**Definition**

A confined space found in the workplace may have a combination of three characteristics, which can complicate working in and around these spaces as well as rescue operations during emergencies. If a survey of your working area identifies one or more work spaces with one or more of the following characteristics, special safety precautions must be taken.

- Openings are limited primarily by size or location. The openings are usually small in size, perhaps as small as 18 inches in diameter, and are difficult to move through easily.

- The space has unfavorable ventilation or lack of natural air movement which may result in the trapping of deadly or explosive gases or a deficit of oxygen.

- Most confined spaces are designed only for occasional worker entry for inspection, maintenance, repair, cleanup, or similar tasks that are often difficult and dangerous due to chemical or physical hazards within the space.

The following safety procedures are recommended for confined spaces.

**Testing**

Because of the differing behaviors of various gases, it is necessary to test all areas (top, middle, bottom) of a confined space with properly calibrated testing instruments to determine what gases are present. If testing reveals oxygen deficiency, or the presence of toxic gases or vapors, the space must be ventilated and re-tested before workers enter. If ventilation is not possible and entry is necessary (for emergency rescue, for example), workers must have appropriate respiratory protection.

Never trust your senses to determine if the air in a confined space is safe! You cannot see or smell many toxic gases and vapors, nor can you determine the level of oxygen present.

EHS/RMS is available to assist with the testing of confined spaces.
Ventilation

Ventilation by a blower or fan may be necessary to remove harmful gases and vapors from a confined space. There are several methods for ventilating a confined space. The method and equipment chosen are dependent upon the size of the confined space openings, the gases to be exhausted (e.g., are they flammable?), and the source of makeup air.

Under certain conditions where flammable gases or vapors have displaced the oxygen level, but are too rich to burn, forced air ventilation may dilute them until they are within the explosive range. Also, if inert gases (e.g., carbon dioxide, nitrogen, argon) are used in the confined space, the space should be well ventilated and re-tested before a worker may enter.

A common method of ventilation requires a large hose, one end attached to a fan and the other lowered into a manhole or opening. For example, a manhole would have the ventilating hose run to the bottom to blow out all harmful gases and vapors. The air intake should be placed in an area that will draw in fresh air only. Ventilation should be continuous where possible, because in many confined spaces the hazardous atmosphere will form again when the flow of air is stopped.

Isolation

Isolation of a confined space is a process where the space is removed from service by:

1. LOCKING OUT electrical sources, preferably at disconnect switches remote from the equipment,
2. BLANKING AND BLEEDING pneumatic and hydraulic lines,
3. DISCONNECTING belt and chain drives, and mechanical linkages on shaft-driven equipment where possible, and
4. SECURING mechanical moving parts within confined spaces with latches, chains, chocks, blocks, or other devices.
Respirators

Respirators are devices that can allow workers to safely breathe without inhaling toxic gases or particles. Two basic types are air purifying, which filter dangerous substances from the air; and air supplying, which deliver a supply of safe breathing air from the tank or an uncontaminated area nearby. Only air-supplying respirators should be used in confined spaces where there is not enough oxygen.

Selecting the proper respirator for the job, the hazard, and the person is very important, as is thorough training in the use and limitations of respirators. Refer to Respiratory Protection Policy and Procedure for more information. Questions regarding the proper selection and use of respirators should be addressed to EHS/RMS (786-1351 or ayssg@uaa.alaska.edu).

Standby/Rescue

A standby person should be assigned to remain on the outside of the confined space and be in constant contact (visual or speech) with the workers inside. The standby person should not have any other duties but to serve as a standby and know who should be notified in case of emergency. Standby personnel should not enter a confined space until help arrives, and then only with proper protective equipment, life lines, and respirators.

Over 50% of the workers who die in confined spaces are attempting to rescue other workers. Rescuers must be trained in and follow established emergency procedures and use appropriate equipment and techniques (lifelines, respiratory protection, standby persons, etc). Steps for safe rescue should be included in all confined space entry procedures. Rescue should be well planned and drills should be frequently conducted on emergency procedures. Unplanned rescue, such as when someone instinctively rushes in to help a downed co-worker, can easily result in a double fatality, or even multiple fatalities if there are more than one would-be rescuers.

Remember, an unplanned rescue may be your last.
The evaluation of confined space should also consider the existence of the following additional hazards:

- Temperature extremes
- Engulfment hazards (materials which may break loose and engulf and suffocate a worker)
- Excessive noise
- Slick or wet surfaces
- Falling objects

To ensure that all hazards have been considered and planned for, refer to the safe entry checklist in EHS/RMS Appendix 9.