ModuLaser®

Aspirating Smoke Detector

UNIQUELY MODULAR. ENDLESSLY FLEXIBLE.

Aspirating Smoke Detection in Cold Storage Applications

TABLE OF CONTENTS

1 INTRODUCTION

Whenever there is a need to protect cold and / or humid environments with an aspirating detector, or for those areas where there may be a severe temperature gradient, consideration must be given to a series of factors that may not be specifically detailed in the installation requirements, but which may help us in minimizing future maintenance of the devices and reducing potential problems.

The aim of this document is to define a series of practices that are intended to help the installer / project engineer to design the most reliable installation for the identified conditions.

2 CONDENSATION & PIPE THERMAL ISOLATION

Although there are different causes that induce condensation, such as a high-pressure differential within the pipe layout or exposure to a humid environment, the biggest problem in aspiration technology comes from the condensation caused by the temperature differential.

When the aspirated air is heated, the increase in temperature causes an increase in the relative humidity of the air. When this moist air makes contact with a cold surface, condensation occurs. (Figure 1)

The goal, therefore, is to minimize temperature changes throughout the piping layout.

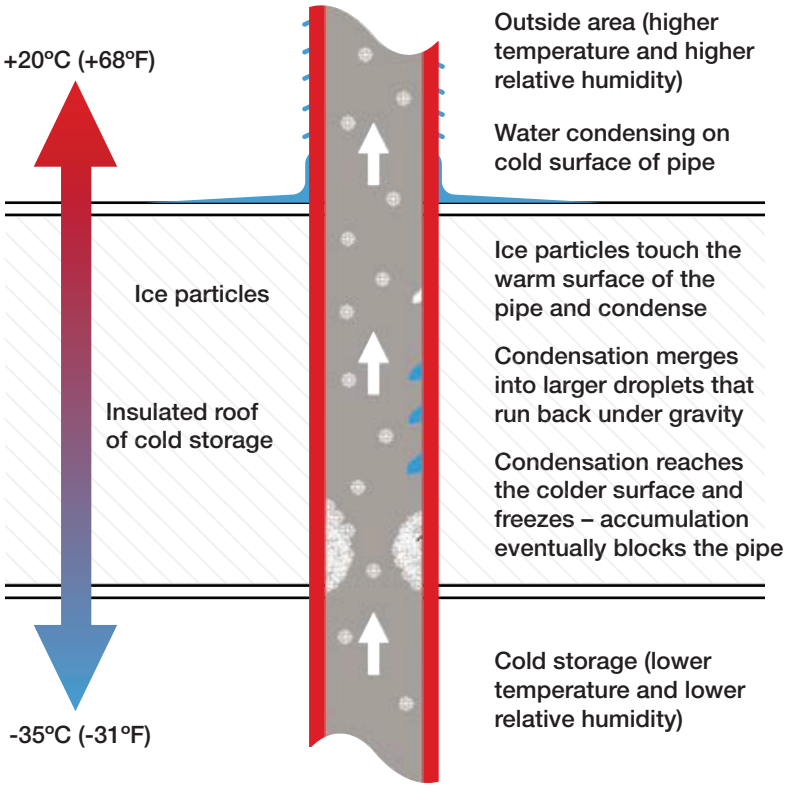


Figure 1. Causes of condensation in freezer applications

1. Whenever possible, it is recommended that the piping is run throughout an area where the environment is stable, so that the air aspirated from all the holes in the pipe network has a balanced temperature, as indicated in Figure 2. Condensation can form on the outside of the pipe due to temperature differences between the air inside and outside the pipe.

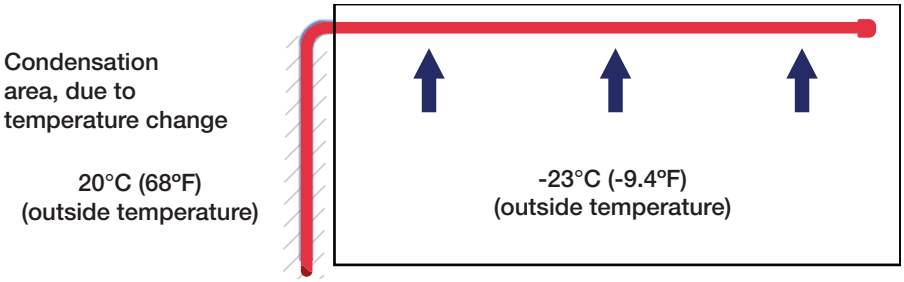


Figure 2. Pipe and sampling holes inside cold storage, detector outside

2. For maintenance reasons, where it is difficult to maintain the pipe network on the area being protected, it is possible to install the pipes outside the chamber, as shown in Figure 3.

