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Code of Practice for isolation of a Display Cabinet evaporator from a Carbon Dioxide (R744) system

Introduction

This document is designed to provide guidance on the correct practice for Display Cabinet application on a system using Carbon Dioxide as a refrigerant. It is important to note the following…

1) This is assumed that the designer, installation, commissioning and maintenance engineer is correctly trained in the use of Carbon Dioxide (R744) as a refrigerant, and how to ensure that the components are selected to meet the correct Maximum Working Pressure.

2) There are a number of system types that may use Carbon Dioxide (R744) in a commercial refrigeration application. For frozen-food the normal system is sub-critical direct expansion in a cascade arrangement which uses an electronic expansion valve for refrigerant flow control. For chilled food the options are normally (a) a "pumped" indirect volatile evaporator system which uses a solenoid valve for refrigerant flow control (b) a transcritical direct expansion system which uses an electronic expansion valve for refrigerant flow control.

3) It is particularly important that the designer, installation, commissioning and maintenance engineer are fully aware of the safety aspects of this refrigerant, and have the correct maintenance equipment and suitable PPE and are trained in it's use.

Identification and general Good Practice

All ball valves on all display cabinets, coldroom evaporators and valves mounted above refrigerated bays will be colour coded along with the insulation to the valves. All feed ball valves and insulation will be yellow and all return ball valves and insulation will be blue.

Extreme caution must be taken when working on a carbon dioxide (R744) system. The following precautions when opening parts of a system must be followed.

Appropriate rated gauge manifold sets and hoses must be used by engineers servicing any part of a refrigeration system containing carbon dioxide (R744).

There will always be a requirement to open parts of a carbon dioxide (R744) system to service valves, filters and other components. Before starting this task, the engineer should familiarize him or herself with that part of the system to be serviced. The engineer should also consider the entire system and what affect the task about to be carried out will have on it. In particular the engineer shall consider if closing a stop valve will trap refrigerant between it and a control valve.

It will often be necessary to remove actuators to manually open motorized or solenoid valves before isolating part of a system. Control valves shall not be used as isolation valves.

Before starting, it is very important to remember that carbon dioxide (R744) liquid or vapour must never be trapped between valves at any time without ventilating. If for any reason the task cannot be completed, the isolated section must be opened back up to the rest of the system.

The section of the system being serviced should never be left unattended while venting. If this section of the system is in a confined space, precautions shall be taken to ensure the carbon dioxide (R744) does not reach a dangerous pressure, possibly by ventilation.

Always ensure the proper personal protective equipment (PPE) is being used for each task.

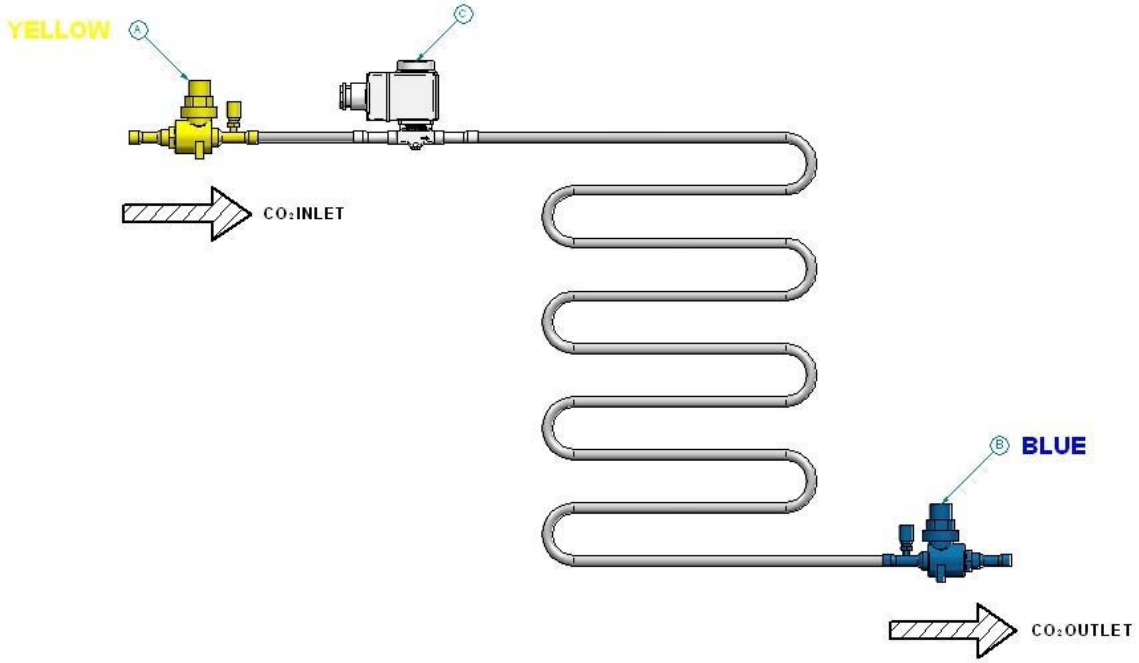
Screwed threads should be slackened slowly to ensure there is no pressure behind them before the threads are completely disengaged. This is more important with R744 because of the added risk of solid carbon dioxide (R744) trapping high pressure in a system that is open to atmosphere.

A problem with venting liquid carbon dioxide (R744) is that it will turn solid when the pressure falls below 4.2 Bar (G). Therefore it is essential to ensure that solid R744 does not block the vent valve. If possible a gauge should be fitted to a separate connection (from the vent connection) on the section of the system to be serviced to ensure it is properly vented and the vent valve hasn't just choked with solid carbon dioxide (R744).

Note: Solid carbon dioxide (R744) at atmospheric pressure could cause frost burns so gloves must be worn.

Venting of Display Cabinet Evaporators

When servicing or working on any evaporator, cold store or display case then the following procedure and sequence of events must be adhered to. The diagram below illustrates a typical coil detailing inlet / outlet ball valves and solenoid valves. Particular observation must be made with the position of the access port on the ball valves.



1) Mount a gauge to the access port on the ball valve ***B*** (Blue)

2) Isolate the inlet ball valve ***A*** (Yellow) whilst the control valve ***C*** (EEV type AKV 10) is open. Ensure the control valve is open using a permanent magnet

3) Allow the coil to pump out for 15 minutes

4) Isolate the evaporator coil outlet ball valve ***B*** (Blue)

5) Immediately proceed to vent refrigerant from the access port ***A*** whilst the pressure is being observed on the gauge.

6) Monitor the pressure in the coil at the coil outlet through service valve ***B***. This is essential to be sure the refrigerant has been fully removed and that the service valve ahead of the liquid control valve ***C*** (EEV type AKV 10) hasn't blocked with solid carbon dioxide (R744).

Note: With reference to the above step 3, an estimated time of fifteen minutes would be enough time to ensure a reasonably frost free coil with the fan running. When all frosting on the coil has stopped, the liquid has evaporated.