

### **“Confined Spaces – Keeping a Clear Head”**

In January of 2002, eight crewmembers were killed by an explosion while spray painting the inside of an upper ballast tank of their Hong Kong registered bulk carrier. Five bodies were found, while three were presumed to have been vaporized. The accident was found to have been caused by improper ventilation, an inappropriate use of paint-thinners, and an unknown source of ignition.

In February of 2002 the Chief Officer of the American flagged tanker S.S. Trinity was indicted on charges of criminal negligence related to the death of a crewman that he had sent into a cargo hold to clean without first testing the atmosphere. The crewman was asphyxiated by remnant vapours from the previous cargo of MTBE.

In January of 2002, four local shipyard workers perished while working on a barge moored in the Fraser River. One worker had entered a ballast tank to affect repairs and did not emerge. A fellow worker went to find him, and neither returned. A third worker was sent and failed to return before emergency crews were called. In all, four men died of asphyxiation in the ballast tank.

All of the above accidents occurred in “confined spaces”. Albeit mostly obvious, a “confined space” is characterized by restricted access, typically a manhole, and limited ventilation. Confined spaces are not intended for human occupancy, except for the purpose of carrying out work in them, typically scaling, painting or metal repairs. The primary danger with confined spaces is the atmosphere that develops within them. Confined spaces, due to their poor ventilation, often have a low oxygen content, or higher than normal concentration of hazardous chemicals, such as diesel fumes.

Generally speaking, any vessel that carries chemicals, including diesel fuel, will have confined spaces with potentially lethal concentrations of chemicals, even when empty. Steel vessels, however, are particularly prone to confined spaces with low oxygen content, such as ballast tanks. This low oxygen content is due to the oxidation process which depletes oxygen as the steel walls of the tank rust.

Employers and workers in the marine industries are required to understand the risks and responsibilities associated with confined spaces on vessels. Each has a legal responsibility to understand the dangers and act accordingly. The *Occupational Health and Safety Regulations* under the *BC Workers Compensation Act*, and similar regulations under the *Canada Labour Code*, set out requirements that are to be followed by workers and employers in respect of confined spaces. Failure to follow these rules may result in penalties to both the employer and the worker.

Legally speaking, requirements under the WCB *Occupational Health & Safety Regulations* include, but are not limited to:

- Each confined space on the vessel be identified and a determination made as to whether access will, at any time, be necessary;
- Before a worker is allowed to enter a confined space the employer must prepare a written confined space entry program which details safe work procedures for entering and carrying on work in that confined space;
- The employer must designate an adequately trained person to supervise work in the confined space;
- Entry permits are required for high hazardous atmospheres, where lock-out of machinery or energy sources is required, or where there is hazard of engulfment. An entry permit is a document created by the employer that details precautions of access to and work in the confined space.

Full requirements under these regulations can be obtained from WCB, the author, or on the Web at <http://regulation.healthandsafetycentre.org/s/Part9.asp>.

Failure to do any of the above may result in a penalty assessed against the employer or the worker. WCB is not obliged to give a warning first, but rather can simply show up on the vessel, and subject to finding circumstances that contravene the *Occupational Health & Safety Regulation*, assess a penalty ranging from \$1,500 to \$30,000 depending on the payroll of the employer and whether the parties have been cited previously for a similar infraction. Persons who interfere with or obstruct a WCB officer in the course of their inspection may be convicted and fined up to \$19,000 or 3 months in jail, or both.

Although most mariners understand the general dangers that confined spaces present, when an emergency arises much of this understanding is immediately forgotten. For example, picture this...you return from coffee-break to help the engineer with the annual job of cleaning the fuel tanks, when you find him crumpled below the access ladder on the floor of the starboard aft tank. Your immediate *reaction* is that he has fallen, so you jump to help him. Within 15 seconds of entering the tank your vision blurs. By the time you have reached his body you collapse unconscious on top of him. Within four minutes you are dead. The lesson here is to avoid *reacting*, but to think first, and act quickly and cautiously. Identifying the dangers of the confined space before acting is crucial to avoiding further injuries or fatalities. Would-be rescuers represent at least 40% of all deaths in confined space accidents.

It is important for vessel owners, employers and workers to identify each confined space within a vessel and develop a procedure, preferably written, for accessing and working in the confined space. Confined spaces that can be opened easily or are not locked should be clearly labeled as being hazardous. All confined spaces, including those that are kept locked or bolted, such as fuel tanks, must have written procedures for accessing and carrying on work. Further to the WCB regulations cited above, these procedures must include the following:

- No person shall enter a confined space without proper instruction as to the hazards and without someone else knowing they are doing so;
- Before entering the confined space, test the air and ventilate if necessary;
- Ensure there is at least one person attending outside of the entrance to act in case of emergency, and that this person is trained and equipped to remove any victim;
- If using a ventilator, ensure it is alarmed to indicate when it ceases to work;
- If you are working in a confined space for a long time, test the atmosphere periodically, not just once at the beginning.

The above list is not a complete one, but includes some of the most important measures to be taken.

Equipment used for testing the atmosphere in these circumstances can be found at safety equipment suppliers, and can be purchased for approximately \$250 for an oxygen-only sensor, or \$2500 for a four gas model which tests for oxygen, carbon monoxide, combustibles and hydrogen sulphide (the latter resulting from decaying organic matter). It is important that these devices be calibrated before every use. In many cases the cost of this equipment is too much for small marine operations, particularly when they access their confined spaces only once per year or so. In these cases, it is recommended that the mariner rent such a device (for approximately \$60/day), borrow one, or share the purchase price with a group of mariners that will share the device. Failure to use such a device is a contravention of the *Occupational Health & Safety Regulations* and may result in a penalty, not to mention a death.

Although I am lawyer now, my time at sea tells me that the procedures noted above are not consistently followed on larger vessels, infrequently followed on private coastal vessels, and rarely if ever followed on many smaller vessels. Personally, I cleaned many ballast tanks and many fuel tanks and never once tested the atmosphere in any of them. If I did, I crawled into the confined space, took a good sniff, and decided it was safe to work. On most of the occasions I worked alone.

I look back at those days now and realize that this type of conduct is akin to playing Russian roulette, except that it endangers more people than just the triggerman. I think of the families of those four men that failed to emerge from the barge on the Fraser River in January of 2003 and I am saddened by the possibility that such a profound loss might have been prevented. It is my hope that next time you peer into a confined space, or find a fallen worker in a confined space, you will think of those workers and your own family, and act, not react, with caution.