MICHIGAN HAZARD ALERT

MICHIGAN STATE UNIVERSITY: Prevention of work-related injuries & illnesses through research & investigation

IMPROPER BULK BAG STACKING CAN LEAD TO FATAL INJURY

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Flexible intermediate bulk containers (FIBCs), also known bulk bags, super sacks and tote bags, are gaining traction in a wide range of industries for transporting and storing dry, flowable products due to their low package to product weight ratio, their design for handling, transportation and storage, and their recyclability. FIBCs can pose hazards to workers when overfilled and exceeding the safe working load limit, and when improperly handled, stacked and stored. FIBCs can be extremely heavy, and any tear or deterioration of the bag structure presents a potentially fatal struck-by or engulfment and suffocation hazard. Improper handling and handling FIBCs in cramped storage can result in handling equipment-caused tears in the bag. Multiple workers have died while attempting to tape the bottom bag while another bag is on top of it. Improper filling and stacking can cause FIBCs to unexpectedly fall. In Michigan, two workers, one in Transportation/Warehousing and one in Manufacturing died when a stacked bulk bag fell onto them. Nationally there have been multiple fatalities involving FIBCs.

FIBC STACKING FATALITIES IN MICHIGAN

In 2003, a grain elevator worker in his 60s suffocated when an approximate 4-foot-wide by 4-foot-deep by 4-foot-high, 2000-pound polyethylene duffle-top style tote of black beans fell onto him. The totes had a safety warning label that indicated how to carry it but did not have information concerning how full to fill them, how to secure the opening, or how to stack them when filled. The double-stacked FIBCs were overfilled, causing them to be “rounded” on the top and did not allow the top FIBC to sit “flat” on the bottom FIBC. The FIBCs were stored on one side of a narrow 29-inch walkway that had a 24-inch retaining wall. The victim was walking by the double-stacked bean totes, and the top tote fell, striking him. He landed on the retaining wall with his chest. The FIBC broke and his upper body was covered in beans and the FIBC. See Photo 1.

Photo 1. Police Photo: MIFACE Report 03MI160. Bean totes stacked on floor

Photo 2. Police Photo: Forklift aisleway with upper sack and pellets on ground.

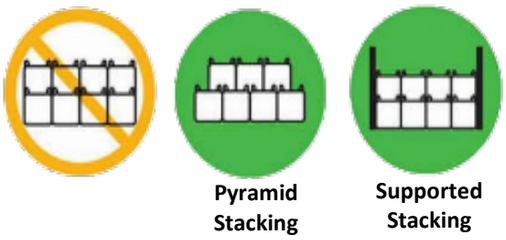
In 2022, a shipping/receiving material handler in his 30s died from mechanical asphyxia when an approximate 4-foot-wide by 4-foot-deep by 5-foot-high, 2000-pound woven synthetic fabric, palletized FIBC containing plastic pellets fell on him. The FIBCs were stored in rows within one foot of each other and double- or triple-stacked. The decedent was operating a powered industrial truck moving and stacking the palleted FIBCs. It appeared that the decedent was attempting to seal the bottom bag of the stack, which was leaking plastic media. He was found under the upper FIBC of the stack, crouched near the base of the stack. A roll of tape typically used to seal FIBCs that had been cut or torn was found near him as well as a partially taped cut in the bottom FIBC. He was declared dead at the scene. See Photo 2.

PREVENTING FIBC STACKING FATALITIES

The Flexible Intermediate Bulk Container Association (FIBCA) has developed Handling Guidelines which can assist employers in identifying hazards and control measures for their facility. **It is important to choose the right FIBC for the product!** The ANSI store, ISO 21898:2024 Packaging - Flexible Intermediate Bulk Containers (FIBCs) for Non-Dangerous Goods, Annex D provides guidance on the selection and safe usage of FIBCs. MIFACE recommends that employers using FIBCs:

- Perform a hazard assessment for handling and storing the FIBC to develop, implement, and enforce control measures to minimize the identified hazards.

- Identify and implement written standard operating procedures for the appropriate inspection, handling, and storage methods based on consultation with the manufacturer/supplier of the FIBC.
  - Include routine/periodic inspection of the synthetic material of the bag and lifting straps.
  - Establish repair and removal from service criteria as part of the inspection standard operating procedure(s) based on manufacturer criteria.
- Never exceed the FIBC's specified safe working load limit (WLL).
- Don't fill an FIBC to a level that exceeds its stability or exceeds its height to width limitations (usually 2:1).
- Ensure any pallets used for transportation and storage are:
  - Undamaged, clean, free from nails or protrusions that could damage the FIBC.
  - Of appropriate size so that the FIBC does not overhang the side unless specifically designed and approved to do so by manufacturer.
  - Rated for the weight they will carry.
- Store FIBCs out of direct sunlight exposure or anywhere moisture might develop.
- **Confirm with supplier if bag stacking is permitted.**
- If stacking is permitted and their stability confirmed, use a Pyramid or Supported Stacking method (see graphic). Only stack FIBCs of identical size, construction type, and fill level together. Mixing types creates instability. **Do Not push the FIBC into a stack** – this can cause damage to sides or back of the flexible tote.



Stacking Graphic courtesy of Safeflex.org

Pyramid Stacking: Where only free stacking is possible, a pyramid method should be used. Each bag above the first layer must sit on at least four lower bags. Each layer is subsequently tiered inwards forming a pyramid structure.

Supported Stacking: Formed against two retaining walls of sufficient strength.

Rack Systems: Using engineered pallet racking designed for FIBCs is highly recommended for safe, high-density storage. Consult with FIBC manufacturer. Follow the rack manufacturer's load ratings and guidelines explicitly.

- Ensure aisles are wide enough for both pedestrian and forklift travel and accessibility.
  - Identify and appropriately mark aisleways and passageways and require employees moving from one work area to another use these marked aisleways and passageways.
- Employee Training
  - **Prohibit on-foot approach or repair of a damaged bag without first removing all bags stacked on top**.
  - Instruct employees on how to deal with stacks that have become unstable or are in danger of collapse.
  - Instruct employees on all control measures implemented. Develop audit procedures to ensure compliance. Re-train employees when necessary.
  - Encourage employees to identify lapses in control practices to minimize future injury occurrences.
  - Ensure that forklift drivers and other machine operators have appropriate training in FIBC inspection, handling, transportation, and storage procedures.

Did You Know

The Working Load Limit (WLL) is the maximum capacity the FIBC can safely carry to avoid breakage.

There are four types (A-D) of FIBCs. Proper FIBC selection depends upon the product it will contain.

- **Contents:** Type of material stored and its specific requirements
- **Capacity:** Choose a bag with a sufficient Safe Working Load Limit.
- **Safety features:** Product requires specific features like conductive or static-dissipative materials.
- **Environmental considerations:** Depending upon the manufacturer, they can be reused and recycled.

FIBCs can be customized in terms of size, type and shape depending upon industry need.

REFERENCES AND RESOURCES

- MIOSHA General Industry Standards: General Provisions, Part 1, Rule 11-Employers Responsibilities and Rule 15 – Housekeeping.
- Flexible Intermediate Bulk Container Association (FIBC): Resource Center; FIBC Handling Guidelines
- European Flexible Intermediate Bulk Container Association (EFIBCA): Handling Instructions; Questions and Answers Concerning the Use of FIBCs brochure
- Safeflex International Ltd: Resources
- Midwestern Bag & Supply: How to Safely Store and Handle FIBC Bulk Bags
- Zibo Yundu Plastic Products Company, Ltd: Mastering FIBC Safety & Efficiency: A Guide for Buyers on Storage, Stacking, and Usage