SEMINAR – ENTRY INTO ENCLOSED SPACES

Early in the year, Captain Harry Gale FNI, Technical Manager of The Nautical Institute, suggested to the North of Scotland Branch of the Institute that Aberdeen may be a suitable venue for a seminar on entry into enclosed spaces, given the concentration of offshore activity in the north east of Scotland. The Institute has been doing work on the dangers associated with enclosed space entry in association with Mines Rescue Marine (MRM), with articles appearing in several recent editions of *Seaways*.

Captain Robbie Middleton FNI convened a planning group, which developed the programme design and the process over several months, resulting in a well-attended one-day seminar at The Beach Ballroom in Aberdeen which attracted high praise from delegates. Speakers were invited to fill slots which set the scene (MAIB and MCA), looked at industry practice (Technip Marine Operations Services, Marine Technical Limits, C Safe T Ltd, Det Norske Veritas, Enviroco Industrial Services), and gave the lawyer's perspective (Mackinnons Solicitors). The seminar concluded with ideas on addressing the hazards of the enclosed space and a practical demonstration of recovering an 80 kg dummy from an enclosed space by MRM.

Scale of the problem

Captain Steve Clinch, Chief Inspector of Marine Accidents, with the Marine Accident Investigation Branch (MAIB) set the scene by highlighting the [trivial] circumstances under which an accident can happen. One example was the tragic case where a banging chain in the chain locker was disrupting sleep. A sailor informed the bridge, then entered the chain locker to lash it, only to be overcome by lack of oxygen and to be followed by two of his rescuers. Another example was the leakage of noxious gases into spaces expected to be safe, such as a forecastle made hazardous by noxious gasses leaking from a cargo space.

The statistics are not good. Three accidents in one year within one company killed a total of 9 people. There have been 101 accidents notified in 11 years including 93 fatalities. In 2009 there were 10 deaths and 7 injuries.

Top of the list is the tanker industry, followed, amazingly, by the fishing industry. Incidents occur during entry into the fish hold and also in a cold store handling area containing fish in cartons packed with dried ice.

Steve left us with the memorable phrase ***'The risk is always there'.*** This was reinforced by the three enclosed space deaths on a farm in Northern Ireland just the previous weekend.

In summary:

- There is no simple set of rules that can deal with such diverse incidents;
- To begin to understand the problem we should look at the definitions of enclosed spaces and confined spaces.
- Compulsory drills can only be effective if the people undertaking the drills have had sufficient training beforehand.

Steve called for;

- Increased awareness
- Better guidance (possibly from The Nautical Institute)
- Better training (Merchant Navy Training Board and SEAFISH)
- Treat every space as an enclosed space.

Julie Carlton, Seafarer Safety and Health Manager, MCA, continued setting the scene by reminding us of UK requirements, European legislation, international legislation and new developments at the IMO intended to reduce the likelihood of the deaths and serious injuries highlighted by Steve.

The UK regulations apply to tankers over 500grt and all other vessels over 1,000grt and include drills for rescue from a dangerous space at least every two months. Julie also summarised the guidelines set out in the UK Code of Safe Working Practices (CSWP) and Marine Guidance Note MGN 423. The European Union Framework directive 89/391/EC (Risk assessment and dynamic approach) advises that procedures may become invalid over time and should be regularly reviewed and revised. The Marine Equipment (Directives 96/98/EC and 98/85/EC are also relevant, setting out testing standards for portable oxygen analysis and gas detection equipment (Annex A.1/3.30).

The IMO is currently carrying out a review of recommendations for entering enclosed spaces aboard ships A.1050(27) (Nov 2011) and Amendment to SOLAS III/9, which calls for mandatory drills every two months, checking and use of Personal Protective Equipment (PPE), checking and use of breathing apparatus (BA), checking and use of rescue equipment and first aid/resuscitation techniques.

In summary, the subject is well covered by regulation and codes of practice but the regulations and guidance need to be updated to improve training and equipment.

Regulations in practice

We are grateful to Mark Bosson of Technip Marine Operations Services for sharing two near misses where crew were overcome in enclosed spaces. The first took place during a tank cleaning operation where a space which had been tested as safe became unsafe as sludge was disturbed, overcoming two persons in the tank.

The second incident included live video showing a technician entering the lower hatch of a diving bell for the purpose of opening a valve to purge the bell of noxious gas. Inadequate training and instruction resulted in his falling through the hatch onto the deck below, having been asphyxiated by lack of oxygen in the diving bell. It was disturbing to watch the muscle spasms as he regained consciousness in the well ventilated deck area.

Both incidents showed weaknesses in the Technip regime for enclosed space entry prompting a review of their processes. Changes included separate guidance for enclosed space entry and for diving unit enclosed space entry, instigating engineering solutions to minimise the risk and developing a Mobile Training Unit based around a standard ISO container frame to take training to the workforce.

Technip standardise personal gas testing equipment. They have also introduced a 'traffic light' tagging system for attaching to tank lids to indicate the status of the atmosphere. Green tags verify that the atmosphere has been verified as safe.

In closing, Mark expressed the importance of training, training and more training.

Marine Technical Limits specialises in FPSO integrity management and on-station repair of cargo and ballast tanks and deck mounted tank systems. According to speaker Calum McLean, no enclosed space work starts until the atmosphere control and risk assessment process is complete, as any deviation from oxygen content of 20.94% within a space means that there is another unidentified gas present within the area. Using the example of a deck mounted gas tank, Calum described the atmosphere control/risk assessment philosophy of:

- **Elimination** (Inlet and outlet pipework fitted with blind flanges, physical disconnection of pipework and instruments, vessel drained);
- **Engineering** (forced ventilation from non-hazardous area, testing atmosphere), **Administrative** (risk assessment, permits to work etc);
- **Behaviour** (training, fitness); and
- **Personal Protective Equipment (PPE)**.

