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CHEMICAL/ BIOLOGICAL /RADIOLOGICAL (CBR) CONTAMINATION: AIR FILTRATION CAN HELP PROTECT YOUR FACILITY

The release of a CBR or TIM (toxic industrial material) agent is a serious worry for commercial facilities, and it's difficult to determine what preemptive actions are best. Here are steps to take now:

STEP 1: Recognize that the best protection against chemical, biological and radiological agents is positive pressure to the outside. Outside air intake should exceed building exhaust to minimize infiltration of contaminants. In the case of a known outside event, exhaust fans can be shut off to help pressurize the building.

Outside air should pass through a filter that has as high a MERV value as possible within the HVAC system's design capability. Filters must be on the suction side of the air handler to prevent leakage into mechanical room spaces.

STEP 2: Determine current levels of filtration. Review air distribution systems and list the types and efficiencies of all filters, including prefilters and final filters.

STEP 3: Access the effect of increasing filter efficiency on HVAC systems. Higher efficiency filtration increases protection from the release of chemical, biological or radiological agents. Higher efficiency filters also keep coils cleaner, maintaining proper heat transfer efficiency for optimum energy use. Keeping coils clean maintains coil resistance at design levels. Clogged coils increase resistance, increasing energy consumption. Dirt accumulation on coils promotes mold and bacteria growth.

An increase in protection from chemical, biological or radiological attacks will only be realized if it applies to the particle size and physical state of the contaminant.
Particulate air filters remove biological/radiological particles, but not the gases and vapors typical of chemical attacks. Chemical contaminants require gas phase adsorbers such as activated carbon.

Gas Phase Filtration should be considered wherever there's risk of chemical exposure. If gas phase filtration is installed, the priority is "single pass removal" efficiency, as the air only passes once through outside air systems. Ideally, gas phase filtration should be selected based on the specific gaseous contaminant to be removed. However, terrorism makes it impossible to predict what chemical will be used, therefore, a good standard grade activated carbon or a blend of gas phase media is advisable.

Upgrading to HEPA filtration can be considered, but only with complete retrofit of the air handling system. HEPA filters operate at resistance levels substantially above the design level of air handling systems originally fitted with ASHRAE grade filters. Also, the sealing capacity of ASHRAE grade filtration is insufficient for HEPA installations. Leakage around filters more than offsets the benefits of HEPA filtration.

The installation of a new air handling system with sufficient fan horsepower to overcome resistance and provide a high integrity seal is the only way to successfully convert a facility to HEPA filtration.

STEP 4: Recognize that some areas of your facility are particularly vulnerable. Recent events show that one major threat to a building comes from mail, making it important to evaluate the mailroom in regard to its pressure relationship to the rest of the building. If mail has entered the facility contaminated, it is advisable to contain it within the space using a negative pressure relationship between the mailroom and adjoining areas.

STEP 5: Consult a contractor or mechanical engineer regarding how various changes will affect HVAC system performance. Higher efficiency filters operate at higher resistance, often reducing air flow and increasing energy costs. The magnitude of the reduction is dependent on system design and capacity. To minimize pressure loss, select filters with the lowest resistance that provide the desired level of efficiency. Or, consider a filter bank with a larger face area to reduce velocity.

Consider return air as well. Improving the filtration efficiency of return air in HVAC systems reduces concentrations of all particulate, including biological agents. Recirculation of the air removes particulate on each pass through the filter system. Filters should be installed in accordance with guidelines in the NAFA Installation, Operation and Maintenance Manual. A minimum MERV filtration level of 11 is recommended.

STEP 6: Assess the integrity of the filter framing. Reducing the leakage of unfiltered air around the filters may be as important as increasing filter efficiency. Check the condition of gaskets on frames and plenum doors and consider caulking the frames.

STEP 7: Implement a plan to keep coils clean. This helps maintain proper heat transfer efficiency, saves energy and maintains coil resistance at design levels. Clogged coils create resistance. Dirt produces biological contaminants of its own in the form of mold and bacteria.

STEP 8: Focus on long-term benefits. Facility investment in filtration upgrades should be carried out with the idea of long term improvement in indoor air quality. Improving the filtration efficiency will aid in the overall reduction of microbial organisms as well as particulate; ASHRAE Standard 52.2 provides a precise tool to measure improvement.