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INFORMATIONAL BULLETIN

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2011-02	TOXIC FUMES AT INDOOR ICE RINKS			FEBRUARY 17, 2011
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Toxic Fumes at Indoor Ice Rinks

In recent months New Hampshire has experienced adverse indoor air quality associated with toxic fumes in ice rinks. The toxic atmospheric chemicals involved were Nitrogen Dioxide (NO2) and Carbon Monoxide (CO). In some cases individuals were transported to local hospitals for treatment. These incidents continue to emphasize the need for daily review and immediate corrective actions on air handling systems located in the facility. Air handling units are an integral part in the minimization of toxic fumes inside the facility. The State of New Hampshire currently has no mandatory requirements for air quality control in ice rinks. However, this information was gathered from best practices used in other states where there are mandatory requirements and it is highly recommended that these practices be followed.

Carbon Monoxide (CO) is a colorless, odorless gas that can cause headaches, dizziness, and nausea. Exposure at high levels can cause death. Nitrogen Dioxide (NO2) is a toxic gas that can cause irritation to the eyes, nose and throat as well as shortness of breath. Poor indoor air quality in indoor ice rinks can cause potentially dangerous health hazards to the occupants from exposure to carbon monoxide and nitrogen dioxide. These pollutants are released from fuel burning equipment such as ice resurfacing equipment that is operated indoors. It is critical that the ventilation inside these arenas is operated and maintained properly in order to ensure that there is enough fresh air entering the building and that the pollutants are removed.

Some of the problems/concerns noted at Ice Rinks

- No alarm notification or evacuation of occupants when high levels of Carbon Monoxide detected and no monitoring for Nitrogen Dioxide.
- Automatic ventilation systems only developed for Carbon Monoxide.
- Automatic ventilation not working properly and staff not trained to recognize hazards resulting in no evacuation of occupants.
- Set points for automatic ventilation activation varies for facilities.

- No emergency plan calling for evacuation of building for elevated Carbon Monoxide or Nitrogen Dioxide levels.
- Potential for snow buildup near intakes and exhaust of ventilation systems.
- No notification to the local fire department or emergency medical services when victims complain of symptoms consistent with Carbon Monoxide or Nitrogen Dioxide exposure.

Recommended Standard Operating Procedures

- Provide continuous ventilation whenever the rink is occupied.
- Ensure that the fresh air intake is not blocked and is not located near the exhaust from loading docks and outside idling vehicles.
- Keep resurfacing equipment well maintained daily and on an annual service by a technically qualified technician.
- Keep arena gates open when resurfacing to allow for adequate ventilation of the ice area.

Air Monitoring

Air Monitoring of CO and NO2, in accordance with standard air sampling techniques, should be conducted in all indoor rinks that use combustion resurfacing equipment. Tests should be conducted a minimum of once per week 20 minutes after the use of an internal combustion engine-powered ice resurfacer or edger. Samples should be taken at center ice or the perimeter of the ice surface at the center ice line at a height of 3-6 feet above the ice surface. The measuring devices typically used are hand pump & colorimetric gas detector tubes or portable electronic direct-read gas detection devices.

Action Air Levels

If the alarms activate or testing results exceed the limits (85 ppm for CO and/or 2 ppm for NO2), immediate evacuation of the facility shall be instituted. This is a hazardous materials emergency and your local fire department shall be notified immediately to assist with evacuation and to assess the hazard. These procedures should be reviewed by your local fire departments. A single test result of over 25 ppm* for CO and 0.5 ppm* for NO2 should initiate corrective measures that include immediately increasing the ventilation inside the rink using appropriate and safe means, continuing to ventilate the rink at above normal rates until an air sample for CO and NO2 is below the corrective action air levels, and taking one or more follow-up air samples in intervals of 20 minutes or less until air samples for CO and NO2 remain below the corrective action air level.

Reoccupancy

Can occur after the following:

1. Two consecutive air samples taken within a 3-hour period in accordance with standard air sampling techniques show that the levels of CO and NO2 are below the correction action levels.
2. Air sample results have been verified after independent measurements by the fire department or local health department.
3. Appropriate long-term corrective measures have been taken to prevent any further incidents.

*Minnesota Department of Health Interim Regulations 4620

Long-term corrective measures

Appropriate long-term corrective measures should be instituted to prevent a further incident. These include:

- Develop an emergency plan that includes training employees to recognize the dangers of toxic combustion gases and directs employees to evacuate the building when dangerous levels of combustion gases exist in the building. Employees should be directed to contact the local fire department and emergency medical services when occupants complain of symptoms consistent with inhalation of toxic combustion gases.
- An alarm system should be installed that detects carbon monoxide, carbon dioxide, and nitrogen dioxide. Notification to occupants should be automatic in the event high levels are detected.
- Improving ventilation by increasing the rate of exchange of outdoor/indoor air at the rink.
- Maintaining and documenting regular equipment checks, e.g., engine tuning, catalytic converters, air monitors, (a service contract is recommended for quarterly maintenance).
- Warming up ice resurfacing equipment outside the building
- Installing a local exhaust system vented to the outside in the area where equipment is warmed up.
- Reducing edging time; replacing ice resurfacing equipment with new equipment with lower emissions.
- Decreasing the resurfacing schedule to reduce the amount of exhaust gases emitted.
- Switching to all electric ice maintenance equipment.

Record Keeping

All operators of ice rinks should maintain a log of all air monitoring activities including dates, times, equipment used, results, and any corrective actions taken.

Resources

U.S. Environmental Protection Agency (EPA) Indoor Air Quality and Ice Arenas:
http://epa.gov/iaq/icearenas.html
International Ice Hockey Federation (IiHF) Technical Guidelines of an Ice Rink:
http://www.iihf.com/fileadmin/user_upload/PDF/Sport/Chapter3.pdf
American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE):
http://www.ashrae.org
NorthEast Ice Skating Managers Association:
http://www.neisma.com
Draeger Tubes & CMS Handbook:
http://www.draeger.com/media/10/01/87/10018750/tubeshandbook_br_9092086_en.pdf
Connecticut Department of Public Health Environmental & Occupational Health Assessment Program
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