



Institution of Fire Engineers
Special Interest Group for Heritage Buildings

Guide to Fire Fighting in Thatched Buildings



Hampshire fire service using foam to tackle a thatch fire



Historic England



Introduction

Fires in thatch roofs pose a special challenge to fire fighters; it may involve a rapidly spreading fire which requires simultaneous application of water, removal of thatch whilst working at height and undertaking salvage operations. The operations may be further hampered by difficult vehicle access, poor water supplies, overhead electrical supplies and a restricted area for managing removed thatch.

When the roof structure has been removed or burnt through the remaining chimneys and gable ends will have lost their support and wind bracing, posing a significant risk of collapse.

Cutting a fire break and damping down to save part of the roof

Chimney is left unsupported posing the risk of collapse



Contents

	Page
Introduction	2
Contents	3
Fire service access	4
Initial considerations	4
Dynamic risk assessment	5
Personal protective equipment	5
External fire fighting	6
When working on a roof	7
Creating a fire break	8
Removing mesh	8
Compressed air foam system	9
Covered thatch roofs	9
Internal fire fighting	10
Dorset Model	10 and Appendix 1
Salvage operations	10
Pre-determined attendance	11
Water supply	11
Chimney fires	11
Pre-planning	12
Appendix I Dorset Model	14
Acknowledgements	15

Illustrations

Hampshire fire service using foam to tackle a thatch fire	Cover
Cutting a fire break	2
Fire break far enough away from fire	4
Mesh that should have been removed	5
Thin roof timbers and defective chimney	6
Working from safety of ladder	7
Hazel spar	8
Compressed air foam lance being used with fire break	9
Siting of piles of debris	12
Using heavy machinery to move debris	13
Thatch restored at Stanton in the Vale	13
Dorset model diagrams	15

1. Fire Service Access

Many thatched buildings are situated in remote rural areas, so locating and accessing the building may be time consuming.

The nature of thatch fires means that many incidents involve a large number of appliances, support vehicles, and vehicles from other emergency services and local authorities.

The first attendance should therefore identify a rendezvous point early on in the incident, so that access for Specialist appliances can be maintained.

If there is sufficient room and hard standing for an aerial appliance at the incident, space should be reserved for access and siting.

If the property is on a narrow through road the build-up of general traffic may restrict access for following appliances, so an early request should be made to the police for traffic control.

2. Initial Considerations

Information gathering is essential before the fire-fighting strategy can be decided; it will vary according to:-

- how developed the fire is,
- the potential for fire spread to adjoining properties,
- the safety of the fire fighters,
- the construction of the thatch (whether it is a thin layer of water reed or a deeper covering of combed wheat reed), and
- if there is a fire-resisting barrier under the thatch.

Many thatched properties are terraced and the roof may cover two or three individual properties, sometimes sharing a common roof space. Halting possible fire spread will therefore take priority

over extinguishing the fire to reduce potential damage

The removal of thatch to create a fire break has the unfortunate consequence of introducing oxygen to the dry substrate and if it is too close to the already burning material the fire will spread even more rapidly rendering the fire break ineffective. It should be noted that individual properties within a terrace may have differing construction methods.

The depth of a thatch roof can be gauged by roughly estimating the height of the chimneystack compared to the level of the thatch. When originally built, a chimney would often be approximately 6ft above the thatch. The depth of the thatch multiplied by the area of the roof will give an indication of how much room will be required for dealing with it when it is removed.

Fire break far enough away to prevent spread, with chimney providing a fire break to the ridge



Many properties have a plaque fitted to the exterior indicating build type e.g. 'Dorset Model Protected'

The occupier may also have an information sheet, which will detail useful information, such as location of water supplies and layout, to consider for operations.

The fire may be deep within the thatch material, and although the Thermal Imaging Camera is a useful aid, it may not highlight the development of a fire within the layers of thatch because of its good insulation. A metal probe could be used to detect heat within the thatch layers.

