



Transport and Storage of Propellants: Procedure 1

BULK OFFLOADING OF ZEPHEX® PROPELLANTS

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Introduction

A procedure for the bulk offloading of ZEPHEX® propellants will always need to be fine tuned for the particular installation to which it applies. Particular details, such as valve numbers, will typically need to be included to ensure the maximum clarity for those responsible for operating the procedure. The outline procedure given below describes the main activities and the precautions to be taken. In the event of any doubt, further advice should be sought from Mexichem Fluor Transport Engineers.

1 General

The connections on ISO tank containers are to the following designs:

Liquid discharge valve: 2 inch ASA 150 flange

Vapour balance valve: 1 inch ASA 150 flange

Connections are made between the delivery tank and the bulk storage tank by means of flexible hoses. The liquid discharge hose is 2 inch nominal bore; this is connected to the ISO tank container liquid outlet flange and the liquid fill valve on the bulk storage installation. The vapour balance hose is 1 inch nominal bore; this is connected to the vapour balance valves on the ISO tank container and the bulk storage installation.

The services of a fitter, or other skilled person, are required to make tight connections with the flanged joints.

In addition to the visible liquid discharge and the vapour balance valves, the ISO tank containers are also equipped with internal plug valves, which must be opened to enable the delivered load to be

discharged. These internal plug valves have excess flow devices fitted to both the liquid outlet and vapour balance valves; these can cause problems on discharge if the discharge procedure is not followed.

2 Safety Precautions

Whilst ZEPHEX® propellants have a very low order of toxicity and are non-flammable on leakage to atmosphere, there are still safety and handling issues which need to be understood. These are outlined below, but details of these and advice regarding personal protection are contained in the relevant Chemical Safety Data Sheet which should be consulted before handling either ZEPHEX®134a or ZEPHEX®227ea.

Avoiding skin contact: The pressure in tanks storing ZEPHEX® propellants will be greater than atmospheric pressure and therefore in the event of a leak, liquid or gas can escape with some force. Contact with the liquid can cause local freezing of the skin and eyes. Therefore whenever there is the possibility that a particular operation could result in a discharge of either vapour or liquid, suitable thermal insulating gloves and eye/face protection must be worn. Particular care should be taken when removing blank flanges or caps, when valves are opened for the first time, when uncoupling hoses, and when disconnecting items of equipment.

Exposure to vapour: In common with other compounds of this class, inhalation of very high concentrations of the vapour, even for short periods of time, should be avoided since this may cause anaesthetic effects and asphyxiation. The vapour is heavier than air and in static, poorly ventilated situations or enclosed spaces may be slow to disperse. Anyone suffering from the effects of inhalation of the vapour should be moved to a well ventilated position and given relevant First Aid as described in the Chemical Safety Data Sheet.

Avoiding static: Liquid transfers between containers, and to and from systems, can result in static generation. Bulk liquid transfers should use metal braided hoses and an earth lead.

3 Discharge Procedure for ISO Tank Containers

3.1 Preliminary checks

The delivery documentation should be carefully checked by the customer to ensure that the correct grade/weight of product has been delivered. The customer should also check that the tamper proof tag seals are in place on the liquid and vapour outlet valves ('C' and 'D' on Figure 1) and that the tag numbers correspond to those on the Certificate of Analysis. The amount of Product already in the storage tank should also be checked to ensure that there is sufficient space in the tank to receive the full delivered load. In signing the Delivery Note

the customer accepts responsibility that the installation is fit and ready for the discharge to proceed.

3.2 Reconciling tank capacity with discharge quantity

It is necessary to ensure that the maximum quantity of product, which may be stored in the tank, is not exceeded.

As an illustration for ZEPHEX®134a:

Assuming a storage tank capacity of 25 000 litres, and a filling ratio of 1.07 for ZEPHEX®134a (determined from liquid density at 45 °C x 0.95), then the maximum quantity which may be safely stored in the tank is [1.07 x 25 000] kg, i.e. 26 750 kg. Similar calculations can be undertaken for tanks of a different capacity.