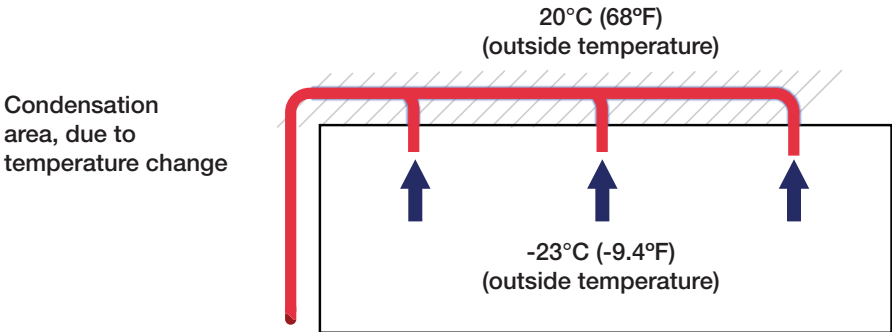


Figure 3. Pipe installed outside cold storage, sample holes inside

In this case, it is highly recommended to thermally insulate the pipe up to approximately 3.28 ft (1 meter) before the first hole (Figure 4). The objective of thermal insulation is to avoid a high temperature differential when mixing the air heated by thermal convection in the pipe and the air sucked from inside the chamber.

The same principle can be applied when the pipe is within the protected area. Insulation is recommended on the 6.56 ft (2 meters) of the pipe as it exits the cold area (Figure 5).

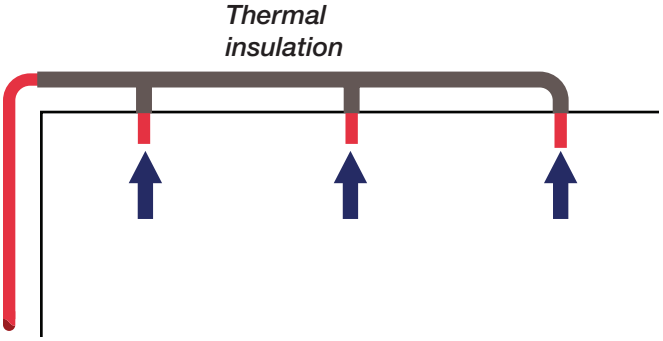


Figure 4. Thermal insulation when the pipe is installed outside the protected area

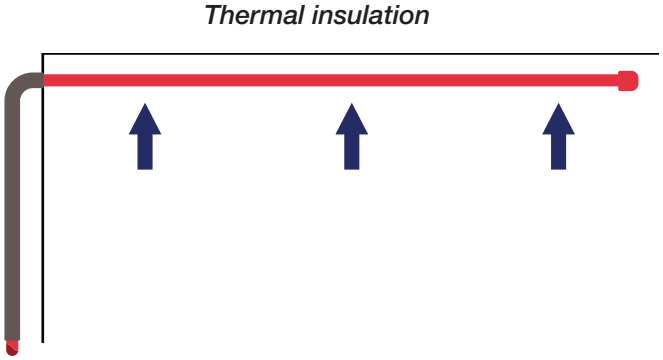


Figure 5. Thermal insulation when pipe is within protected area

3 CONDENSATION TRAPS

1. In an area where condensation is expected to form, pipes need to be installed with a minimum gradient of 1-1.5%, so that the water slides towards the trap (Figure 6).
2. To avoid possible condensation, the detector will be placed in an elevated place, so that the pipes slope upwards to the detector. Note that the detector will be placed with both air inlets and outlets at the bottom (Figure 7).