3. Dynamic Risk Assessment

A Safety Officer should be appointed as soon as possible to observe the building for signs of hazards and risks which may include:

- The presence of an un-insulated electrical supply close to the thatch, as they may be low and close to the roof.

Note: Particular attention should be paid when erecting ladders in the dark; wire mesh covering and steel fixings within the thatch could become 'live' if contact is made with electrics.

The electricity board may need to disconnect or insulate overhead supplies before work on the roof can commence'

Mesh that should have been removed



- Thatch and other debris falling from the roof (particularly if angle of roof is steep).
- Weakening or collapse of roof support structure, gable ends and chimney stacks. Keep observing during fire fighting operations, clear up and investigation phases.
- Fire fighters should not rely on the strength of the roof, but work on ladders.
- The presence of earth-based walls, such as cob, clay lump or wychert (a mixture of white chalk and straw), which may collapse if exposed to sufficient amount of water.
- Lack of fire resistance within the property.
- Complex building layout including the roof space – voids, double roofs, weak floors, uneven/hazardous walkways, poor visibility, etc.
- Presence of nesting insects or vermin.
- Manual handling considerations with personnel issues such as fatigue, heat exhaustion, eye contamination.

4. Personal Protective Equipment

Personal Protective Equipment (PPE) should be worn for the duration of the incident. In particular:

- Breathing Apparatus (BA) when fighting the fire or on the roof removing thatch, creating a firebreak, etc.

Note: This is due to possible inhalation of smoke containing toxins, fungal or mould spores.

- When working on the ground, clearing undamaged thatch that has been removed from the roof, dust masks are the minimum form of protection.
- Eye protection must be used, as the thick smoke can be densely packed with large thatch cinders that may be hot. The removal of thatch will disturb shards of thatch, which can be very sharp and are particularly hazardous for anyone working on the ground in the vicinity of the roof.
- Consider utilising visors instead of goggles whenever wearing dust masks to aid visibility, reducing the chances of the goggles steaming up.
- Hand protection for firefighting, salvage and if removing sections of thatch. Protection will be required against burns, puncture wounds, debris and infection.

5. External Fire Fighting

An Aerial Appliance is an ideal tool whenever practical at an incident. External crews will need to prevent any fire spreading across the roof by creating fire breaks or removing thatch, for example.

Weather conditions such as high winds and heavy rain may affect operations. During freezing weather, the imposed load on the roof can be increased by water turning to ice rather than running off.

Use fire-fighting water in the form of sprays to wet the thatch to prevent fire from taking hold. However, water alone will not successfully extinguish a fire or prevent fire spread due to the nature of thatch, which is designed to shed water. Fire can and will spread through the lower layers of the thatch, sometimes with little external signs of fire, and reappear further along the roof.

Beware roof timbers too thin to support weight of fire fighters and chimney in poor state of repair, which could collapse.



Working from safety of ladder which should extend to ridge



When working on a roof:

- Only work on roof if actions are supported by a Dynamic Risk Assessment.
 - Ensure personnel working on ladders are supervised.
 - Ensure that any ladder used is stable and extends beyond the ridge which is the strongest point of the roof; (secure ladders with line to substantial objects if required.)
 - Consider overhead hazards, e.g. (incoming electric cables, phone lines, etc.)
 - Consider construction and the amount of support given by roof and walls.
- Always work from the security of a ladder.
- Roof ladders are not designed for use on thatched roofs and do not provide a safe level of stability. Only use a roof ladder if there is a suitable and secure anchor point available.
- A traditionally-built roof with a thick thatch should carry the weight of personnel, but there is no guarantee of the structural integrity or strength. The beams and timbers may be weak or rotten and the thatch may be the only thing holding the roof up; (its removal may weaken the whole roof structure).
- Do not assume that all thatched roofs are constructed to the same standard. For example, in a row of three properties in which the central property conforms to the Dorset Model, the two traditionally-built properties on either side may look exactly the same as the central one from the outside.
- The roof type may also vary on one building. For example, a cottage with a traditional roof may have a modern extension featuring a Dorset Model roof but it may not be obvious from outside.
- The crooks spars and luggers that secure the thatch on some roofs may have plastic hooks or hazel spars which could melt or burn through when affected directly by fire. Although rare, this may result in a sudden release of burning thatch, sliding off the roof with little warning.

