

STATIC ELECTRICITY AND FIBCs

Flexible Intermediate Bulk Containers (FIBCs) are used for the storage, packaging and transportation of powders and granules in many industries. What is not always appreciated is that basic FIBCs can produce electrostatic discharges capable of igniting flammable gases, vapours and dust clouds. Standards and guidelines have been unable to keep up with developments aimed at avoiding this problem, and there is often confusion and uncertainty amongst end users. This datasheet aims to provide guidance on FIBC selection.

BASIC FIBCs AND ELECTROSTATIC HAZARDS

Most FIBCs are made from a heavy-duty fabric of woven polypropylene (PP), which is highly insulating and will prevent electrostatic charge on the contents being dissipated. It will also acquire charge of its own during filling and emptying.

The charged surface of the FIBC (and some liners) will lead to **Brush Discharges*** that are capable of igniting most common flammable gases and vapours. If the FIBC contents are conducting, retained charge could lead to **Spark Discharges*** which could ignite many powders, too. In some situations, especially when the FIBC is coated or used with a liner, there is even the possibility of a highly energetic **Propagating Brush Discharge***, capable of igniting any flammable atmosphere.

To overcome these hazards a number of options have been added to the basic FIBC. This has led to FIBCs designated as Type A, B, C and D. The designations are widely recognised by users and manufacturers, although they do not yet appear in current standards or guidelines. This is expected to change in future.

The following explains the FIBC type designations and where each can be used, including references to liners and coating, which are often areas of confusion. In many situations this can be used as an FIBC selection guide, provided the Minimum Ignition Energy (MIE) of all gases, vapours and powders has been determined.

TYPE A FIBCs

Type A FIBCs are as described above, with no features to address electrostatic hazards and no restriction on the type of coating or liner that can be used.

Type A can be used in situations where there are no flammable gases, vapours or powders, including the FIBC contents. They should not be used in hazardous areas.

The use of Type A FIBCs can lead to electrostatic discharges that could be annoying to personnel and in extreme cases to **Propagating Brush Discharges*** which could be painful or even injurious to personnel.

TYPE B FIBCs

Type B FIBCs are constructed so their walls cannot sustain a voltage of more than 4kV. Insulating coatings and liners can be used, provided the combined wall/coating/liner still breaks down at less than 4kV. This ensures that a high energy **Propagating Brush Discharge*** cannot occur.



FIBC Static Discharge Testing

The only other type of electrostatic discharge that could occur from a Type B FIBC is a **Brush Discharge***. These can ignite many vapours and gases, and possibly, some very sensitive dusts (MIE<4mJ).

In general, Type B FIBCs can be used with, and in the presence of, flammable powders, subject to the following:

- Type B FIBCs must not be used in the presence of flammable vapours and gases, solvent-wet powders or particularly sensitive dusts – including the FIBC contents.
- If the FIBC contents are conducting, specialist advice may have to be sought since without proper control a powder-igniting **Spark Discharge*** could be possible.

TYPE C FIBCs

Type C FIBCs are most commonly made with interconnected conductive or dissipative yarns incorporated into the PP weave. These yarns should be parallel and not more than 20mm apart, or forming a grid of squares with sides not more than 50mm. Whichever pattern is used, at no point must the dissipative yarns have a resistance to a clearly marked earthing point of more than $10^8\Omega$.

Liners in Type C FIBCs must be static dissipative, and electrically connected to the dissipative yarns *at all times*.

Dissipative coatings may be used provided they are in good electrical contact with the dissipative yarns. Insulating coatings may be used provided that:

- The breakdown voltage between the coating surface and the dissipative yarns does not exceed 4kV, and

- The coating does not prevent any liner being electrically connected to the dissipative yarns, and
- The coating is less than 2mm thick, or less than 0.2mm thick if Group IIC gases are present.

Provided the above are all complied with, and they are properly earthed throughout filling and emptying operations, Type C FIBCs can be used in the presence of flammable gases, vapours and dusts, subject to the General Considerations below and especially the reference to unusually sensitive gases and vapours.

TYPE D FIBCS

Type D FIBCs usually reduce static charge by **Corona*** from unconnected dissipative yarns or fibres, and/or limit discharge energy by the use of dissipative coatings. Type D FIBCs have the advantage that they do not need earthing.

Dissipative liners can be used with Type D FIBCs.

There are no simple measurements that can be made to assess a Type D FIBC. They *must* have been tested in full-scale trials before being used.

Type D FIBCs are suitable for use in the presence of flammable gases, vapours and powders. Suitability for use with different gas groups will depend on full scale test data.

GENERAL CONSIDERATIONS

Before selecting an FIBC the MIE of all materials present must be known. For powders this must include a sample of the fines of the actual powder being handled.

Documentation prepared during Hazardous Area Classification, a legal requirement under UK and European regulations (DSEAR / ATEX 137), will provide much of the information required for FIBC selection.

If there is any uncertainty about the suitability of an FIBC and liner, a process-specific assessment is essential.

Process-specific assessments should also be undertaken if unusually sensitive gases and vapours may be present, or if unusually high charge levels are expected or observed.

If FIBCs are being filled with highly charged insulating powders or granules, consideration must also be given to **Cone Discharges***, which can occur in all FIBCs, including Types C and D.

Incorrectly used FIBCs such as Type C FIBCs when not earthed or Type D FIBCs with damp patches or similar contamination, can be as hazardous as using the wrong FIBC, so appropriate procedures must be in place.

* ELECTROSTATIC DISCHARGES

Spark Discharges occur between conductors. They are relatively energetic and can ignite many flammable gases, vapours and powders.

Brush Discharges occur from insulators. They are of low energy, but still able to ignite many flammable gases and vapours.

Propagating Brush Discharges occur from highly charged thin insulating layers backed by a conductor. These can ignite most flammable atmospheres.

Cone Discharges occur across the surface of an accumulating heap of charged insulating powder. They can ignite flammable gases and vapours, and some flammable dusts.

Corona Discharge is a low energy discharge that occurs from sharp points and fibres.

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