-tales simply crack if movement takes place and are therefore no help in determining the direction or speed of movement. If the wall or parts of the wall are out of plumb then this movement can be monitored by dropping a plumb line from a marked point at one level and measuring to it from another marked point at a lower level. Remember it is possible for a leaning wall to collapse at any time—if in doubt prop the wall and seek advice.

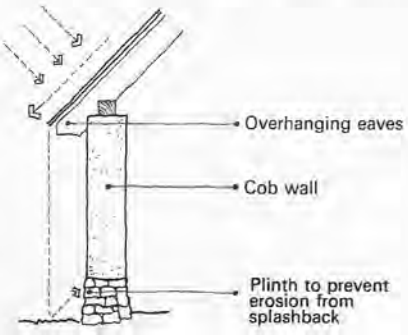
Problems caused by water penetration

Water penetration through walls and roofs can damage the material of the wall or roof itself or can lead to damage internally, particularly of structural timbers.

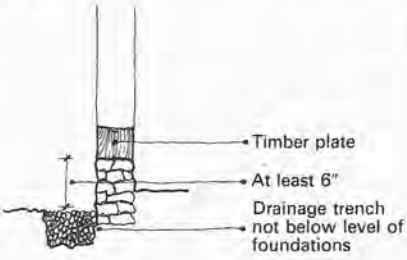
Walls

Earth walls such as cob, walls made with earth mortars or walls with rubble cores are all endangered by water penetration. The object of repair is to keep out water at the top of the wall, to control rising dampness and to fill cracks so that water cannot reach the vulnerable core of the wall.

If cob or other earth walls become excessively damp they will decompose; for this reason such walls stand off the ground on a base such as flint or stone and the roof has a good overhang at the eaves. It follows that standing water should be drained away and overflowing gutters repaired or replaced. If water penetrates the rubble core of a stone wall and then freezes the expansion of the core will damage the outer faces of the wall, in addition washing away of the core can lead to the outer faces of the wall bulging or moving apart.



Timber framed buildings normally stand on plinths of brick, flint or stone. If this plinth becomes saturated due to rising damp, or if the ground level is allowed to rise up to or above the timber cill beam then there is a danger that the timber will rot. Similarly timber wall plates sitting on top of saturated walls will rot.



WALLS

The tops of walls must be protected by a roof in good condition with guttering to take away surface water or a wide eaves. If there is no gutter, as is usually the case with thatch, then water dropping from the eaves must not splash or run back onto the lower part of the walls. For this reason, and also because it helps prevent rising damp by providing a large surface area for evaporation to take place, a gravel filled drainage trench at the foot of the wall can be helpful but should not be taken below the level of the foundations (see SPAB technical pamphlet "treatment of damp in old buildings"). Where ground levels are too high at the foot of the wall (less than 6" below the cill beam) they should be lowered taking care not to form a water trap along the edge of the building.

Cracks in walls which are vulnerable to water should be filled. In earth walls, such as cob this filling can be a mixture of earth and straw. In brick or stone walls joints may be filled with a lime mortar.

External render which is cracked or damaged should be repaired with a "soft" lime render. Cement renders will crack allowing water to penetrate and then trapping it in the wall behind with serious consequences (see Information Sheet No 4).

Roofs

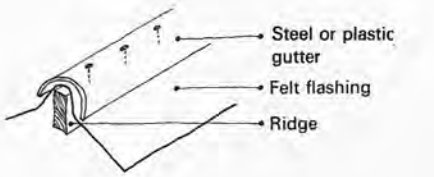
Except in the case of thatch, roof coverings themselves are unlikely to be affected by water penetration. The danger is to the underlying structure—small areas of missing tiling can lead to significant structural failure—it is for this reason that it is important to get some sort of covering in place immediately.

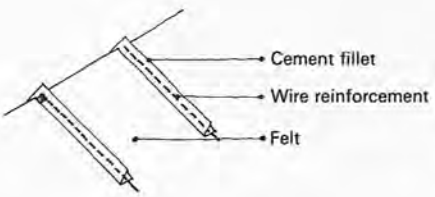
The type of repair to *tiled or slate* roofs will depend on the area and nature of the defect. If tiles have slipped it is important to put them back as soon as possible. Small areas or individual tiles which have slipped because their fixings have corroded can be re-attached with lead or zinc "tingles" screwed (NOT nailed) to the existing battens; alternatively wood blocks can be glued to the back of the tile with epoxy resin but it must be realised that the block is then permanently attached to the tile and the tile cannot be re-used. Because of their weight it is not sensible to refix stone slates with tingles or glued blocks; they should rather be

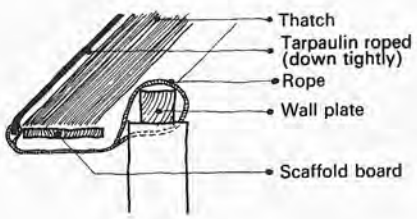
Rot at junction of purlin and principal rafter led to collapse of one whole bay of the roof.

attached with loops of stranded, non-ferrous wire taken through the original fixing holes and around the battens. Loose battens should be screwed to rafters if accessible otherwise they may be retained in place with small wooden retainers screwed to the sides of the rafters.

