installed inside bins and processing equipment containing combustible materials Where water is undesirable, either because of reaction with or damage to the material, protection can be provided by inert gas extinguishers

If a particularly hazardous material like metal powder is being handled, the apparatus may be completely enclosed and flooded with an inert gas like carbon dioxide, nitrogen, or helium to remove or reduce the oxygen content and, thus, prevent ignition

The area should be explosion-vented, preferably by windows and skylights which swing out on friction catches If other means are not available, the windows may be scored with a diamond so that they will easily break outward in case of explosion

Portable containers. The same general rules that apply to the storage and handling of containers of liquids apply also to the storage and handling of containers of solid materials The most popular containers for solids are 50- and 100-pound paper bags These bags are free from sifting or leaking, but they must be handled with some care to prevent mechanical damage A few slipover bags should be available to cover the occasional broken or leaking container, both to save material and to prevent skin contact with the dust

Full bags should be stacked on pallets or staging to prevent water damage Interlocked stacking on pallets generally leads to better piling and less mechanical hazard in moving material Bags should be protected from the weather, although some of the laminated bags now made are remarkably weather resistant

Large quantities of solid chemicals are handled and shipped in bulk, cloth bags, barrels, and barrels with paper liners

The filling of bags or barrels with solids is always a potentially dusty operation and, if the material being handled is finely divided or dangerous, the health and fire hazards may be serious The simplest solution to the problem is to moisten the material, so that it does not produce fine dust

This solution, however, cannot be used with some materials, and some methods of handling and hoods and exhaust ventilation in quantity must be provided (See Chapter 36, "Exhaust and Ventilation")

The common way to open bags, both cloth and paper, is to slit one side crosswise and fold back the top and bottom The hazard of knife cuts can be minimized by keeping knives in scabbards where bags are opened and by using knives with hilts or guards

The emptying of bags and barrels involves health hazards similar to those of filling However, prevention of dust and of skin contact is somewhat more difficult where such containers are emptied than where they are filled because of the tendency to dump them suddenly, with consequent rapid dispersion of dust which may not be trapped by the collecting system

Exhaust hoods that are larger than the containers and careful supervision can help solve this problem In some instances, toxic materials can be handled in complete enclosures The head of the barrel is broken in after the enclosure is sealed, and all dust is removed before the next barrel is put in

Explosives should be stored in magazines of approved fireproof and bulletproof construction, located at a safe distance from railroads and other buildings (Table 16-A) Federal, state, and municipal codes regarding storage of explosives should be consulted and followed closely NFPA Standard 495 gives detailed specifications for handling and storage, as does the Institute of Makers of Explosives and the duPont *Blasters Handbook*

Explosives should be stored under lock and key, and records should be maintained of all explosives issued

No matches, flammable materials, metal, or metal tools should be brought into an explosives magazine Floors must be kept clean and free from loose explosives The floors, which are usually of wood, should be blindnailed, no nail or bolthead should be exposed

Magazines should be clean, dry, and well ventilated Ventilation openings should not exceed 110 sq in in area and should be screened to prevent the entrance of sparks and rodents

Only portable lights, approved for such use, are to be permitted in a magazine Fire or sparks should not be allowed near a magazine, and the surrounding ground should be kept clear of brush, leaves, grass, debris, and