Selecting the Right Ventilation Equipment When Working in Confined Spaces Under the New Construction Standard

If the environment is hazardous, explosion-proof or intrinsically safe ventilation equipment must be used to protect workers.

By Stephen Durr | Nov 01, 2015

After 20 years in development, OSHA published the Confined Spaces in Construction Standard, 29 CFR 1926 subpart AA, on May 1, 2015. The final rule is similar in content to the General Confined Space Industry Standard, 1910.146, and adds several provisions to address construction specific hazards and advancements in technology, and also it improves enforceability of the requirements.

The standard was effective Aug. 3, 2015, with full implementation on Oct. 2, 2015. A Temporary Enforcement Policy for Residential Construction Work in Confined Spaces was recently issued that delayed full implement for residential construction until Jan. 8, 2016.

What is a Confined Space?
Confined spaces are some of the most dangerous and potentially life-threatening work environments in industry. Fresh air ventilation equipment is an integral component of a total safety program, along with PPE, fall protection, gas monitoring and a respiratory program. Proper selection and training with safety equipment can reduce potential accidents, loss of life, and can lower insurance rates.

Confined spaces include: manholes, crawl spaces, sewer systems, storm drains, tanks, boilers, pits, excavations, water mains, transformer vaults, HVAC ducts, silos, turbines, and elevator shafts. This is not a complete list but shows a few examples of the many areas on a construction site considered a confined space.

After identifying a confined space, testing the atmosphere for potential hazards is necessary. A quality three- or four-gas meter must be used to determine whether oxygen levels are sufficient to allow work in the confined space and whether the air is potentially hazardous or explosive. If the environment is hazardous, explosion-proof or intrinsically safe ventilation equipment must be used to protect workers.

Hazardous Location Ventilation: Explosion-Proof or Intrinsically Safe Equipment Required
If it is determined there is a hazardous location or potential for a hazardous work location, it is necessary to take every precaution to guard against ignition of the hazardous atmosphere.

The traditional "combustion triangle" is made up of three elements: 1) fuel, 2) oxygen, and 3) an ignition source. All three must be considered when developing a plan to ventilate hazardous or potentially hazardous environments.

Consider these items when working with a hazardous environment:

Power source
Explosion-proof electric ventilation products should be certified showing the approving

agency and in what location the equipment can be used safely. Blowers should have a grounding lug attached to a ground source to safely remove the buildup of static electricity. These types of certified electric blowers should have a metal frame or a conductive plastic housing to assure a good ground to the electrical source. The blower selected should have an aluminum non-sparking blower wheel to prevent metal and dust sparking that could ignite in the hazardous area.

Intrinsically safe equipment is pneumatic (air driven) equipment that cannot cause a spark and does not require third-party electrical approval. Even with intrinsically safe equipment, proper grounding and non-sparking components should still be utilized.

Conductive air ducting
Choose ventilation air duct with fabric made of conductive material. The conductive duct will reduce the potential buildup of static electricity on both the interior and exterior surfaces of the duct that can result from the movement of air and small dust particles during ventilation.

Non-Hazardous Location Ventilation: Standard Equipment May Be Used
If the confined space is deemed non-hazardous, standard electric ventilation equipment can be used to ventilate the confined space. Verify the ventilation equipment has any necessary certifications required for the work area. Hazardous location ventilation equipment may be used in a non-hazardous location, but typically cost becomes an issue because explosion-proof and intrinsically safe equipment is more expensive due to the added features.

Ventilation Selection: Axial Fan vs. Centrifugal Blower
All ventilators have two characteristics:

1) *Air volume delivered–flow*. Measured by cubic feet per minute (CFM).
2) *Force of air–pressure*. Static pressure measured by inch of water gauge (WG).

Axial fans
An axial fan creates high airflow but the blade design develops lower pressure. When used with ducting, the ventilation duct creates resistance and the axial fan becomes inefficient at longer distances. Axial fans are designed with several large paddle blades that develop a large volume of airflow (CFM). Axial fans are lightweight, low cost, and best when working at short distances with minimal ducting, preferably 15-to 25-foot flexible ducting. Axial fans are available in explosion-proof certified, standard electric, and battery-powered 12 VDC models (DC powered fans do not require certification).

Inline axial fans
Inline axial fans are used when ventilating at long distances; simply add an in-line fan to the existing ducting to increase or maintain airflow for long working distances. As with standard axial fans, inline axial fans are designed with several large paddle blades. Inline fans can be coupled with axial or centrifugal blowers to extend longer ventilation distances. Inline fans are available with explosion-proof certified or standard electric motors.

<>Centrifugal blowers
A centrifugal blower uses a "squirrel cage" designed with numerous forward curving blades on a circular wheel. The blades create significant volume (CFM) at higher velocities and higher static pressure than an axial fan. Centrifugal blowers are typically heavier and cost more than axial fans due to their larger motor. Centrifugal blowers are used to move air a long distance using long or multiple lengths of duct. Centrifugal blowers are available in explosion-proof certified, pneumatic, gasoline, and standard electric models.
One Final Requirement: Proper Electrical Certification
In the United States, OSHA requires independent recognized certification laboratory testing of all AC electrical devices. Each fan or blower must meet recognized electrical codes and be manufactured with the proper mechanical safety devices. Prior to use, verify equipment has been tested, approved, and labeled by a Nationally Recognized Testing Laboratory (NRTL), such as UL, ETL, or CSA, and make sure the equipment is certified to operate in your country.

If one (or more) of the NRTL testing company logos is displayed on the electrical equipment, the NRTL has tested and certified the electrical equipment. A "C" to the left of the insignia indicates the product was tested and meets Canadian standards. A "US" insignia on the right side of the testing company's insignia certifies the piece of equipment was tested and certified to meet United States standards.

There is no OSHA requirement stating a seller must sell certified equipment; it is the user's responsibility to purchase equipment to meet work location requirements.

Remember, OSHA requires the equipment user to use the proper equipment approved for the specific work location.

About the Author

Stephen Durr is the Marketing Manager at Air Systems International, the industry leader in Grade-D breathing air filtration and confined space ventilation. Visit www.airsystems.com for more information.