Never "turnerise" or otherwise coat a roof with bitumen or similar—the tiles or slates will be unsalvageable—rather strip the roof and replace with corrugated steel or fibre cement sheeting. Wind uplift can be a problem with sheet roofings—this can be prevented by cutting ventilation slots in the sheeting. Advice on this technique is given in Ministry of Agriculture, Land and Water Services Topic No. T/FBS/06 "Cutting ventilation slots in existing roofs".





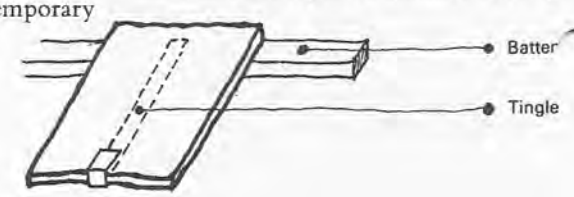


If all the tiling is slipping then the tiles should be removed. The roof can then be covered with felt and counterbattens. This felting can last for up to 3 years as long as the felt is taut to prevent it being torn by the wind. The same method can be used for large patches.

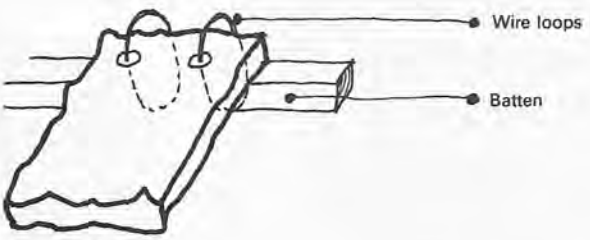
Because they are vulnerable and because they are valuable, ridges and hip tiles are often found to be missing. Ridges can be replaced by upturned steel or plastic gutters used to retain a felt "flashing" and screwed to the ridge. Plastic gutters may be easier to use where the ridge is uneven but will require more frequent fixing. A similar method can be used for hips but, because of the extra width, the felt may need to be retained at its outer edges by a reinforced mortar weight. Galvanised wire is run down the roof and fixed top and bottom and then covered with a triangular fillet of 1:1:6, cement:lime:sand, mortar. Similar mortar restraints can be used to hold felt in place where it is used as a temporary covering but extra weighting with, for instance, stones, may be needed at the eaves to prevent the wind tearing the felt.

To prevent further deterioration of *thatch* it should be kept dry by being covered with tarpaulins. This is very much a temporary measure and can only be relied upon over one winter. The roof must be dry before being covered or the thatch will rot. The tarpaulins must be held tight either by being staked to the ground or by being tied back to the wall plate. In the latter case the eaves of the thatch should be protected from crushing by a scaffold board or similar. Provision should be made to allow wind to escape towards the top of the tarpaulin to prevent it being blown off.

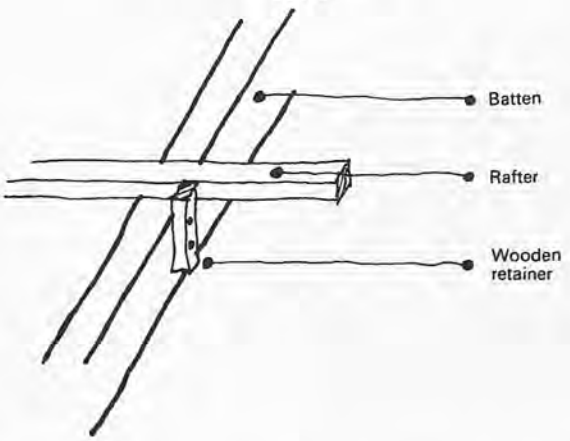
Straw thatch often needs recoating, but may be damaged by the use of tarpaulins. Remember that thatch can be patched (see SPAB Technical Pamphlet "The care and repair of thatched roofs").



TILE



SLATE



All illustrations are by Peter Buchanan, who is a Patrick Plunket Memorial Scholar

References

BRE Digests Nos. 343 and 344—"Simple measuring and monitoring of movement in low rise buildings".
SPAB technical pamphlet—"Treatment of damp in old buildings".
SPAB Information sheet No. 4—"A need for buildings to breathe".
MAFF land and weather service topic No. T/FBS/06—"Cutting ventilation slots in existing roofs".
SPAB technical pamphlet—"The care and repair of thatched roofs".