Hazel spar to hold the thatch on



observed (fire may travel across the break via the ridge if left in place).

- Work approximately 750-1000mm below the ridge downwards, grasping handfuls of thatch and tearing it free. As the hidden fixings are revealed, work them free and remove lower layers of thatch; this will release the thatch further down the roof.

- Ensure the fire break is wide enough to stop fire jumping across.

5. Creating a Firebreak

Before a fire break can be created any wire mesh must be removed and ridge cut to allow access to the thatch below.

Removing Wire Mesh

- Wire and sometimes plastic mesh is commonly used to protect thatched roofs from bird or rodent attack, and can be installed on or within the surface of the roof.
 - Mesh can cover the whole or partial areas of the roof (and may only cover the ridge area). It is commonly held in with steel fixings and there may be more than one layer of wire mesh within the thatch. Remove the wire mesh rapidly to enable the safe removal of thatch to create a firebreak. When the mesh has been removed it should be moved away from operations, folded and flattened.
 - The ridges on thatch roofs are very tough and will not cut easily, although a partial cut into the ridge may be enough to free it up a little, enabling the release of thatch in and around the ridge itself. The ridge can be removed fully at a later time once a break has been created but must be
- When using ceiling hooks, be careful of puncturing the thatch, as somebody may be working within the roof void below. Be careful not to puncture the fire-resisting board or membrane below the thatch if the roof is of the Dorset Model Build. (see appendix 1)
 - Check the discarded thatch for signs of fire and then promptly remove safely away from the area of operations. This will reduce the likelihood of any affected thatch re-igniting and affecting the building. Keep the area of operations and any access/egress points clear of any obstructions as the amount of thatch removed can quickly add up.
 - Removing the thatch may affect the integrity of the roof or chimney structure, leading to possible structural collapse; collapse is more likely in older properties. Observe the structure for any signs of collapse and if seen withdraw to a safe distance.
 - The central layers of old and thick thatch can be compressed by surrounding layers into a very dry and dusty material. The creation of a fire break may expose air to the material and draw the fire quickly through the central layer towards the break.

6. Compressed Air Foam Systems

Compressed Air Foam Systems (CAFS) can be used to create a fire break; the siting of the break should be the same place as if it was being carried ridge down to the eaves on both sides of the roof.

The foam should be injected into the thatch by use of a lance which should be inserted into the thatch a number of times from the ridge down both sides of the roof

The success of utilising CAFS will rely on the depth of the thatch and experience of the operator. If the thatch is thicker than the length of the lance the foam will not penetrate the lower layers, so will be ineffective.

Compressed air foam lance being used to protect the fire break



7. Covered Thatched Roofs

There are a small number of buildings where thatch survives beneath a later roof covering, such as corrugated iron, slate or tile; such buildings are usually farm buildings.

Unless the owner is available and aware of roof construction, there may be no reference to the presence of thatch in the first reports of fire.

The rate of fire development is approximately the same as a 'standard' thatch incident, although the primary roof covering will hamper determining the exact progress.

Once you have established the fire front, decide the location of the firebreak, remove the primary roof covering, and remove the thatch material. Once you have created a firebreak, commence a progressive removal of the primary roof covering to expose the burning thatch below.

