

Types of Wet Well Sites

Wet well sites are generally thought of as sewers, pump stations and waste water holding tanks, but also include water fountain control valve pits, septic tanks, ewage digesters, and water tower interiors. Many wet well scenarios are defined as confined space, despite that some are open and outdoors.

Sewer hazards include carbon monoxide (CO) migration through soil layers due to explosives used prior to installation of pipelines and manholes. Explosives can expose sewer workers to potentially fatal CO levels. Flooded chambers and oxygen-deficient atmospheres that can result in drowning and asphyxiation are also risks during sewer and underground pump station maintenance, especially in areas that lack newer self-priming sewer pumps that minimize worker proximity during manual pump operations.

Waste water holding tank maintenance workers are likely to be at risk of toxic chemical exposure to sulfuric acid used for drain cleaning, as well as from asphyxiation and burns due to methane gas produced by stored waste. Septic tank and sewage digester maintenance workers are at risk for similar hazards.

Control valve pits for water fountain displays also pose potential asphyxiation hazards, as workers can be subject to CO sewer trap gases and oxygen deficiency while inside pit crawl spaces to perform adjustments and maintenance.

Wet well confined spaces can be deceptive in appearance and include open-topped municipal fresh water tanks that require maintenance performed from catwalks located above or risers placed within, using potentially hazardous materials such as epoxies.

Site Assessment

Wet well-related confined space entry necessitates that working environmental conditions are determined in advance and that proper PPE (personal protective equipment) is used and worn. The Occupational Safety and Health Administration (OSHA) defines confined space in 29 CFR 1926.21 as "any space having a limited means of egress, which is subject to the accumulation of toxic or flammable contaminants or has an oxygen deficient atmosphere."

The National Institute for Occupational Safety and Health (NIOSH) (Criteria for a Recommended Standard defines confined space as:

"...a space which by design has limited openings for entry and exit; unfavorable natural ventilation which could contain or produce dangerous air contaminants, and which is not intended for continuous employee occupancy. Confined spaces include but are not limited to storage tanks, compartments of ships, process vessels, pits, silos, vats, degreasers, reaction vessels, boilers, ventilation and exhaust ducts, sewers, tunnels, underground utility vaults, and pipelines."

Hazardous atmospheres are defined by NIOSH as follows:

"...a confined space may be extremely hazardous because of the lack of natural air movement. This characteristic of confined spaces can result in:

- 1/ oxygen-deficient atmospheres.
- 2/ flammable atmospheres, and/or
- 3/ toxic atmospheres."

Confined space hazard assessments are made through atmospheric testing conducted with calibrated portable gas detection instruments. All areas of the confined space must be tested due to varying vapor pressures. The type and airborne concentration of contaminant(s) present and the presence or lack of sufficient oxygen must be assessed in order to determine the type of respirator to be used. If ventilation is impossible, workers entering the confined space must be outfitted with proper respiratory protection, as well as other necessary PPE that may include fall protection, head, eye, and face, hazmat, and gas detection gear.

The permissible exposure limit or PEL is OSHA's federal legal limit for employee exposure over specific time periods, TWA or time-weighted average and STEL, or short-term exposure limit, to chemicals and physical agents. Results of atmospheric testing for airborne contaminants are compared to the PEL to determine proper PPE to be worn by workers. Respiratory protection is likely to be required if measured airborne contaminants exceed their PEL within a confined space.

Respirator Types

Air-purifying respirators (APR) scrub contaminants from ambient air via cartridges and filters. This type is available commercially in either half-mask or full-face versions with replaceable one-time use cartridges and filters, or as half-mask filtering facepieces generally meant for one-time use. If air-purifying respirators are determined by the hazard assessment to provide sufficient protection, choosing the correct cartridge and/or filter type should follow. Many cartridge and filter choices are offered for protection against airborne toxic substances and particulates.

Powered air-purifying respirators (PAPR) that employ a motor-blower to feed filtered air to the facepiece may be required if the PEL of a given contaminant requires protection at a stage between ordinary APR and air-supplied respirators.

Supplied-air respirators (SAR) feed safe breathing air to workers and must be used when workers are within oxygen-deficient atmospheres or those classified as IDLH (immediately dangerous to life or health). Three basic types are available, with breathable air supplied from a cylinder bank, personal cylinder (worn) or combination. Typical supplied-air respirator industrial use is that of workers wearing respirators connected to long lengths of air hose.

