CDI Best Practice:

Managing Electrostatic Hazards in the Collection of Liquids in Portable Containers

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1. Introduction

In noting the wide and varied differences in practices regarding how electrostatic hazards are managed when collecting liquids in portable containers and the continuing number of related incidents and accidents that are occurring e.g.

a) Draining cargo lines into portable containers.
b) Draining cargo lines into the manifold drip tray.
c) Sampling and gauging.
d) Adding substances.

CDI believes that setting out common best practices will be beneficial in enhancing safety on board vessels handling chemicals.

2. Aims/Objectives

The aim of this document is to provide best practice information for managing electrostatic hazards when collecting liquids in portable containers to enhance procedural safety.

3. Scope

1) The scope of this paper is aimed at vessels crew, that may get involved in activities related to the collecting of liquids in portable containers and aims to raise awareness on risks and controls that do not exist in other maritime industry publications, to provide guidance;
   - regarding the different types of products,
   - their related conductivity,
   - the type of portable container required,
   - guidance regarding how to mitigate associated electrostatic risks when filling/transferring liquid substances into portable containers on board vessels.

Remark: In the event the activity includes transfer between vessel and shore, necessary precautions as per ISGOTT on preventing stray currents causing ignition should be taken into account.

2) This document does not override any requirements by national or local regulations, nor those specified by competent authorities, terminal or local port authorities or a company's Standard Operating Procedures (SOP) or Safety Management System (SMS).

4. Terminology and Definitions

1) For the purpose of this document, the term "portable container" will be used to address all of these types of containers including:
   a) Non-conductive containers <5ltrs.
   b) Non-conductive containers (e.g. made of insulated plastic).
   c) Conductive containers or containers made of conductive or dissipative plastic.
   d) Non-conductive containers wrapped in a conductive grid e.g. Intermediate Bulk Containers (IBCs).

2) IEC Definition of Hazardous Zones.

Zone 0	An area in which an explosive mixture is present continually or for long periods. e.g. cofferdam with cargo pipe flanges.
Zone 1	An area in which an explosive mixture is likely to occur in normal operation e.g. hold space containing independent cargo tank, cargo pump room, areas on deck within 3m of a manifold valve or pipe flange.
Zone 2	An area in which an explosive mixture is not likely to occur in normal operation and if it occurs, it will be infrequently and will exist only for a short time. e.g. area on open cargo deck.

3) Flammable liquid - For purposes of this document, "Flammable" liquids are defined as those which have a flashpoint of <60 °C, or any liquid with a flashpoint ≥ 60 °C that are handled at a temperature within 10 °C of its flashpoint or higher.

4) Conductivity - the degree to which a specified material conducts electricity, hence a measure on how quickly charge can dissipate to an earthed conductor.

5) Non-conductive liquids are liquids with a conductivity of 50 pS/m or lower (e.g. gasoline, kerosene, white oils, lubricating oils, Natural Gas Liquids (NGLs). For some chemicals, which have relative permittivity > 2.5, these will have a longer relaxation time and therefore a higher threshold for low conductivity is used < 100 pS/m (e.g. diethyl ether, Butyl stearate – see NFPA77 for a longer list). If the relative permittivity of a liquid is unknown, then the higher threshold of 100 pS/m is used.

5. Roles and responsibilities

1) The Person-in-Charge should carry out the operations as per procedures provided by the company.

2) These procedures should be based upon a risk assessment and include guidance on managing electrostatic hazards when using portable containers.

6. Hazard identification

Build-up of electrostatic charge to cause a spark with sufficient energy that it ignites flammable atmospheres.

7. Examples of Static Electricity Fires/ Accidents/Near Miss

- A flash fire occurred at the ship shore interface when draining a product into a non-conductive half drum where static electricity was not managed.
- During a line clearing activity, product was collected into several 200 litre non-conductive plastic drums onboard a ship. No appropriate precautions for the management of the static electricity were in place; this could have resulted in ignition.
- There are a number of industry wide fires that have occurred when using portable containers where static electricity risks was not managed.

8. Recommended Best Practices

1) The table in Annex 1, summarises some best practices from the industry standard IEC/TS 60079-32-1 for managing electrostatic hazards and shows how the principles from these best practices may be applied to discharging liquids into portable containers located onboard a vessel. The table in Annex 1 is NOT an exhaustive list of all precautions that should be taken prior to such activity. It is intended to be a discussion tool regarding what measures might be advisable. You should always conduct your own risk assessment of what safety measures are required for your specific operations, taking into consideration the equipment in the area and risk related to sources of electrostatic or electrical hazards.

2) Unless otherwise specified, this table assumes the containers into which product is being handled are located in Zone 2 on the deck of a vessel.

3) In the use of non-conductive Intermediate Bulk Containers (IBCs), the Gas Group of the product should be taken into consideration (Ref. IEC/TS 60079-32-1 Explosive Atmospheres - Electrostatic Hazards). IBCs with a cage type enclosure may be used for Gas Group IIA and conductive liquids; for other Gas Group IIB vapours there should be a continuous dissipative or conductive outer surface; for Gas Group IIC vapours, only dissipative or conductive containers may be used. (When liquids are being loaded into IBCs within a zone 1 area of a vessel, the IBC should be certified for Zone 1).

9. References

ISGOTT

IEC/TS 60079-32-1

NFPA77

10. Disclaimer

Type of Product Being Discharged	ANNEX 1 Type of Portable Container			
	Non-conductive container <5L	*Non-conductive containers (e.g. made of insulated plastic)*	*Conductive containers or containers made of conductive or dissipative plastic*	*Non-conductive containers wrapped in a conductive grid- e.g., intermediate bulk containers ("IBCs")*
Non-flammable liquid (whether or not conductive)	Suitable for this type of product	- Ensure no charging mechanisms to outside of container - Earth and bond all conductive and dissipative components - Hoses should be conductive or dissipative - Ensure conductive path exists between the liquid, earth and the transfer system for all levels of fill, e.g. a long metal spout or pipe or a grounding rod extending to the bottom of the container. - Avoid operations that generate additional static (e.g. 2 phase flow, splashing, rubbing)	- Earth and bond all conductive and dissipative components - Hoses should be conductive or dissipative.	- Earth and bond all conductive and dissipative components - Hoses should be conductive or dissipative, - Ensure conductive path exists between the liquid, earth and the transfer system for all levels of fill, e.g., a long metal spout or pipe or a grounding rod extending to the bottom of the container.
Flammable and conductive liquid	Suitable for this type of product	Not Recommended	See above for non-flammable liquid	- Gas Group[1] of the product should be considered - Earth and bond all conductive and dissipative components - Ensure conductive path exists between the liquid, earth and the transfer system for all levels of fill, e.g. a long metal spout or pipe or a grounding rod extending to the bottom of the container.
Flammable and non-conductive liquid	Not recommended . Either use a metallic container or non-conductive container <1 litre.	Not Recommended	- See above for non-flammable liquid - Allow the liquid to settle for relaxation of any static charge before handling liquid, e.g. sampling/gauging	- Gas Group[1] of the product should be considered - Earth and bond all conductive and dissipative components - Hoses should be conductive or dissipative - Ensure conductive path exists between the liquid, earth and the transfer system for all levels of fill, e.g. a long metal spout or pipe or a grounding rod extending to the bottom of the container. - Allow 30s relaxation before handling liquid, e.g. sampling/ gauging
Liquids being loaded into containers on Zone 1 of a vessel	Same guidelines for the type of product as for Zone 2 listed above	Not Recommended	Same guidelines for the type of product as for Zone 2 listed above	IBC should be Zone 1 certified