Be aware:

- Removal of top layer of thatch or other covering will provide oxygen to the fire, causing rapid fire growth.
- Thatch will be dry, large presence of dust, risk of extremely rapid fire spread.
- Thatch construction may be of poor quality or in a state of disrepair, (weakened, rotten, etc).
- The roof space should only be entered as a last resort and following a risk assessment. Tackling the fire internally may be effective but will be inherently hazardous with confined space, poor construction, flashover/backdraught issues.

- the thatch will be enclosed so entering roof space will provide oxygen as well.

8. Internal Fire Fighting

Any fire fighting within the roof space will be hot and hazardous work. Always consider alternative access to the roof space through the ceiling if there is no loft hatch within the property. Where there is a shared roof space, a neighbouring property may have access.

The roof space may be cramped and cluttered so care must be taken if the floor has not been boarded.

If flame is free burning beneath the roof and timbers, the rate of growth and spread can be significant. Consider directing fire fighting jets to the underside of the thatch. Observe the timbers because if they are dry and frail, they will quickly fail if exposed to sufficient attack from fire, potentially starting a domino effect of progressive collapse.

Whilst working with ceiling hooks care must be taken not to puncture the thatch close to anyone who may be working on top of the roof.

Removing the ceiling directly below the roof space may enable the fire to be safely tackled from the room below. This may overcome any difficulties of fire fighting within the roof space but will be time consuming and the following is recommended;

- Remove any furniture in the room.
- Check the roof space to ensure there are no heavy objects present before removing the ceiling.

- Remove the ceiling with a ceiling hook, in a safe and controlled manner.

- Consider using small hand controlled branches or hose reels with pulse spray jets to tackle the fire and this will reduce potential water damage to property and conserve water supplies.

10. Dorset Model

The Fire Resisting Building Board (FRBB) utilised for the Dorset Model has a minimum resistance time of 30 minutes. See appendix A

A BA crew may be tasked with monitoring the underside of the roof and its integrity. Do not make any penetrations in the FRBB for fire fighting as oxygen will be introduced into the underside of the thatch causing it to burn more rapidly.

11. Salvage Operations

Thatch fires and fire-fighting water will usually cause severe damage to the property and contents and the aim of a salvage operation is to limit this damage by removing everything of importance or value.

Salvage operations are labour intensive but must remain a high priority.

The following requirements for salvage operations will be determined by the seriousness of the fire and the potential for structural collapse;

- Consider salvage operations at the earliest opportunity even if resources are limited.
- Consider early request for additional resources due to the labour intensive nature of operations.

- Ask the occupier where valuable items are and if there is a suitable area for storage.
- Start in the highest room closest to the fire first (as long as it is safe to do so) and work down and away from the fire.
- Move items to an unaffected area of the building if possible, but if the fire is likely to spread there, it may be necessary to remove items from the building altogether.
- The salvaged items should be left in charge of the occupier or the police if not present.
- Leave items in a place of safety and if possible, under cover and secure.
- Salvaged items must not cause an obstruction to fire fighting operations or cause a trip hazard.

15. Pre-Determined Attendance

It is the responsibility of each Fire and Rescue Service to determine the level of attendance based upon their Integrated Risk Management Plans and any risk specific information available.

Fire and Rescue Services should consider;

- Task analysis for required amount of personnel to be carried out and this should then determine level of pumping appliance response. The work will be hot and arduous, so extra personnel will be required to ensure requisite breaks.
- Available water supplies, consideration for water carriers and

numbers taking into account turnaround times in rural areas.

- Consider high volume pumps and aerial appliances.
- Consider Compressed Air Foam system equipped appliances for fire suppression purposes.
- Required number of additional Officers for Incident Command System purposes.
- Consider support vehicles, multi role, emergency catering, operation equipment technicians etc.

16. Water Supplies

The water supply may be limited at an incident, particularly if in a rural area and there may be a lack of hydrants in the area and no natural water supply that is local or accessible. Consideration may be required for the following;

- Requesting a water carrier if there are doubts regarding water supplies.
- The viability of locating and securing adequate water supplies (e.g. open water).
- Such a process may be very time and labour intensive, requiring significant resources to set in to a lengthy water relay and it will have an impact on operations due to the depletion of resources available for other essential tasks.