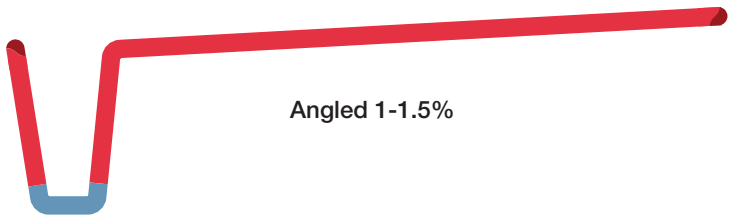
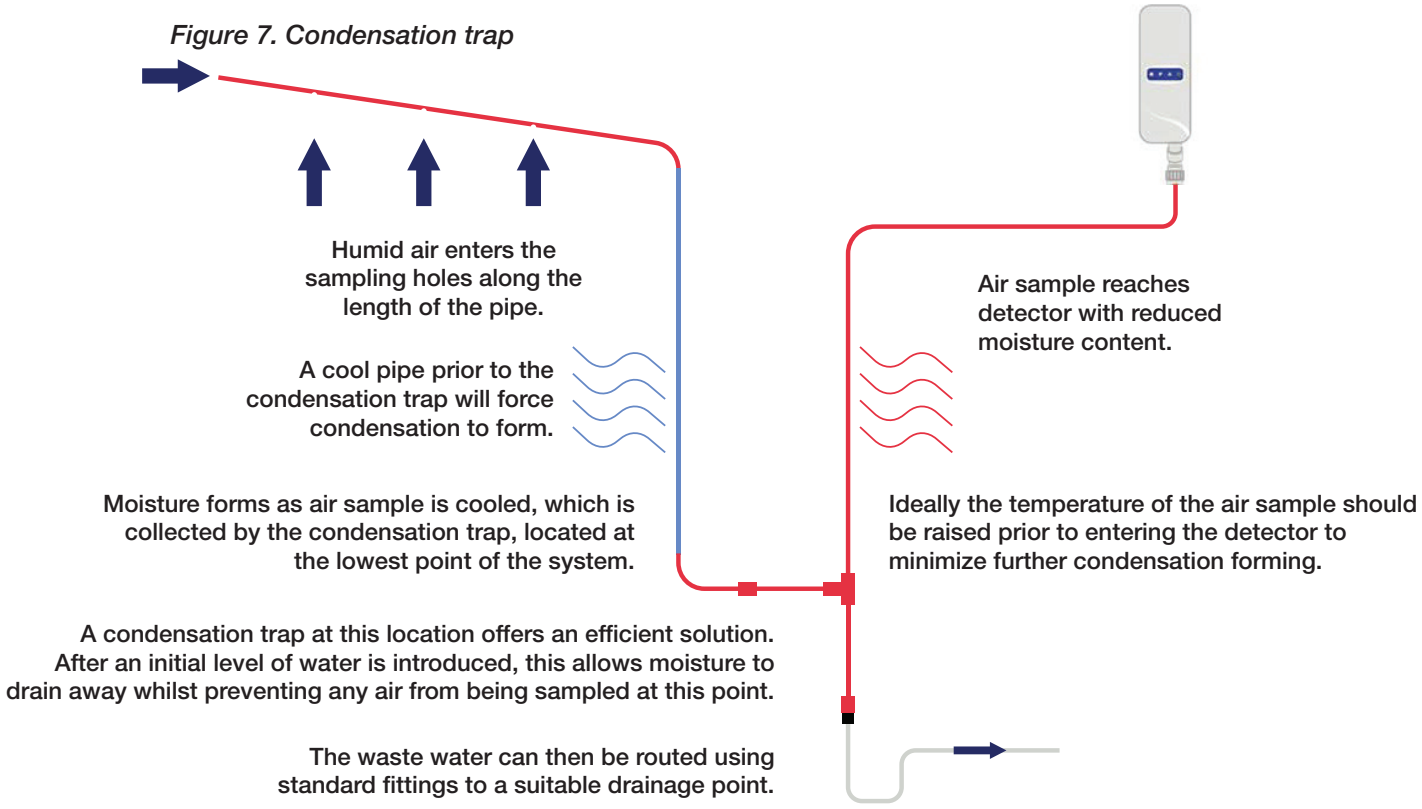


Figure 6. Condensation trap

3. If the detector is placed on one of the walls of the cold room, thermal insulation needs to be applied between the detector and the wall.
4. It is beneficial if the temperature of the air enters at the same temperature as that of the detector. To do this, either use a heater, or install enough length of pipe without insulation so that the internal air is heated by natural convection.

