

Annex IV – Carbon dioxide (CO₂, R744) Refrigerants in RACHP Systems Casualties (selected incidents)

CO₂ (R744) Refrigerants Casualties

There is no systematic monitoring of accidents due to thermodynamic systems (AC, HVAC, refrigeration, heat pumps, etc.) charged with CO₂ (carbon dioxide refrigerants R744 - also so-called "*natural refrigerant*"). Until now, fire brigades, emergency services and house insurances do not survey natural refrigerant casualties. Due to high operating pressure repair and disposal risks are considerably high due to human error.

CO₂ refrigeration units function at higher pressures, which can cause dangerous equipment ruptures and projections of metallic parts at high energy, potentially causing severe physical injuries. In addition, CO₂ is harmful when exposed to it for several hours at low concentrations (1-3%). At concentrations above 10% it may cause fatalities due to the lack of oxygen uptake potentially leading to suffocation and asphyxia.¹

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A non-exhaustive selection of accidents reported in the media, in the last two years, are set out below:

1) [CA man dies from CO2 gas leak in Los Angeles airport accident \(2022\)](#)

One of four workers who inhaled carbon dioxide in an accident at Los Angeles International Airport has died, his family said.

Cris Abraham, 36, of Lomita died on Nov. 11 at a hospital where he'd been in a medically induced coma, his sister-in-law Tamara Plouffe said on a GoFundMe page.

"The entire family has been devastated by his loss," she wrote.

The CO₂ was released on Oct. 31 in a utility room near a Terminal 8 baggage area, authorities said.

Abraham, a pipefitter, was one of four independent contractors working in the utility room. He was fixing a leaky pipe when a fire suppression system malfunctioned and spewed carbon dioxide, authorities said.

"The carbon dioxide displaces the oxygen in the individual's bloodstream and they went into cardiac arrest," fire Capt. Erik Scott said at the time.

Two men and a woman managed to quickly leave the room and were treated at the scene for minor complaints.

Abraham suffered repeated seizures at the hospital and was placed in a medical coma, his family told KTLA-TV.

He leaves behind a wife and two children.

<https://www.foxnews.com/us/ca-man-dies-co2-gas-leak-los-angeles-airport-accident.amp>

¹ [Safety first when choosing a refrigerant! EFCTC Factsheet on published refrigerant-related accidents.](#)

2) [Five injured in CO2 refrigerant leak \(14 April 2014\)](#)

GERMANY: Five people were slightly injured following a CO2 refrigerant leak at a supermarket in Laufach. Three people were treated at the scene and two men were taken to hospital after emergency services were called to the incident at the recently refurbished Tegut supermarket on Friday evening.

A local resident reported several loud explosions at the rear area of the supermarket and at the same time the fire alarm was triggered in the store. The store manager and his assistant ran to the externally mounted refrigeration system where a CO2 gas cloud had developed. The two employees, the local resident and two of his neighbours complained of breathing difficulties. The victims were treated at the scene and two were taken to hospital as a precaution.

The supermarket only reopened at the end of February following a major refurbishment which included the installation of the CO2 refrigeration system.

Tegut operates over 300 stores across Germany and signed a contract in 2010 to install CO2 systems in 50 of its stores. The chain was bought by Migros at the beginning of 2013.

<https://www.coolingpost.com/world-news/five-injured-in-co2-refrigerant-leak/>

3) [CO2 refrigeration thought to be involved in Tesco "explosion" \(2010\)](#)

Unconfirmed reports are suggesting that a CO2 refrigeration system was responsible for the 'explosion' at the Tesco Extra supermarket in Walkden, Greater Manchester, yesterday.

A spokesman at Greater Manchester Fire and Rescue confirmed that three appliances were called to the store after reports of an explosion. The store was evacuated and a number of people were treated for minor injuries.

Other sources have told ACR News that a CO2 system was used in the store and that a section of ruptured pipe had been isolated.

There has been no statement from Tesco, as yet, nor have they confirmed that a CO2 refrigeration system was involved. Eight people were treated by paramedics and four sent to hospital.

<https://www.acr-news.com/co2-refrigeration-thought-to-be-involved-in-tesco-explosion>

4) [CO2 buildup in vehicle cabins becoming a safety issue, 2017-04-17](#)

... CO2 effect on car crashes

Mathur noted several deaths recorded by the Arizona Dept. of Transportation were blamed on crashes from CO2 buildup affecting the driver. The attributions were validated by blood analysis of the crash victims, indicating the issue is real world.

Although he had no specific data, Mathur said that research also needs to consider possible contributions from carbon monoxide (CO). He observed that in recirculation there is no positive pressure in the cabin, so with exhaust and underbody seams leakage, CO can penetrate. The level would be subject to great variability based on the exhaust system and car. If it reaches a level of 30 ppm, it is likely to cause passenger headaches.

<https://www.sae.org/news/2017/04/co2-buildup-in-vehicle-cabins-becoming-a-safety-issue>