[It should be noted that 'filling ratios' may be defined by local regulation or standard; this should be ascertained.]

As an operating guide, the level of liquid in the storage tank for ZEPHEX® 134a should be at least 21 000 kg (21 metric tonnes) below its maximum level before an ISO tank container of ZEPHEX®134a is discharged, otherwise the tank may be overfilled. This assumes a maximum delivered weight in the ISO tank container of 21 000 kg (21 metric tonnes) of ZEPHEX®134a.

If the ISO tank container is known to contain less than its maximum capacity then a correspondingly smaller margin can be allowed.

The above illustration is for ZEPHEX®134a. Similar considerations apply to ZEPHEX®227ea, where the maximum delivered weight in the ISO tank container is up to 24 metric tonnes (24 000 kg).

3.3 Connecting the ISO tank container to the storage tank installation

Refer to Figure 1, showing the typical stock tank and delivery installation.

- 3.3.1 The ISO tank container should be berthed adjacent to the filling point, the wheels chocked and an earth lead connected between the ISO tank container and the storage tank.
- 3.3.2 Check that the valves in the inlet lines to the storage tank are closed.
- 3.3.3 Check that the valves in the vapour balance lines to the storage tank are closed.
- 3.3.4 Remove the blank flanges from the inlet and vapour balance hoses connected to the storage tank.

- 3.3.5 Check that the liquid outlet valve 'C' and the vapour balance valve 'D' on the ISO tank container are closed, and the cable linkages to the internal valves 'A' and 'B' are in the closed position. Remove the tamper proof tag seals from valves 'C' and 'D'.
- 3.3.6 Carefully remove the blank flanges from the liquid outlet and vapour balance lines on the ISO tank container.
- 3.3.7 Connect the vapour balance line hose to the vapour balance connection on the ISO tank container. Connect the liquid discharge hose to the liquid discharge connection on the ISO tank container.
- 3.3.8 Slowly pull out and secure the handles linked to valves 'A' and 'B'. This action opens both the internal valves ('A' and 'B') and excess flow valves on the liquid outlet and vapour balance lines on the tank container. Allow the pressure to equalise on both sides of the excess flow valves before proceeding further (at least 30 seconds).

See Figure 2 for the operating sequence for internal valves:

- (1) shows valves in the closed position,
- (2) pulling the handle A (B for the vapour valve) moves the lever via a cable link through 70 °. This opens the pilot valve allowing the pressure to equalise.
- (3) pressure has equalised across the valve and the valve fully opens.

The valve will remain closed at a differential pressure greater than 3 mbar.

3.4 Discharge

- 3.4.1 Wearing appropriate eye protection and gloves crack open momentarily both the liquid outlet valve and the vapour balance valves 'C' and 'D' on the ISO tank container and check that all the joints which have been made on the flexible hoses are leak tight. Cure any leaks that are found and confirm by further testing as necessary.
- 3.4.2 Open valves '5' and '6' in the vapour line to the storage tanks.
- 3.4.3 SLOWLY open the vapour balance valve 'D' on the ISO tank container.

