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Using Flat Buildings for Dry Grain Storage

In years when grain yields are high and prices are low, it is worth considering use of existing flat buildings (machine storage buildings, warehouses, or even livestock buildings, for example) for temporary grain storage. Here are some things to consider when deciding whether a given building would be a good choice for grain storage.

Sanitation. Can you get the building clean enough for grain storage? If the building previously contained manure, ag chemicals, or petroleum products, can you completely remove these materials and their odors so that grain will not be physically contaminated or pick up odors that would result in down grading? Also, take a look at the way the building is constructed and try to determine whether you can keep birds and rodents away from the grain.

Wall strength. Dry grain exerts high pressure on walls, and unless the building was specifically designed to withstand the pressure of grain or some other granular product, it will need to be reinforced. If the building was designed and erected by an ag building company, you might ask the company if a "grain package" is available. Or you could consider hiring an engineering consultant to design building modifications for you. Another option would be to set free-standing bulk heads inside the building to keep grain away from the walls. Extension doesn't currently have plans for do-it-yourself bulk heads, but some local contractors or building materials suppliers might be able to build them for you. Some farmers avoid the wall-pressure problem by buying metal grain bin rings (without floors or roofs), and setting the rings inside the building. Finally, you could accept reduced storage capacity and just place grain in the center of the building in sloping piles that do not touch the walls.

Capacity. When you are trying to decide whether it is worth using an existing building for grain storage, make sure you estimate how many bushels can be stored. It is disappointing to find how few bushels can actually be stored in some flat buildings, especially when buildings have low ceilings or when grain is not piled against the sidewalls. To estimate capacity, calculate the volume of the planned grain pile in cubic feet and then multiply by 0.8 bushels per cubic foot, or divide by 1.25 cubic feet per bushel to get volume bushels. Contact the University of Minnesota Extension Service if you would like assistance in estimating building capacity.

Water-tightness. First, check the roof for leaks and estimate how difficult and expensive it would be to repair it. Next, look at the grade around the building to make sure that water doesn't get onto the building floor. Finally, look at the floor itself. A vapor barrier (6-mil plastic, for example) is needed between the soil and the grain to prevent moisture from moving into the bottom layer of grain. For buildings with earthen floors, consider piling the grain on plastic, or installing a new concrete floor with a vapor barrier under it. Keep in mind that new concrete floors should be allowed to cure for several weeks before grain is placed on them. If the building has an older concrete floor that does not have a vapor barrier under it, and the grain will be stored more than a few months, it would be best to put down plastic over the floor as the building is filled.

Filling and unloading the building. Grain handling is not as convenient in flat storage as it is in round metal bins and it can be a challenge to move grain in and out of the building. There is some specialized equipment designed for this purpose that you could buy or rent. But if that's not practical, you might be able to use portable grain augers to fill flat storage by making openings in the roof, or by moving the auger around inside the building. Unloading can be accomplished by using a portable auger or a front end loader. Pneumatic grain conveyors could also be used for filling and emptying flat storage.

Grain moisture. Because it is difficult to achieve uniform air movement in flat storage, it is difficult to dry grain adequately in these buildings. It is probably best to make sure grain is dry enough for storage before placing it in the building. Corn that will be fed through the winter months can be held at up to 18% moisture, but corn to be stored into the following spring should be no more than 15% moisture. Use 14% moisture for corn storage into summer, and 13% for storage of a year or more. Small grains should be 13 to 14% moisture, and soybeans should be about 13% moisture.

Grain aeration. Even if grain is dry when it is moved into flat storage, it should still be aerated so that you can control grain temperature to reduce mold and insect activity and to prevent moisture migration. Perforated ducts placed on the floor can work well for flat buildings. If the pile is fairly level, duct spacing should be about equal to the pile depth. If you have a long triangular-shaped pile, you might get by with one duct, centered under the peak, running the length of the pile. Unusual pile shapes make aeration design tricky; consult with an experienced aeration system designer in these cases. Perforated ducts (metal or plastic) that are made for grain aeration work best. Ordinary plastic drainage tile doesn't work very well because it doesn't have enough perforated area for good air movement. Try to keep duct lengths to less than 100 ft to reduce problems with non-uniform air distribution.

Positive pressure designs (air blowing into ducts and out of the top of the pile) tend to work best for flat storage, but be aware of potential condensation problems under the roof. You can minimize condensation problems by providing plenty of air exhaust area and plenty of air movement over the pile while the fans are running, and by running the fans often enough to minimize the temperature difference between the grain pile and outdoor air.

Round metal grain bins are hard to beat for convenient grain handling and aeration, but flat storage can also work if you provide good management and can meet grain handling, aeration, and pest control challenges. Contact the University of Minnesota Extension Service for more information.

This article is also available on the Web at http://www.bae.umn.edu/extens/postharvest/