Improving Fire Resistance of Farm Building

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Fires in farm buildings cost Missouri agriculture nearly $1 million per year. This loss could be reduced substantially through better site selection use of less flammable materials and some simple fire stopping techniques. This publication describes some of the construction features that you can use to reduce the risk of fire loss on your farm.

Fire normally starts within a single area or room. It spreads over surfaces and penetrates combustible coverings, moving to adjacent areas either directly or through natural openings in the building construction.

Buildings collapse when the fire has progressed to the point where structural members are weakened by either burning or excessive heat.

Risk of loss is reduced whenever we use construction practices that slow or prevent the normal progression of fire.

Location

Building location may help prevent fire spread to or from adjacent buildings. A recommended minimum separation between farm buildings is 50 feet. Farm shops or fuel storage structures should be situated at least 100 feet from any other buildings. Consider using greater separation whenever buildings are in alignment with prevailing winds.

Block potential fire passages during construction

Fire stops are obstructions placed in concealed passages within buildings which slow or halt the movement of flame heat and hot gases from one area to another. They are used most often to block wall stud spaces or areas between floor joists on multistory buildings. Solid wood blocks 2 inches thick make effective fire stops. Wall cavities that are completely filled with non-combustible insulation do not need fire stopping.

Most modern agricultural buildings can benefit from fire stopping in the area above the ceiling and under the roof. This relatively open space provides a natural tunnel for fire to move throughout the building once it has burned through the ceiling.

An easy way to provide fire stops for this area is to cover both sides of a truss with 1/2-inch gypsum board. The board should cover the area between the ceiling and the underside of the roof completely. One of these fire stops should be over each cross-partition in the building or approximately every 50 feet for buildings with large rooms.

Properly constructed walls can be used as fire stops in buildings where it is desirable to provide more control over fire spread between adjacent areas. These stops (commonly called fire walls) can provide time to remove animals or equipment from a portion of a building.

Consider using a fire wall whenever two areas with different risk levels are contained in the same building. For example, a shop constructed in one end of a machinery storage building should be separated from the machinery storage area by a fire wall. Other examples include separation of utility rooms or heating plants from other areas of the building.

Fire walls need not be elaborate. In many cases, more careful selection of materials combined with conventional construction can provide valuable protection. A standard 2 x 4 stud wall covered with 1/2-inch gypsum board provides a 40-minute fire rating. Ratings for other types of wall construction can be found in Table 1.

Table 1. Fire resistance ratings for various types of partition wall construction.

Construction	Fire resistance rating (minutes)
Wood frame covered (both sides) with:	
1/2-inch fiberboard	10
1/2-inch fiberboard, flame proofed	10
1/4-inch plywood	10
3/4-inch T&G boards	20
3/8-inch gypsum wallboard	25
1/2-inch gypsum wallboard	40
5/8-inch gypsum wallboard (type X)	60
Cement asbestos board 3/16-inch thick	10
3/16-inch cement asbestos board over 3/8-inch gypsum board	60
Masonry construction	
4-inch blocks plastered both sides	60
6-inch blocks	60
6-inch concrete	240

Flame spread ratings

Fire moves through a room at a rate that depends on the material used to cover interior surfaces. Many building materials carry a flame spread or fire rating, which is an indication of their ability to resist burning.

Flame spread or fire ratings are obtained by comparing the burn rate for a material with the burn rates obtained from the standardized materials, red oak lumber and asbestos cement board. Flammable rates for these materials are assigned values of 100 and 0, respectively, and other materials are given values that represent a comparison with these numbers. For example, a material that burns twice as fast as red oak would receive a flame spread rating of 200.

Flame spread ratings are sometimes grouped into classes, providing a general indication of flammability. Class ratings and their associated flame spread ratings are shown in Table 2.

Table 2. Class, flame spread and suggested use for interior building materials.

Class	Flame spread	Use
A	0-25	Farm shops, heating plant rooms, fuel storage, high-risk areas
B	26-75	Confinement buildings without heating system
C	76-200	Low-risk buildings, such as hay storage
D	201-500	**Do not use without protective covering**
	500+	**Do not use without protective covering**

Protective coatings

Urethane and styrene foam plastic insulations commonly used in farm buildings have extremely high flame spread rates. To minimize risk when using these materials, it is suggested that they be protected from fire with fire-resistant coatings. Materials that provide satisfactory protection include the following:

- 1/2-inch thickness of cement plaster.
- Fire-rated gypsum board.
- 1/4 - 1/2-inch thickness of sprayed-on magnesium oxychloride.
- Asbestos-cement board 1/4-inch thick.

Note: If foam plastic insulations are not protected suitably from potential fire, your insurance company may refuse to provide coverage on the structure.

Fire-retardant treatment

There are two methods of treating wood to improve its resistance to fire — pressure treatment with special chemicals and painting with fire-resistant paints.

The pressure treatment process is similar to that used with the more familiar wood preserving chemicals. Special waterborne salts are used that limit the amount of combustible products released when wood is exposed to flame. Some of the more commonly used chemicals include monammonium and diammonium phosphate, ammonium sulfate, zinc chloride, sodium tetraborate and boric acid.

Fire-retardant treatment does not prevent wood from burning, nor does it slow up penetration of fire in structural members. Its main benefit is to slow the rate of surface spread. It is very questionable whether the cost of pressure-treated, fire-retardant wood can be justified for agricultural buildings.

Fire-retardant paints have low surface flammability and tend to expand or "foam" when exposed to fire. This expanded layer acts as an insulation to help keep heat away from the flammable surface under the paint. Properly applied coatings can reduce the flame spread for wood products to 25 or less and they are being applied routinely to some factory finished building products.

Metal frame buildings

Many farmers have purchased metal buildings because they believed them to be "fireproof." The flame spread rating for metal is 0; however, when a fire occurs the unprotected metal frame building will fail much more rapidly than a wooden structure. This is particularly true in the case of machinery and other storage buildings where fire is more likely in the stored product than in the building itself.

Temperatures build up very quickly during early stages of a fire and often spread through a building even more rapidly than the fire itself. As soon as metal structural members get hot, their strength

decreases rapidly. The result can be complete structural collapse long before actual flames spread through the building.

Metal frames can be protected from heat by encasing them in concrete, by constructing an insulated firewall around them, or by spray-on insulating coatings. A 1-inch thickness of sprayed-on asbestos fiber yields a two-hour fire rating for an 8-inch steel I beam. An unprotected beam has a 10 minute fire rating. In most cases, protective cost probably is not warranted for farm buildings. An exception might be the farm shop, which is a relatively high-risk area usually containing high-value equipment.

First aid for fires

Nearly all fires start small and grow big. A good fire extinguisher in the hands of a person who knows how to use it can often prevent a small fire from becoming a major loss.

To order, request G1910, *Improving Fire Resistance of Farm Buildings* (25 cents).

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