In the latter case, as long as the installation allows it, it will be possible to install the pipe with a serpentine-shape prior to the detector inlet (Figure 8). To do this, consider that these additional pipe sections must be taken into account in the calculations made by the PipeCAD software.

Figure 7. Condensation trap



4 HEATER BOX OR THERMAL CONVECTION

One should always try to ensure that the air entering the detector is at a temperature close to room temperature.

1. It is possible to apply natural convection using additional pipe to allow the air to warm naturally before entering the detector. The level of thermal convection that can be achieved depends on the external environmental temperature, the temperature of the aspirated air, the air flow speed, and the material of the pipe. The Edwards passive heater tool can be used to calculate the required pipe distance to warm the air through thermal convection (Figure 8).
2. In those places where there is not enough pipe length to apply thermal convection, an additional heater box can be installed, a short distance before the detector entrance, to condition the air (Figure 9). In this case, it is advisable to apply thermal insulation to the pipe.

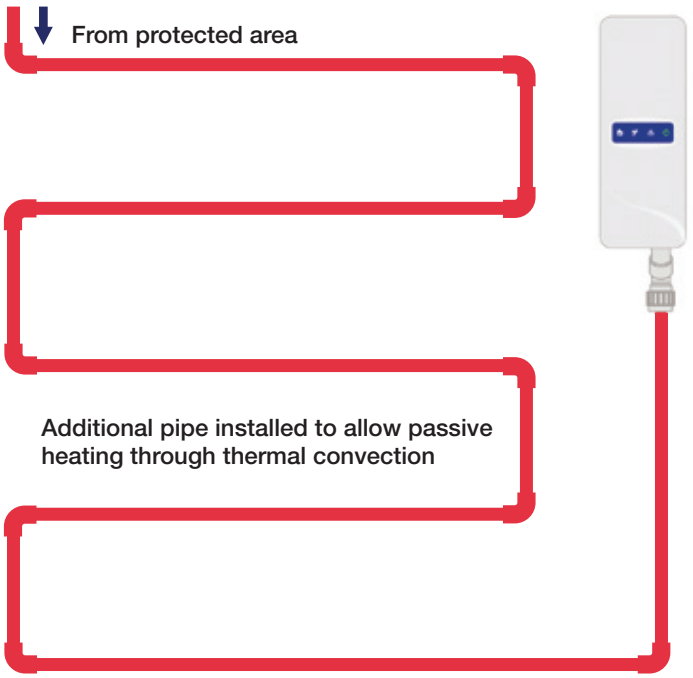
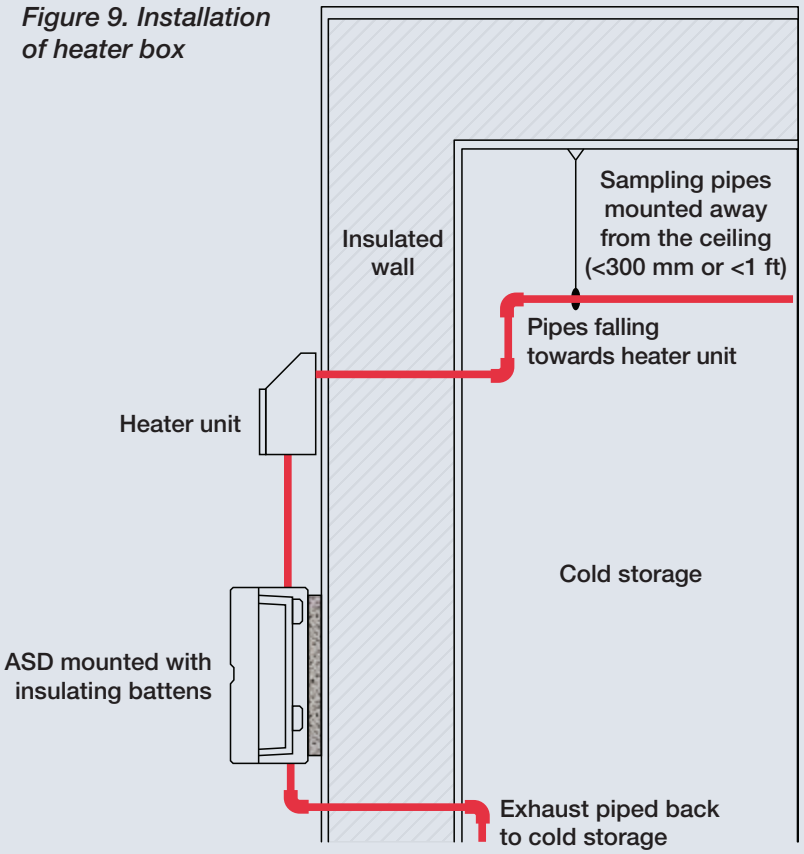