Figure 1: Typical Stock Tank and Delivery Installation

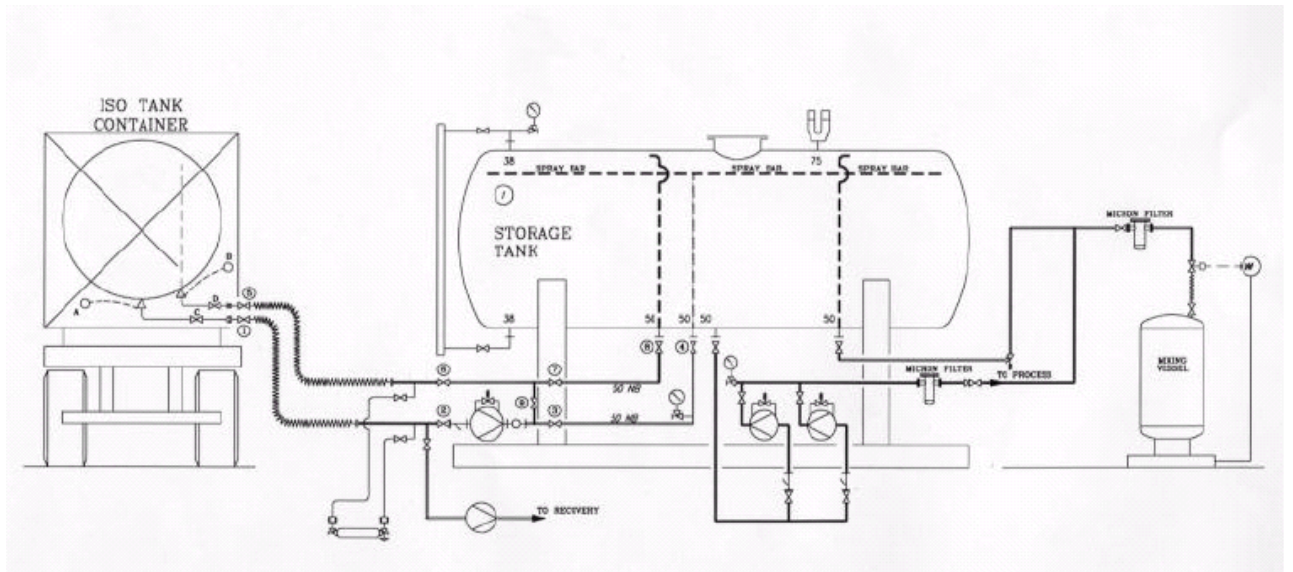
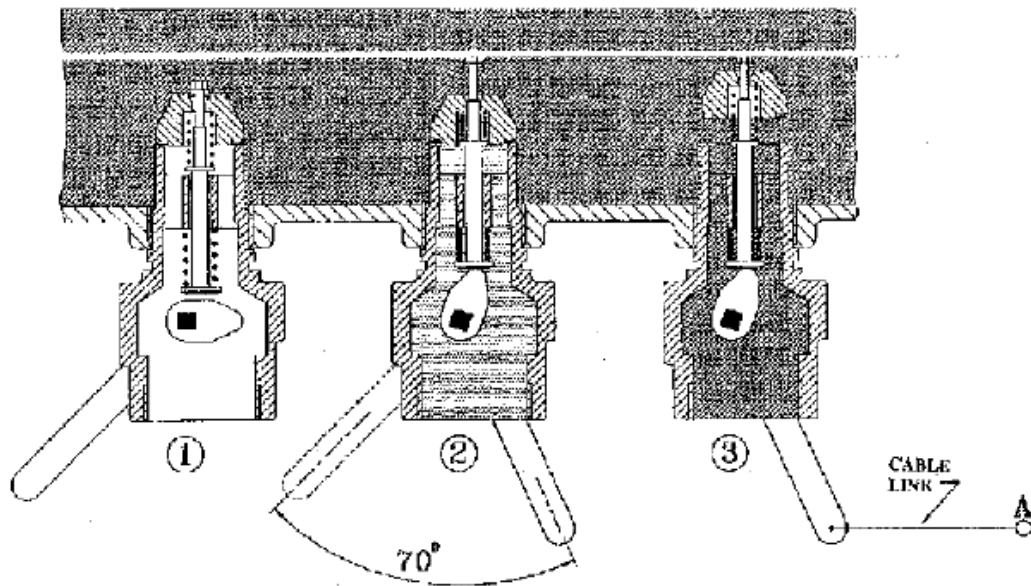


Figure 2: Internal Valve (Liquid Line)



- 3.4.4 Open valves '1' and '2' in the liquid inlet pipework to the storage tank, and valve '9' connecting the liquid and vapour lines to the storage tank.
- 3.4.5 SLOWLY open to halfway the liquid outlet valve 'C' on the ISO tank container. Wait at least 1 minute for the pressure to equalise and then fully open valve 'C'.