Terry Callan, HSE & Marine Consultant at C Safe T Ltd gave a presentation sub-titled 'The Silent Killer'. He began with a summary of his career showing how the enclosed space entry regime had improved over the period. He reminded the audience that accidents had far reaching consequences to families, survivors, colleagues and companies, giving an example of heavy fines levied on two companies whose employees died in oxygen deficient tanks on a barge.

Quoting a hierarchy of control similar to that outlined by Marine Technical Limits above, Terry highlighted the importance of identifying the hazard, eliminating the need to enter by substituting technology for people (remote control vehicles, tank washing machines), having robust administrative processes in place (procedures, risk assessments, check lists, permits to work, space plans), supported by a documented management system. He noted that elimination was at the top of the hierarchy and that PPE was the last resort, at the bottom of the hierarchy.

Terry closed his presentation by reminding the audience that entry into enclosed spaces must be effectively managed. If not, the silent killer will continue.

Mike Deeming, Det Norske Veritas (DNV) reinforced the 'scene setting' by bringing to our attention several enclosed space incidents.

In answer to the question 'Why do we enter enclosed spaces?' Mike showed slides of several activities such as internal inspection of a pressure vessel followed by a list of the main hazards associated with such activities. Three hazards that are often ignored are claustrophobia (in a double bottom tank for example), vertigo (at the top of a wing tank in an FPSO) and drowning (when inspecting a VLCC cargo tank using an inflatable boat for access).

Mike closed by summarizing the DNV principles and requirements:

Only enter a confined space:

- if absolutely necessary – stay as short a time as possible;
- when a confined space entry permit has been issued.

Do not enter:

- first or alone;
- if respiratory equipment is required;
- adjacent to tanks containing toxic material.

If in doubt – do not enter! You have the right to refuse.
Report your concerns.
Use DNV checklist for safe entry into confined spaces.

The legal position

Bruce Craig, Mackinnons Solicitors was invited to address the seminar on the lawyer's view of the regulations applying to enclosed spaces. After summarising the legal framework, Bruce interpreted the relevant UK regulations, bringing to our attention the subtle changes in meaning that can be given to words in the legal context.

Bruce questioned the statutory tonnage limits of the mandatory application of two monthly drills to tankers of >500 GT and other ships of >1000 GT when one of the incidents in which three persons lost their lives was a cargo ship of 974 GT. He suggested that The Nautical Institute should propose changing tonnage limits specified in the regulations in order to include ships below 1000 GT.

In general term the onus for safety lies with the Master and the employer. The employer is liable for ensuring that all work is undertaken by competent persons in accordance with documented procedures; personnel must be trained and experienced and tank entry must be allowed only by a responsible officer. Case history begs the question as to whether this officer can be the same person in charge of the tank entry.

Bruce closed with a reminder that several P&I Clubs publish guidance on enclosed space entry.

Several earlier speakers had mentioned that they would prefer to eliminate the need to enter a tank, rather than improve safety procedures for doing so. Alister Wait reported on Enviroco's moves to do just this, by removing the need to enter tanks to clean them. To this end they carried out research to identify a cost effective, reliable system for remote tank cleaning. The solution was a rotating nozzle with a figure of eight coverage and hose mounted in a standard ISO container frame. Tank cleaning can be reduced to a 45 minute cycle, with minimum slops through re-cycling and no need for personnel access into the tank.

Theory in practice

The MRM team, Adam Allan, Captain Michael Lloyd FNI and Colin Richardson explained the 'Enclosed Space Box' which has four inter-related sides necessary for safe entry. These are design, equipment, training and culture.

Under 'Design', they gave a number of examples of inaccessible and otherwise inadequate accesses, and asked 'who is responsible'? Is it the naval architect, the ship yard, the company technical manager, the classification society, the superintendent standing by, the senior officers standing by, or the ship for not reporting the faults?

Under 'Equipment', MRM described the minimum needs for safe entry from oxygen meters to rescue harness, acknowledging the exhibitors whose equipment was displayed around the arena. MRM reminded the audience that enclosed space entry equipment was often un-adapted fire equipment. They strongly advocate the use of 'fit for purpose' personal protective and safety equipment for use in enclosed space entry. Further information can be found in *Seaways*, September 2012.

Under 'Training', MRM emphasised the importance of competence training of rescue personnel, training in the use of specific rescue equipment and familiarisation with the spaces.

Under 'Culture', MRM advocates an Enclosed Space Management System which offers protection, copes with personnel changes, provides an instantly accessible documented review and copes with the responsibility problem.

MRM concluded with a practical demonstration of recovering two 80 kg dummies from an enclosed space simulated by a scaffolding structure installed on the stage. This brought home to the audience the value of custom made PPE such as compact breathing apparatus and the difficulties in manoeuvring an incapacitated person though the typical 650 mm x 450 mm manhole/ lightening hole. They also asked why manhole/lightening hole openings are constructed in a size that restricts safe entry and recovery.

The seminar closed with a question and answer session.

The planning group is grateful for the support of sponsors who displayed equipment in the arena and to the organisations that sponsored up to six delegates. The planning group is very pleased with the attendance, and with the positive feedback received from several persons/ organisations that attended.

Captain Mike Sutherland FNI and Alistair Struthers, MNI

Copies of the presentations are available from the Nautical Institute website at http://www.nautinst.org/en/about-the-institute/branches/north-scotland--enclosed-spaces-seminar.cfm