Figure 8. Additional pipe to provide convection warming of sampled air

Figure 9. Installation of heater box



5 PIPING INSTALLATION

Condensation and subsequent freezing often happens on those surfaces that are close to or in direct contact with the walls/ceiling of the chamber, due to the temperature gradient and heat convection.

1. In cold rooms, we recommend moving the piping away from surfaces by means of support clips at a minimum distance of 1 ft (or 30 cm).
2. Given that the ABS material contracts about 6 cm (2.36 in) for every 100 m (328 ft) for a temperature differential of 10ºC (50ºF), we recommend using a thermal expansion joint or flexible tube at least every 25 meters (82 ft) of pipe, which will be placed in a horizontal position, to absorb the expansion and contraction of the plastic (Figure 10).
3. It is advisable to add as much distance as possible from, or even avoid, the direct air currents applied by the conditioning machines, since these can expel extremely cold air (Figure 11).

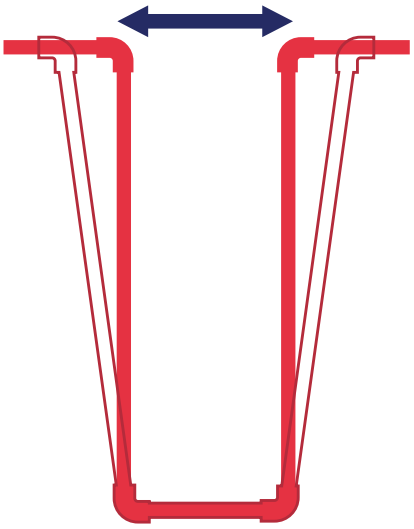


Figure 10. Thermal expansion / contraction join

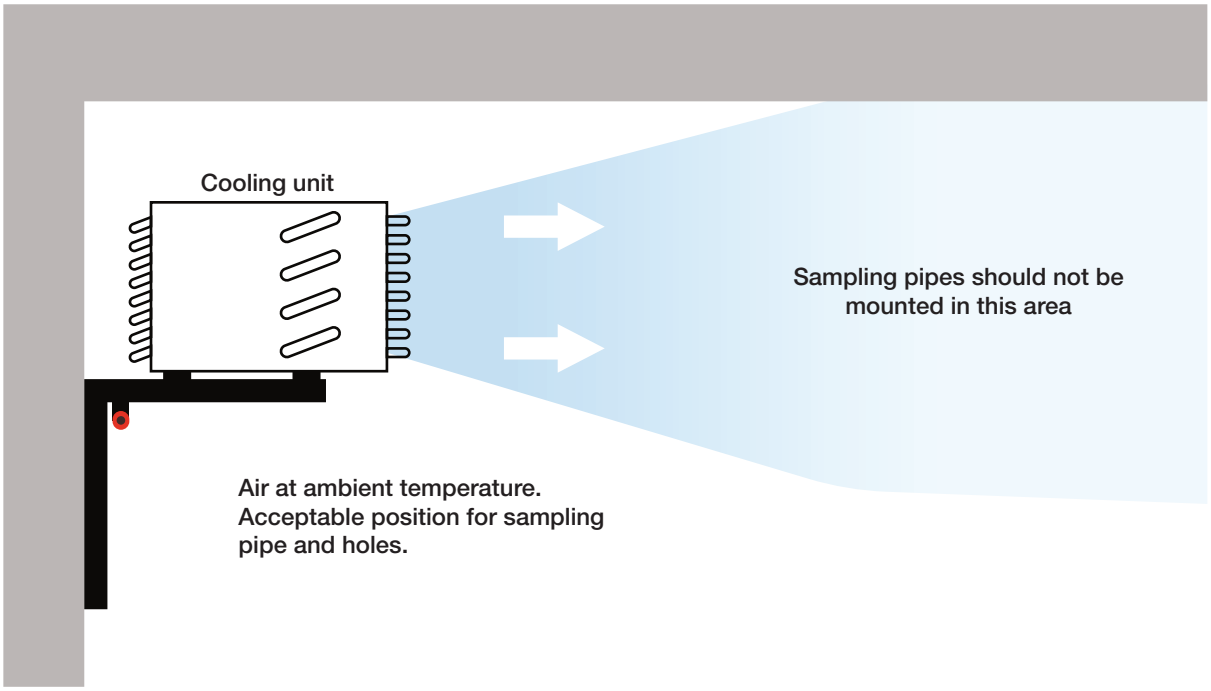


Figure 11. Locating pipes in cold storage

6 LOCATION OF SAMPLING HOLES

1. When drilling the holes in the main pipe, it is recommended to align them at an angle of 45º and not at the base of the pipe (Figure 12). This is to prevent any condensation from plugging the hole.
2. If the main pipe is outside the chamber, a conventional pipe should be used to enter the chamber, allowing a minimum distance of 30 cm (1 ft) from the ceiling. It is recommended that the use of capillaries is avoided, as the internal diameter is small and therefore any condensation can block the capillary tube.
