

## Toxic Places and Confined Spaces Using the CAREvent® CA for Toxic Environment Rescue and Resuscitation

### The Problem

Toxic environment rescue and resuscitation is both an important and an emotive subject. The death of an otherwise healthy individual in an industrial accident due to the inhalation of a toxic gas, or from anoxia due to an oxygen depleted environment, is unacceptable in today's health and safety conscious society. No worker should enter an area that has the potential to be Immediately Dangerous to life or Health (IDLH) without the proper protective equipment and monitoring of the space. But what of the environment that is tested and found to be "clean"? There may still be pockets of toxic gas lurking in corners, or striated in the atmosphere waiting for the unsuspecting worker to disturb the gas and take a breath!

If there is any doubt that the space may be contaminated you should not go in unprotected. There are however, always circumstances where everything looks clean and safe but unfortunately is not. Under these circumstances, where there is even the remotest possibility that a worker could come in contact with toxic gas or oxygen depleted atmospheres within the working environment, the highest level of care must be taken. It is also essential that extrication of the worker, in the event of an emergency, is well planned, practised and executed. Although the regulations call for the worker entering a confined space to be on a tether, this is not always possible due to the nature of some spaces. Therefore the use of a rope to pull the victim from the confined space is not always practical.

Anywhere there is a risk of exposure to a harmful environment that may be Immediately Dangerous to Life and Health (IDLH) precautions must be taken to (a) minimize the risk of exposure and (b) plan for the rescue of a downed worker. In the event of a worker being overcome by a toxic substance could your

rescue team arrive, assess the situation, gear up, enter the space and extricate the victim in time to save that workers life? Unless you have a skilled, highly trained rapid response team the likelihood is that they will arrive long after the worker is passed rescuing. Accepting this fact and not providing additional means of ventilatory support for the downed worker within the toxic environment while extrication is planned means that you are accepting that worker's potential death.

### The Solution

In 1990, one of Canada's largest gas companies and two Doctors from the University of Florida developed a specification for a new industrial resuscitator designed to meet the challenges of confined space, toxic atmosphere resuscitation. By 1993 they had successfully, screened, tendered for, and had developed by O-Two Medical Technologies Inc., a new, toxic environment rescue resuscitator, designed specifically for the IDLH environment. This product, the Genesis® II IDLH Rescue Resuscitator was the predecessor of the CAREvent® CA Chemical Agent Environment Resuscitator. This is still the world's only, specifically designed, toxic environment rescue resuscitator.

In 1994 the Canadian Standards Association added these criteria for a Confined Space Resuscitator to their CAN Z8382-94 standard on Resuscitators Intended for Use with Humans. This standard is an extension of the ISO 8382 standard on Resuscitators Intended For Use with Humans.

The gas company also implemented a training program for their staff that met the criteria for confined space and/or toxic atmosphere resuscitation. This ability to immediately provide ventilatory support within the confined space / toxic atmosphere (without risking the lives of

other workers who may jeopardize their own life by attempting to help their co-worker by entering the confined space unprotected) is achieved by having a "Safety Person" stationed nearby. This Safety Person must be in a position to call for help and render assistance in the event of an incident. The Safety Person does not take part in the actual work and wears suitable respiratory protection equipment with the mask at the ready but not in place. This person must also be able to communicate at all times with the workers inside the confined space and also with support personnel in the event a rescue is required. He/she must also have the knowledge, training and experience to perform the duty safely and properly.

Immediately a problem develops and it is identified that the downed worker requires ventilatory support and cannot be extricated, the safety person, having called for assistance, dons the mask, enters the space and begins artificial ventilation using the automatic resuscitator with which he/she is equipped. By providing this immediate assistance to the downed worker it gives the rescue team a larger time frame in which to arrive, evaluate the rescue, set up their equipment and effect the extrication in a safe, controlled manner.

The CAREvent® CA has "only one external control". The chemical agent and IDLH environment is considered to be so hazardous that the less the rescuer has to do (during rescue and transport) to ventilate the patient, the quicker the patient can be resuscitated and the greater the chance for the patient's survival. All the rescuer has to do is turn on the oxygen/air supply, apply the mask to the patient's face and secure the airway. The CAREvent® CA will provide automatic ventilation to the non-breathing patient at a rate and

volume designed to provide adequate oxygenation while reducing the risk of gastric insufflation in accordance with the current Guidelines for resuscitation.

The micro-pneumatic circuitry of the CAREvent® CA requires no batteries or electrical supply to operate. Should the patient start spontaneous breathing, the "Demand Breathing" feature of the CAREvent® CA allows the patient to

breathe at their own rate and volume. The patient's inspiratory effort (if adequate) will also cause the "automatic circuit shut off" to stop the automatic cycling of the ventilator allowing the patient to breathe at their own rate and volume. If the patient stops breathing again, the automatic cycling will restart with no action required on the part of the rescuer.

A Manual Override Button is provided to allow for the provision of 2 breaths followed by 30 chest compressions during CPR in accordance with the current resuscitation guidelines. In addition it can also be used to supplement spontaneous ventilations if required. An added feature of the CAREvent® CA is the 2 L/min "MASK PURGE", BLEED FLOW. This reduces the risk of the patient drawing in toxic ambient air into the mask should a leak in the mask-to-face seal occur.

By combining this "simplicity of operation" with technological sophistication, the CAREvent® CA provides trained individuals with a safe and effective means of maintaining artificial ventilation during respiratory arrest which may occur during confined space entry or a toxic chemical agent release.

## Conclusion

By incorporating the CAREvent® CA into your toxic environment emergency planning the benefits you provide to the downed worker are immediate and one does not have to become resigned to the only possible outcome (which currently exists) if immediate extrication is not possible, which is the potential for the necessity to remove a body from the toxic environment.