

Carbon Monoxide Poisoning Tracked to Faulty Pool Heater

Q-TRAK™ IAQ Monitor Case Study #1

Background

A routine morning at a Denver hotel quickly turned into an emergency situation when housekeeping staff discovered an unconscious guest in a second-floor room. An immediate call to 911 alerted the local fire/rescue team. As the team arrived on the scene, housekeepers found a second unconscious guest in another, third-floor room directly above the first. A third victim was then discovered in an adjacent second-floor room.

At first, the investigation was treated as a simple medical call, but when more victims were identified, emergency personnel and hotel management quickly responded to the severity of the situation. The staff immediately evacuated all guests to nearby hotels. In all, four guests and two employees were transported to local hospitals for further evaluation and treatment. Initial examination at the hospital suggested symptoms much like meningitis. Blood gas analysis revealed carbon monoxide poisoning, indicated by high levels of carboxyhemoglobin.

Investigation

Once the guests and workers were safe, emergency personnel began their investigation. Firefighters quickly surveyed the two-wing, three-story building, noting that each guestroom was served by its own electric heating/cooling unit. The units were pulling air from the corridors, which were served by a separate HVAC system.

Suspecting high levels of poisonous gas, the fire department used a multi-gas meter to check for high gas levels. The instrument indicated high levels of carbon monoxide, but its slow response and recovery times made locating the source extremely difficult.

After several hours of inconclusive investigation, a Tri-County Health Department industrial hygienist arrived on the scene. Instead of a multi-gas detector, he used a Q-TRAK™ IAQ Monitor. Known for its rapid response time, the monitor quickly confirmed higher-than-normal CO levels.



To identify the source of the CO, the industrial hygienist and Fire Chief methodically used the Q-TRAK monitor to collect data on CO levels. The heating units in affected rooms contained approximately 50 parts per million (ppm) CO, compared to the recommended exposure limit of 9 ppm for a period not to exceed 8 hours.¹ As they moved into the corridor, CO levels jumped to 300 ppm, indicating that the corridor was a source or pathway for the high CO levels. The industrial hygienist then checked some gas-fired water heaters, found acceptable CO levels, eliminated the water heaters as the CO source and continued the investigation.

Carbon monoxide levels rose as they walked farther down the corridor. With the rapid response of the Q-TRAK monitor, the hall ventilation systems were quickly confirmed as a source or pathway of the high CO concentrations. With this information, the Fire Chief then narrowed the source down to a first-floor room containing the heater for the hotel swimming pool. Here, CO levels exceeded 1,000 ppm. The CO was highest at two vent louvers located on the heater flue.

A careful examination of the heater revealed the cause of the high CO levels. The exhaust flue was neither ideally installed nor operating properly. Because the fan of the powered exhaust stack was not functioning, exhaust CO was flowing through the vent louvers in the flue and into the room. In addition, a general room exhaust fan designed to keep the pool heater room under negative air pressure was not operating at the time of the incident.

¹EPA National Ambient Air Quality Standards; State of Colorado Ambient Air Quality Standards.

From the heater room, high levels of CO moved through wall spaces to the second- and third-floor rooms. In addition, CO followed a secondary pathway which included the hall ventilation system and then the corridor itself. From there, the CO was pulled into the guestrooms by the individual heating/cooling units. In addition, the relatively positive pressure within the heater room caused a pressure gradient that moved CO toward the guestrooms and into the hall ventilation system.

Conclusion

A critical investigation was quickly concluded by choosing an instrument with the appropriate technology. With the rapid response of the Q-TRAK monitor's sensors, investigators were able to confirm the high CO levels and to locate their source. Once the exact cause was pinpointed, CO levels were controlled and appropriate action was taken to prevent a reoccurrence. Hotel management reopened the hotel for business as usual the following day.



TSI Incorporated - 500 Cardigan Road, Shoreview, MN 55126-3996 USA
USA Tel: +1 800 874 2811 E-mail: info@tsi.com Website: www.tsi.com
UK Tel: +44 149 4 459200 E-mail: tsiuk@tsi.com Website: www.tsiinc.co.uk
France Tel: +33 491 11 87 64 E-mail: tsifrance@tsi.com Website: www.tsiinc.fr
Germany Tel: +49 241 523030 E-mail: tsigmbh@tsi.com Website: www.tsiinc.de
India Tel: +91 80 41132470 E-mail: tsi-india@tsi.com
China Tel: +86 10 8260 1595 E-mail: tsibeijing@tsi.com
Singapore Tel: +65 6595 6388 E-mail: tsi-singapore@tsi.com



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