3. To avoid total obstruction of the sample points, whenever possible and when calculations allow it, it is recommended that the holes are great than 3 mm (0.12 in). We always recommend relying on the hole sizes calculated by PipeCAD Software.

Figure 12.
Hole location

7 EXHAUST PIPE

The exhaust pipe allows the pressure to be balanced when the chamber pressure is different from the ambient pressure where the detector is located. In the event of a fire, the smoke will be transported to where the detector is.

1. Where there is a substantial pressure difference between the chamber to be protected and the area where the detector is located - for example, ducts or pressurized chambers - the exhaust pipe must return to the protected area to equalize the pressures.
2. If the detector is in an area sensitive to smoke transportation, an exhaust pipe must be installed either outside the area or to the same chamber being protected.
3. In any other situation, it is possible to avoid installing the exhaust pipe, always bearing in mind that it is recommended to use about 50 cm (20 in) of. pipe with a 90º radius bend at the end to facilitate air flow and avoid the introduction of contamination into the detector (Figure 13).
4. To minimize noise, it is recommended to face the outlet pipe towards the ground (Figure 14).

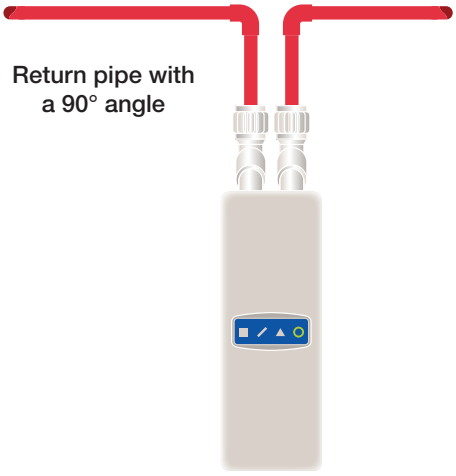


Figure 13. Exhaust pipe

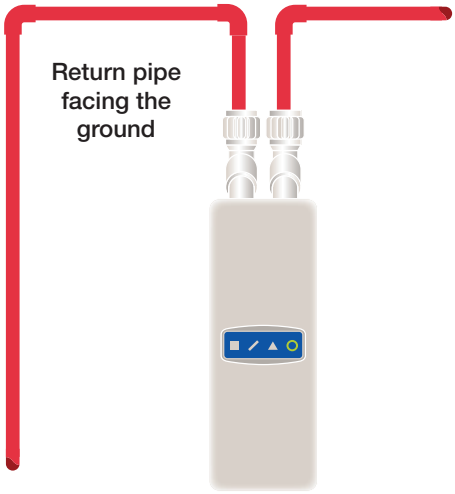


Figure 14. Exhaust pipe orientation to reduce noise

edwards.fire@carrier.com
edwardsfiresafety.com
8985 Town Center Parkway
Bradenton, FL 34202