

LiVSafe is a conscious safety initiative of Liberty Videocon to help people live safer, secure lives through an education series of proactive and preventative suggestions in the safety arena. This document does not purport to promote any product directly or indirectly.

## Measures to augment safety from static electricity hazards at workplace

### Overview

Nearly everyone recognises that the phenomena of static electricity, which occur mainly when the atmosphere is very dry, particularly in winter. The most common experiences of static electricity are the crackling and clinging of fabrics as they are removed from a clothes dryer, or the electric shock felt when touching a metal object after walking across a carpeted floor, or stepping out of an automobile. In many industries, particularly those where combustible materials are handled, static electricity can cause fires or explosions and create a major hazard.

We at Liberty Videocon General Insurance value the safety of your assets and workers at your workplace; and intend to suggest some effective ways to control hazards emanating from static electricity. We sincerely hope that the measures suggested in this document will help in achieving great deal of safety and protection at your place of work from static electricity hazards.



### How is static electricity generated?

Matter is composed of atoms that consist of negatively charged electrons circulating about a positively charged nucleus. When the surface electrons of a material are disturbed, an imbalance of negative and positive charges arises between the inter-acting surfaces, and results in the phenomenon known as static electricity.

On an earthed conducting material, the charge flows away so rapidly after separation that it cannot be detected. However, if the material is a non-conductor, or a perfectly insulated conductor, the electric charge cannot leak away. As this charge is unable to flow, it accumulates on the object.

### Common Hazards

- Ignition of flammable vapours or powders
- Unexpected shocks in humans that might result in injury caused by involuntary impulse action
- Industrial handling problems such as uninvited adhesion or repulsion of sheet paper in the printing industry
- Damage to delicate integrated circuits by the presence of high static voltages
- Blocking of powders and dusts being conveyed in pipes

### Examples

Examples of typical situations likely to produce static electricity are:

- The use of insulated conveyor belts moving over pulleys and rollers.
- Crushed materials or dusts passing through chutes or being conveyed pneumatically
- The flow of fluids through pipes or conduits, or from orifices into tanks or containers
- The flow of gases from orifices
- The general accumulation of static charge on personnel in the work place.

## Case Study

On October 29, 2007, at about 1 p.m., a fire and series of explosions occurred at the Barton Solvents Des Moines, Iowa, chemical distribution facility. The initial fire started in the packaging area while a 300-gallon portable steel tank, known as a tote, was being filled with ethyl acetate, a flammable solvent. An operator placed the fill nozzle in the fill opening on top of the tote and suspended a steel weight on the nozzle to keep it in place. After opening the valve to begin the filling process, the operator walked across the room to do other work. As the tote was filling, he heard a 'popping' sound and turned to see the tote engulfed in flames and the fill nozzle lying on the floor discharging ethyl acetate. Fire spread rapidly to the wood-framed warehouse, igniting a large volume of flammable and combustible liquids.

### Key Learning

- Ensure that equipment such as fill nozzles and hoses are

bonded and grounded and designed for flammable service. *(The fill nozzle and hose used at Barton were not designed to be bonded and grounded, and were not intended for flammable service.)*

- Use bonded and grounded metal dip pipes when top-filling portable tanks. *(Although the lack of a dip pipe for filling the tank was not a cause in this incident, use of grounded metallic dip pipes is recommended by NFPA 77.)*
- Install fire suppression systems in flammable packaging areas. *(A fire suppression system in the packaging area likely would have stopped the rapid spread of the fire to the warehouse.)*
- Separate flammable packaging from bulk storage areas. *(Proper separation from the warehouse by fire-rated walls and doors would have helped prevent the fire from spreading to the warehouse.)*

## Static Charge Control Tips

### General

- Bonding and earthing metal components are generally the single most effective means of control
- Conductive flooring and footwear should be provided wherever an easily ignitable atmosphere may exist, as static charge can accumulate on the human body
- Fabric containing synthetic fibres should not be removed within the area of potential hazard
- Workers should be provided with training under safe working practices with flammable products

### Liquids

Static charge generation in liquid is commonly caused by operations liquid flow through pipes, mixing, pumping, filtering, agitating, by pouring a liquid from one container to another.

- Fill pipes should extend almost to the bottom of the tank or enter from below to minimise mist formation
- Limit the velocity of liquids in pipelines to below 1 m/sec, this can also be achieved by using larger diameter pipe. This will generally reduce the formation of static electricity to non-hazardous levels.

### Moving Belts

- Use conductive material like metal rollers in the belting. This allows the charges to dissipate as fast as they are formed.
- Make belts conductive by incorporating interwoven wires, or by the addition of carbon to the belt material during manufacture.

### Electrostatic Paint and Powder Application

- Ensure the article being painted and all metallic equipment in and within 2 meters of the booth are adequately earthed.
- Ensure the floor and soles of the operators' footwear are conducting.

### Combustible Dusts

Most industrial processes producing dusts, e.g. sieving, pouring, conveying and grinding, result in the build-up of static charges. Charged clouds of dust settling upon insulated surfaces can cause appreciable accumulations of static charge.

- All equipment producing, collecting and transporting dusts such as grinders, conveyors and hoppers should be constructed from metal and be bonded and earthed.
- Industrial systems handling combustible dusts also must be protected against the possible effects of an explosion. The most commonly employed protection method is to fit explosion relief vents of adequate area.

## Facts

- Static electricity travels at the speed of light -- more than 1,86,000 miles per second!
- A spark of static electricity can measure up to 3,000 volts.



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