IT IS ESSENTIAL THAT THE EQUALISATION OF PRESSURE BETWEEN THE TANK CONTAINER AND THE OFF LOADING PUMP DELIVERY SIDE PIPEWORK IS ACHIEVED BEFORE STARTING THE PUMP OTHERWISE THE EXCESS FLOW VALVE IN THE INTERNAL VALVE MAY CLOSE.

- 3.4.6. Start the discharge pump and observe that the liquid flows through the sight glass in the liquid inlet line.

If the flow ceases, stop pump, and close internal valve 'A'. Wait for 1 minute and re-open valve 'A' and allow pressure to equalise. Then recommence discharge procedure as above. If problems persist carry out the checks in 3.4.7 and 3.4.8 below.

- 3.4.7 Check lever on internal valve has moved through 70 ° (see Figure 2).

The cable link could have stretched or broken.

There is a remote possibility that the pin securing the lever to the valve may have sheared; in this situation the lever would travel through 70 °, but not operate the valve.

- 3.4.8 If difficulty is still experienced then half close valve 'C', and half close valve '2'. Restart the pump and observe that liquid flows through the site glass.

Gradually fully open valve 'C', followed by valve '2', taking care that flow is not interrupted.

- 3.4.9 Recirculate product back into the ISO tank container for 15 minutes and take a sample of product. After sampling, stop the pump and close valve 'C' on the ISO tank container.

- 3.4.10 On confirmation of satisfactory analysis of the sample of product can be discharged into the storage tank. Close valve '9' connecting the liquid and vapour lines to the storage tank.

- 3.4.11 Open valve 'C' on the ISO tank container, valves '3' and '4' on the liquid inlet pipework to the stock tank and valves '7' and '8' in the vapour line to the stock tank.

- 3.4.12 Start the pump and stand by during the discharge of the contents of the ISO tank container. Be prepared to stop the discharge in the event of an emergency or abnormal occurrence e.g. extreme noise and vibration from the pump.

Should this occur the first action should be to STOP THE PUMP, then close the liquid outlet valve 'C' and vapour balance valve 'D' on the ISO tank container, followed by closing the inlet valves and vapour balance valves on the storage tank.

3.5 Completion of discharge

- 3.5.1 The end of the discharge can be noted by watching the flow of liquid through the sight glass and from the noise of the pump, which changes when all the liquid has been emptied.
- 3.5.2 The contents gauge on the stock tank will provide an approximate check on the quantity discharged from the ISO tank container providing no withdrawals from the stock tank have taken place during the discharge.
- 3.5.3 When the ISO tank container is considered empty, raise the liquid discharge hose two or three times to drain residual liquid from the hose.
- 3.5.4 When the hose is drained STOP THE DISCHARGE PUMP and close the valves in the liquid inlet line ('1', '2', '3' and '4'), and the valves in the vapour balance line ('5', '6', '7' and '8').
- 3.5.5 Close liquid outlet valve 'C' and the vapour balance valve 'D' on the ISO tank container.
- 3.5.6 Release the handles attached to valves 'A' and 'B' and allow the internal/excess flow valves to close automatically.

3.6 Disconnection of the ISO tank container

- 3.6.1 When all the valves have been closed, and wearing appropriate eye protection and gloves, cautiously slacken the joints connecting the liquid and vapour balance hoses to the ISO tank container. Allow only gas to escape, slowly.
- 3.6.2 When the gas escape ceases, disconnect both the liquid discharge hose and the vapour balance hose from the ISO tank container. Refit the blank flanges on the hoses and on the outlets of the tank container.
- 3.6.3 Check that all valves on the ISO tank container are closed and fit a new tamper proof tag seals to both the liquid and vapour valves 'C' and 'D' before it leaves the customer site.



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