Air flows from either a compressor or bank of large cascade air cylinders. For certain applications, SAR gear must incorporate a small escape cylinder to provide air sufficient for confined space escape should the hose connection be terminated.

Self-contained breathing apparatus or SCBA or are used in situations where a larger air cylinder is worn and serves as the worker's sole air supply. Industrial applications generally involve deep confined space where use of long lengths of air hose is impossible or impractical.

Respiratory Requirements and Recommended PPE for Wet Well Applications

OSHA Respiratory Protection Standard 29 CFR 1910.134 details respiratory requirements for many applications, including those listed earlier, and should be referenced for specific scenarios. However, a few basics are listed here:

- Workplace respiratory hazards must be evaluated and identified.
- Respirators must be NIOSH-certified.
- Atmospheres are considered to be IDLH when exposure cannot be assessed with reasonable certainty.
- Oxygen-deficient atmospheres (less than 19.5 percent by volume) are considered to be IDLH.

For unknown hazard concentrations or where the situation is changeable, the following SARs are recommended:

AirHawk® II Air Mask for use within toxic and/or oxygen deficient atmospheres

- Lightweight, durable, economical SCBA is intended for use within non-fireground applications.
- Many options include choice of facepiece, carrier and harness assembly, cylinder, first-stage regulator, mask-mounted regulator, and end-of-service time indicator.

PremAire® Cadet Escape Respirator

Combination supplied-air respirator with SCBA is designed especially for escape.

- Versatile, comfortable and affordable system offers single-assembly first-stage regulator and cylinder valve.
- Small in size and profile, this respirator is ideal for working in tight places.

For non-IDLH atmospheres where known concentrations of contaminants are present at non-changeable levels greater than APR maximum use concentration, non-IDLH SAR is recommended:

PremAire® Cadet Supplied Air Respirator

Type C supplied-air respirator with mask-mounted regulator responds quickly to changing breathing requirements.

- Available as basic supplied air device or as combination supplied-air/air-purifying respirator.
- For use only in non-IDLH environments.

For non-IDLH atmospheres where known concentrations of contaminants are present at non-changeable levels less than APR maximum use concentration, APR/PAPR half-mask or full-face respirators with cartridges and/or particulate filters are recommended. Consult the MSA Response® Guide (www.MSAafety.com) and NIOSH Pocket Guide to Chemical Hazards (<http://www.cdc.gov/niosh/npg/>) to determine appropriate APR and cartridges.

Advantage® 200 LS Half-Mask Respirator

Economical, lightweight, high-performance respirator of thermoplastic rubber construction increases softness and decreases weight.

- Patented MultiFlex® System equalizes face-seal area pressure.
- AnthroCurve™ Sealing Surface instantly conforms to wearer's face.

Advantage 420 Half-Mask Respirator

Low profile, latex-free respirator increases comfort and easily switches between lock-down and drop-down modes.

- UniBond over-mold facepiece and AnthroCurve Sealing Surface provide customized fit.
- Four-point yoke and harness design promotes easy donning and doffing

Advantage 4100 Full-Facepiece Respirator

Respirator is compatible with several MSA respirator models including air-purifying respirators, supplied-air respirators and powered air-purifying respirators to provide comfortable, cost-efficient performance.

- Available in both silicone and Hycar™ Rubber and in three sizes.
- Standard noseclip is provided for reduced fogging in low-temperature or high-moisture environments.

OptimAir® MM2K PAPR

Powered air-purifying respirator (PAPR) is compact and easy-to-decontaminate.

- Rechargeable NiMH battery offers eight hours continuous use.
- Dual-rate smart charger fully powers discharged battery in less than three hours.
- Used with Advantage 3000, 4000, Ultravue®, or Ultra Elite® Facepieces.

References and Sources

Permit-Required Confined Spaces, Final Rule; OSHA, 29 CFR Part 1910.146; Federal Register, 63:66018-66036 (1998, December 1)

A Guide to Safety in Confined Spaces, (NIOSH Publication Number 87-113), July 1987

The NIOSH Criteria for a Recommended Standard...Working in Confined Spaces dated December, 1979

Note: This bulletin contains only a general description of the products shown. While uses and performance capabilities are described, under no circumstances shall the products be used by untrained or unqualified individuals and not until the product instructions including any warnings or cautions provided have been thoroughly read and understood. Only they contain the complete and detailed information concerning proper use and care of these products.



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