17. Chimney Fires

When in attendance at a chimney fire at a thatched building the following should be considered;

- Observing thatch for signs of fire.
- The need to remain at incident for one hour or more after chimney fire has been extinguished.
- Utilising a Thermal Imaging Camera, (there may be limited effectiveness because thatch is a good insulator).
- Pushing a metal object/pole into the thatch and leaving it in place for a period of time to see if it heats up.
- In the event of a serious chimney fire, consider stripping the thatch around the stack as a precautionary measure to reduce risk of fire spreading/escalating.
- Check the stability of the stack whilst stripping as it may be held in position by the thatch!

18. Pre-planning

The use of thatch is becoming more prevalent and may not be noted on the database in Fire Control.

Crews undertaking community fire safety should make a note of the roof construction and any relevant points (e.g. access, water supplies, overhead power cables, usability of Aerial appliances, etc), so that the details may be added to the database.

*The siting of piles of thatch and other debris needs early consideration.
This fire in Stanton in the Vale was caused by a kitchen fire*



Consider using heavy plant to remove thatch from fire scene



Stanton in the Vale cottages rebuilt



Appendix 1

Dorset Model From Dorset and Wiltshire FRS

The Dorset Model is a code of practice from Dorset Building Control Technical Committee, for new build thatched properties and extensions to existing thatched properties where the distance to the boundary is less than 12 metres. The model recommends that a rigid barrier of at least 30 minutes' fire resistance (insulation and integrity) is provided under the thatch; this protects the thatch from a fire in the rooms below and also protects the rooms below from a fire in the thatch.

In the few instances of fires in the thatch of properties built to this standard, the damage to the accommodation and contents has been minimal.

The Dorset Model makes the following recommendations:

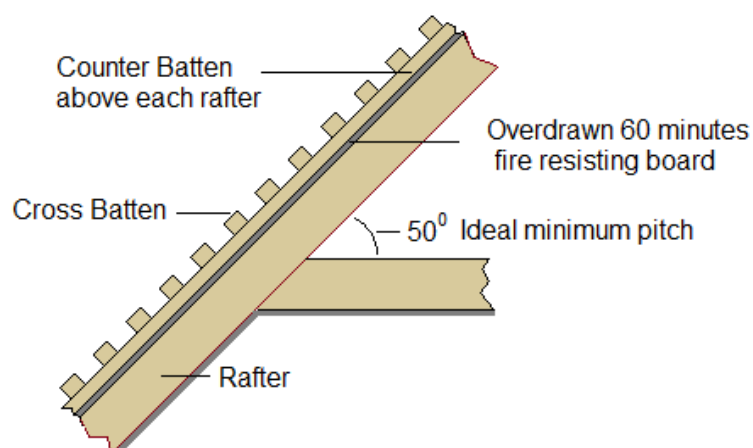
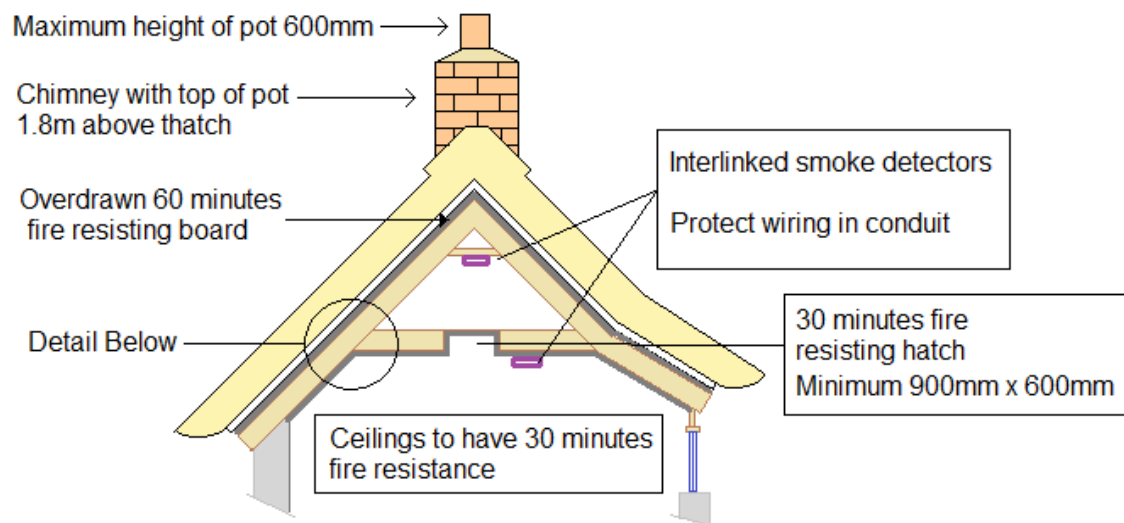
- The provision of a loft hatch is recommended for firefighting purposes and the minimum recommended size is 600mm x 900mm.
- Advice should be sought from an approved electrical contractor regarding the most appropriate type of wiring system. Effects from rodent damage and straw debris need to be considered and the National Inspection Council for Electrical Installation Contracting have issued guidance to their members.
- Recessed lighting should not be cut into the ceilings below the thatch. Light fittings within the roof space to be in a bulk head fitting. External floodlights should not be installed just under thatch.
- Spark arrestors on the flues are **NOT** recommended because they can clog and restrict the flow of flue gases.
- It is recommended that an external water tap supplied from the rising main, is fitted with a hose capable of reaching all parts of the roof.
- Any metal plumbing in roof space should utilise compression joints to avoid the use of blow torches.

