approximately 120 hours (five days) for the entire grain mass to cool or warm when air is supplied at the rate of 0.1 cfm per bushel. This time is reduced to 12 hours when the airflow rate is increased to 1 cfm per bushel, which would be typical of the performance of a drying fan used for aeration.

The types of aeration systems and methods of bin filling determine the probable storage problem locations within the bin.

## Aeration Systems

Most modern grain storage bins are equipped with either subfloor aeration ducts or perforated floors. Subfloor duct systems may be of several types usually resembling an "X" "Y," or "I" type system (Figures 3, 4, and 5).

Air flows along the path of least resistance; hence, there may be "dead space" areas through which very little air passes when using a duct type aeration system (Figures 6 and 7). Likewise, overfilling of a bin may create "dead space" zones (Figure 8). When inspecting a bin for possible trouble spots, be sure to probe into these "dead space" zones if possible.

The best method for distributing air evenly through the grain mass is to use a perforated floor (Figure 9). However, if improper filling procedures are used, possible trouble areas could still occur if there is an accumulation of fine material and foreign matter in the top and bottom centers of the bin (Figure 10). Likewise, overfilling may present the same problem for bins equipped with perforated floors as for those with duct systems (Figure 8).

## Filling and unloading grain bins

Storage problems may result from factors other than inadequate aeration. For example, when grain bins are filled, the foreign and light materials, such as trash, weed seed and broken parts of kernels, tend to accumulate in the center of the bin and may form a "core" of material from top to bottom (Figure 11). This core may be so tightly packed that aeration of drying air will go around it through the surrounding loose, clean grain. Consequently, this zone may not dry properly, and in the case of in-bin drying systems, it provides an excellent environment for mold and insect problems. This potential problem may be reduced by using a grain spreader that evenly distributes the fines. It is also possible to remove the center material by unloading the bin with a center draw unloading auger, and then uniformly spreading this material over the top surface of the grain after leveling. Other options would include feeding or selling the core material separately.

One method of determining when the central core has been removed is to place tissue paper on the grain surface and observe when it passes through the unloading auger. Core removal may involve some risk to workers. No one should be inside the bin when it is being unloaded. The preferred procedure is to clean the grain before it is

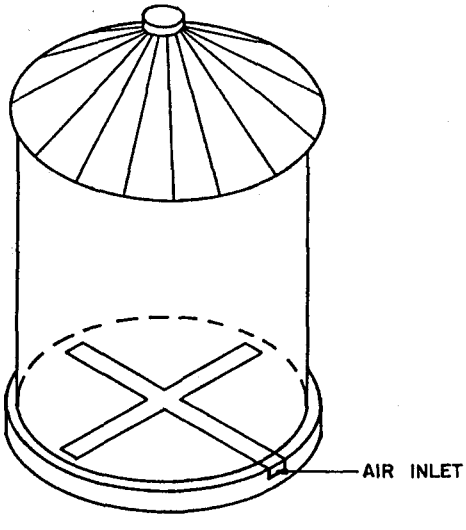


**Figure 3. An "X" type aeration subfloor duct system.**

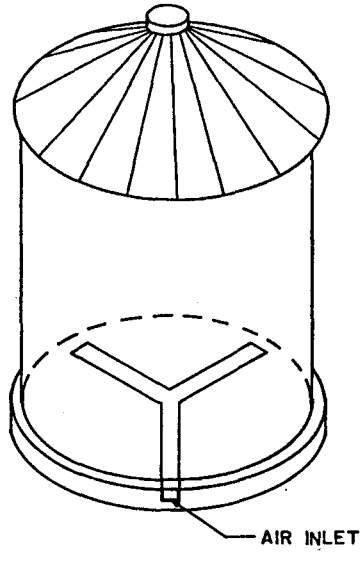


**Figure 4. A "Y" type aeration subfloor duct system.**

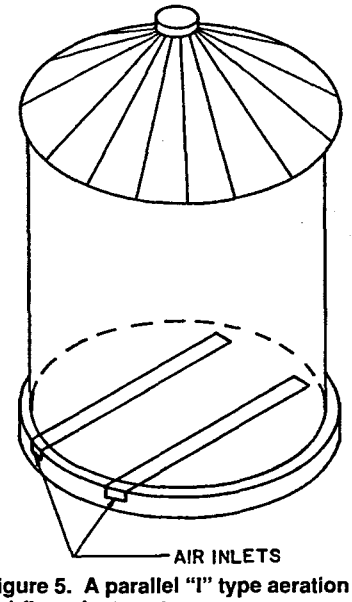


**Figure 5. A parallel "I" type aeration subfloor duct system.**