

# FARM FIRE SAFETY SHEET



## Hay Fire Prevention

### What Causes Hay Fires?

Freshly cut forage is not dead; respiration (the burning of plant sugars to produce energy) continues in plant cells and a small amount of heat is released in the bale. Many producers refer to this elevation in bale temperature as “sweating” or “going through a heat.” In hay that is baled at the proper moisture concentration, plant cell respiration has slowed dramatically and will eventually cease.

The heat generated by plant cell respiration in hay bales is normal and generally of little consequence. However, if bale moisture levels are too high (greater than 20 percent), the heat and moisture will provide a suitable environment for the growth and multiplication of mesophilic (warm temperature) bacteria that are present on forage crops.

The respiration of mesophilic bacteria releases additional heat in the bale and interior bale temperatures can reach 130° to 140°F. At this temperature range, most mesophilic bacteria die and interior bale temperatures start to decline.

This cycle of heating and cooling may occur several times during the weeks after baling as the microbial population increases and decreases.

However, the maximum temperature decreases during each subsequent cycle. The interior bale temperature will eventually stabilize near the ambient temperature. Hay that has sustained these heat cycles has lost much of its quality as a feeding source, but is unlikely to catch fire.

### Reducing the Risk of Hay Fires

Hay moisture concentration has a major effect on the microbial activity that can lead to hay fires. Therefore, hay should be cured to the proper moisture concentration prior to baling.

### Monitoring Hay Temperatures during Storage

The temperature of hay that has been baled at a high moisture concentration should be checked twice a day for six weeks after baling. Use a probe and thermometer to accurately determine the temperature inside a stack of hay.

A simple temperature probe can be made in the farm shop from a 10-foot piece of 3/4-inch diameter iron pipe. Drill eight 3/16-inch diameter holes about three inches from one end then hammer that end of the pipe together to form a sharp edge (Figure 1). Compost manure gauges may also work well.

Commercial temperature probes are available, but are often too short to monitor the maximum interior temperature zone within a hay stack.

Check hay temperature in the center of the stacked hay. The easiest way to do this is from the top of the stack. Do not walk directly on the stacked hay; pockets may have already burned out under the hay surface. Place boards, plywood, or a ladder on the hay and walk on those instead.



This will spread the weight of the person monitoring the temperature over a larger area and help keep him from falling into burned-out cavities. Be sure to use a lifeline in case the hay surface collapses into a fire pocket. A second person, standing safely away from the hay, should hold the other end of the rope to pull the person monitoring the temperature out in case the hay surface collapses into a fire pocket.

Drive the probe from the top of the hay stack into the inner most bales. Lower a thermometer to the end of the probe with a piece of light wire. After 10 to 15 minutes, retrieve the thermometer and read the temperature. If the temperature has reached 150°F, the temperature is likely to increase and hay bales should be moved to allow increased air circulation and cooling. Continue monitoring the temperature every two or three hours.

**Temperature interpretations for hay stacks.**

Temperature (°F)	Interpretation
<130	Continue monitoring temperature twice a day.
130 – 140	Temperature may go up or down. Recheck in a few hours.
150	Temperature will most likely continue to climb. Move the hay to provide air circulation and cooling. If hay is stored inside evacuate any livestock to a safe area and remove hay from building. Monitor temperature every two hours.
≥175	Fire is imminent or present. <b>Call the fire department immediately.</b> Continue probing and monitoring the temperature.

Fire is imminent if interior bale temperatures exceed 175°F and fire is present at temperatures greater than 200°F.

Other symptoms of hot hay or an internal hay fire include a slight caramel or strong burning odor, visible vapor or smoke, a strong musty smell, and/or hay that feels hot to the touch. If any of these symptoms occur, **call the fire department immediately.**

Let firefighters take control of the situation once they arrive. Do not move hay if signs of fire are present. Moving hay exposes the overheated or smoldering hay to oxygen and may cause the fire to burn uncontrollably.

**Controlling Hay Fires**

In the event of a hay fire, surveying the fire scene is the most important step to ensure everyone’s safety.

Review the area surrounding the hay fire. If flammable products (e.g. gasoline, fertilizers, and pesticides) are located nearby, **leave the area immediately.**

If there are no flammable products in the area and time permits, there are several steps you can take before the fire department arrives.

**Hay Stored Outside**

Use a disk to create a firebreak around the stacked hay. The firebreak should be approximately 15 feet wide. If water and a high-pressure hose are available, water the hay and the surrounding vegetation to keep the fire from spreading.

**Hay Stored Inside a Building**

If the area is safe and time permits, evacuate any livestock from the building. Put the animals in a pasture that is a safe distance from the structure. Turn off the building’s electricity to prevent an electrical fire.

Monitor wind direction carefully. If water and a high pressure hose are available, water the roof of adjacent structures that are downwind of the fire.

*This information was developed with the assistance of*  
**Virginia Tech Extension**  
**Virginia Polytechnic Institute and State University**  
**Department of Biological Systems Engineering**  
 The National Fire Protection Association (NFPA)

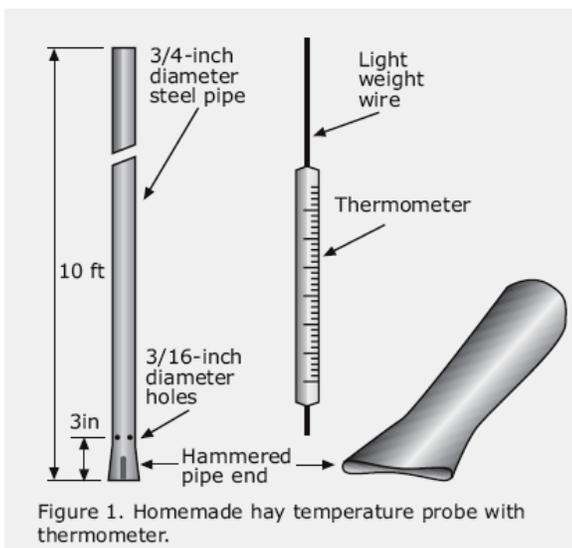
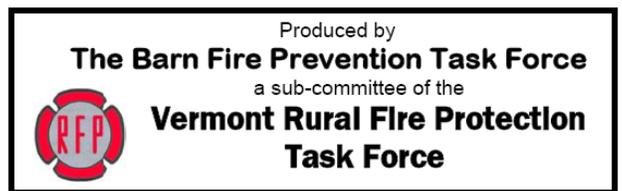


Figure 1. Homemade hay temperature probe with thermometer.



The USDA us an equal opportunity employer.

**Disclaimer:** This fact sheet is intended for information purposes only. The authors and distributors of this facts sheet accept no liability for the information or suggestions provided. Each recipient waives and releases the authors and distributes from any and all claims relating to the usage of information, in whole or in part, contained on the fact sheet. The authors and distributors will not be held responsible for any injury, loss or damage incurred by reliance on the information provided.