August 2021

Carbon Dioxide Exposure

BACKGROUND

A Fire Marshal and Building Inspector fell ill after becoming exposed to carbon dioxide (CO_2) while inspecting a restaurant.

INCIDENT DETAILS

Two members of the municipal Fire Marshal's office attempted to complete a building inspection of a local restaurant. The two officials – a Fire Marshal and a Building Inspector – both arrived at the local restaurant, made their introductions to the owner/manager on site to state their intentions, and were granted permission to proceed with their inspection. The team headed towards the basement to start their inspection. As they entered the basement, they were finding minor violations and taking notes. As they made their way to the opposite end of the basement, they noted a soda tap box system and an office across from them. The Marshal began to feel winded, like he "just ran around the building and up and down the stairs 10 times." They made their way roughly 10 feet back toward the way they originally came into the basement and stopped to write some notes; that is when the Marshal realized that things were getting worse.

While talking with the Inspector, the Marshal noticed he was not making a lot of sense in what he was saying and was becoming more winded and had a crushing feeling in his chest. The Marshal stated to the Inspector that he was embarrassed that he was really out of shape because he (the Inspector) was not having the reaction that the Marshal was at this point. The Marshal realized that there was an issue and excused himself to exit the basement; the Inspector decided to continue the inspection as to finalize the basement area. As the Marshal made it to about the halfway point to the exit on the first floor he noticed a change in the air and when he got outside, the symptoms subsided. That's when he realized something was wrong with the air in the basement.

The Marshal hastily re-entered the building, making his way back to the bar area where the owner was. The Marshal asked if the owner had been in the basement. The owner stated that he had. Then the Marshal asked if he had similar symptoms as the Marshal did. The owner replied yes, but blamed it on a cold he had been getting over. The Marshal made his way to the top of the stair and began to experience symptoms again and called for the Inspector, with no reply. He decided there was more of an issue and needed to have it checked out. The Marshal radioed dispatch and requested a full Haz-Mat response to the building. Crews responded and completed a rapid removal of the Inspector, who was in extreme respiratory distress and was transported to the local hospital. The building was metered to identify the unknown cause for the sudden on-set of illness. The engine crew made entry with full PPE and the 4 gas meter. Oxygen (O_2) levels in the basement were 17.2%. The crew(s) identified that the carbon dioxide (CO_2) tank on the outside of the business for the beer and soda had sustained a substantial leak. The tank was frosted 3/4's of the way up the tank and the leak was isolated and the building was ventilated.

INVESTIGATION AND LIABILITY ASSESSMENT

The Marshal and Inspector were admitted to the hospital for respiratory distress issues and held overnight for observation and released the next day. The two were relieved from their duties for two additional days until a medical clearance was obtained.

In the investigation report, it was noted that carbon dioxide (CO_2) gas is heavier than air and has a displacement factor for breathing air. As the line that went from the tank to the basement beverage system became compromised over time, the basement, with insufficient ventilation over time accumulated the gas (CO_2) displacing the breathing air (O_2) from the standard 19-20% to as low as 17.2%. Although this is a 1.8% drop in normal breathing air, it was enough to create mild confusion and respiratory compromise.

Common symptoms of carbon dioxide toxicity include: nausea, vomiting, dizziness, headache, rapid breathing and heart rate, and flushing. Severe cases of carbon dioxide Toxicity progress to confusion, convulsions, and loss of consciousness. Treatment for people with carbon dioxide toxicity as follows: administration of fresh air or oxygen and allow the person to rest.

CIRMA is 100% responsible for this work-related incident. The total direct cost of these two claims, including medical expenses, equaled $41,500.

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KEY RECOMMENDATIONS / ACTION ITEMS

The CIRMA Fire Services Task Force has recommended the following to help reduce liability.

- Consider implementing a policy stating that all inspections be performed by a minimum of two persons.
- Use metering devices when entering confined space or basement areas.
- Obtain a detailed pre-inspection report of the facility from the owner(s) point of view.
- Develop a general knowledge of what type of equipment is in basement and other underground- or low-level areas prior to enter.

Questions on this topic? Ask your Supervisor or CIRMA Risk Management Consultant at (203) 946-3700.

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