The use of a flexible fire-resistant material as a fire resisting barrier in new buildings is not considered acceptable for the purposes of the Dorset Model.

There are other Local Authority Building Control-approved systems which offer useful alternatives to the Dorset Model if the roof is not square or is undulating.

The need for roofs to breathe should also be considered when applying any barrier under the thatch, especially with listed buildings. Further advice is available from Historic England.

Although 60 minutes fire resistance is preferable, Building Control only ask for 30 minutes for the fire resisting board.



Further Reading

The IFE guide to fire safety in thatched buildings.

Fire and Rescue Services National Operational Guidance;

<https://www.ukfrs.com/guidance/fires-buildings?bundle=hazard&id=18879>

Thatched buildings - the Dorset Model;

<https://www.dorsetforyou.gov.uk/planning-buildings-land/building-control/advice-and-guidance/thatched-buildings-the-dorset-model.aspx>

The National Society of Master Thatchers;

<https://www.nsmtltd.co.uk/what-we-do/>

The IFE Special Interest Group for Heritage Buildings and Historic England acknowledges the kind permission of Hampshire Fire and Rescue Service to allow their publication "Thatched Property Safety Guide" and fire fighting photographs to be used as a basis for this guidance document.

We would also like to acknowledge

Mrs M. Sanders, Dr. R. E. Angold, and Dr. P. A. Sadd from the National Society of Master Thatchers (NSMT) for their research into fires in thatched properties.

Keith Benjamin of Burgoynes for allowing access to the results of his investigation into causes of fire in thatched properties.

Simon Denny of the National Society of Master Thatchers and fire fighter.

David Ebbs of Specflue Ltd.

Suffolk Preservation Society.

The Thatching Advisory Services (TAS).

Dr Jim Glockling of the Fire Protection Association, the NFU Mutual and Historic England for their work in testing wood burners, flues and chimneys.

Assistant Divisional Officer Jo Puttick, MIFireE, Dorset Fire and Rescue Service (Rtd) for his editing and kind donation of records from the testing for the Dorset Model.