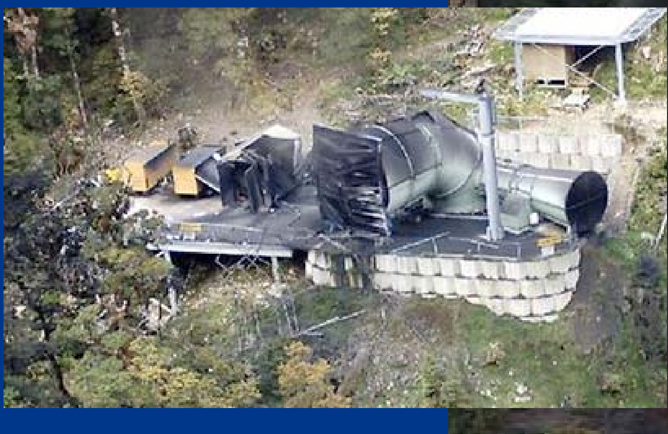
FLASHPOINT

December 2010 – January 2011

What price self-certification?



NZ INSTITUTE OF HAZARDOUS SUBSTANCES MANAGEMENT

USEFUL ORGANISATIONAL CONTACTS

NZ Institute of Hazardous Substances Management
(formerly the Dangerous Goods Inspectors Institute)
www.nzihsm.org.nz
The official home of professionals committed to the safe management of hazardous substances and dangerous goods.

The NZIHSM is a 'not for profit' industry association specialising in improving safety, health and (site) environmental performance, particularly the safe management of hazardous substances in the community.

Responsible Care NZ
www.responsiblecarenz.com
Responsible Care NZ works closely with and industry partners to successfully implement the Hazardous Substances legislation. This is achieved by implementing and promoting the international SH&E protection initiative practised by the chemical industry in more than 53 countries worldwide.

The NZIHSM works alongside the ResponsiblecareNZ to enhance professional knowledge and capability.

ERMANZ
www.ermanz.govt.nz
Extensive information on working with hazardous substances.

Ministry for the Environment
www.mfe.govt.nz
The Ministry administer the HSNO Act, and provides policy, publications, technical reports and consultation documents

Department of Building and Housing
www.dbh.govt.nz
The Government agency that maintains the Building Act and the Building Code.

Local Government NZ
www.lgnz.co.nz/lg-sector/maps/
Local Authorities have responsibility for policing building controls. Some local authorities are contracted to Department of Labour to provide enforcement of the Hazardous Substances legislation.

If you know of other agencies which could be useful to members, please let us know at office@nzihsm.org.nz.

Earthquakes, explosions and extreme events

We almost seem to be bit players in a dramatic adaptation of *The Tempest* lately. Canterbury has had a major earthquake of a size that brought other countries to their knees, and further west in the South Island, the Pike River coal mine has experienced a dramatic example of the dangers of flammable gases.

Thankfully, the buildings and people of Canterbury emerged mostly intact, although some of the internal pallet structures were not sustained. However, the miners of Pike River were not so fortunate, a sad example of the dangers of flammable gases. Our condolences and thoughts go out to their families.

We in the NZIHSM are committed to the protection of people, the community and the environment. Articles in this edition of *Flashpoint* show different experiences of hazardous substances under these extreme conditions.

The review of the Tamahere incident, which also resulted in loss of life from flammable gases, was announced recently. While the NZIHSM agrees with many of the findings, there is still some confusion among members as how removing independent inspection by certifiers or enforcers for up to 300kg of LPG will improve safety in this area. Many members believe that inspections and safety prior to flammable gas incidents is preferable to resulting reviews of tragic incidents following insufficient independent inspection. Concerned members are encouraged to provide 'useful input' into the proposed LPG Association's code of practice prior to 12 December 2010.

One positive aspect of recent times is the apparent increase in chemical suppliers who are taking the HSNO controls more seriously, and ensuring their customers have suitable HSNO controls in place before hazardous substances are supplied. We understand that the suppliers and ERMA have been working together on this issue …

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Cover photo

Not able to establish accurate copyright for cover photos, except *Waikato TImes.*

Flashpoint

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Editorial material does not necessarily reflect the views and opinions of the Institute.

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What price self-certification?

Despite the high risk of flammable gases evident in the Tamahere and the Pike River mine tragedies highlighting the risks associated with insufficient control over these hazardous substances, the LPG industry seems to be happy with self-regulation.

While understanding the many positive benefits of LPG, the HSNO industry finds some of the recommendations from the review of controls on LPG and flammable gases surprising, given the real risks of flammable gases in uncontrolled environments.

The NZIHSM canvassed members, certifiers and enforcement opinions, from an overall safety perspective, and passed the following results through to ERMA on 18 Oct 10.

The consensus from respondents was:

> Hazardous substance management professionals, certifiers, enforcers and designers agree that there should always be independent inspection to minimise potential conflicts of interest on environments such as LPG installations that could easily be potentially dangerous to people and the environment. The recent Tamahere case is emphasised as an example where it was found that insufficient HSNO controls were in place (eg: signage). Their absence may have easily been identified if independent certification had been used. This incident resulted in loss of a firefighter's life. There are a number of similar examples where the treatment of LPG containers in industry is not always code compliant (ie: safe) on initial site visits, until reminded by certifiers.

With regards to other items, the position appears to be:

Odorise or leak detection

New control: LPG, propane and butane must be either odorised or there must be a mechanism for leak detection present.

NZIHSM agrees.

LPG in refrigeration

New control: a refrigeration system that uses LPG, propane and butane must meet the minimum requirements set out in AS/NZS 1677.2

NZIHSM agrees.

Signage (LPG within a building)

New control 1: threshold quantities lowered - signage is required at 50 kg reduced from 250 kg.

NZIHSM agrees.

Location test certificate requirements

New control: hazardous substance locations with 100kg and < 300 kg must be test certified by an ERMA approved test certifier at least once in the life span of the installation (this would usually be after installation). Thereafter, an alternative verification process (through an ERMA-approved code of practice) can be used to demonstrate compliance. This code of practice has yet to be developed.

NZIHSM does not agree as it believes that for public safety, there must always be regular and independent inspections and certification.

Stationary container system test certificates

New control: the requirement for a stationary container system test

Condolences

The NZ Institute of Hazardous Substance Management is deeply saddened by the recent tragedy that has occurred at the Pike River Coal Mine. We believe that this is a reminder to us all of the risks involved with flammable hydrocarbons.

Our thoughts and prayers go out to the families and all the people affected by this tragedy.

certificate for a LPG tank has been removed. Third-party verification of LPG tanks is already addressed under HSE (Pressure Equipment, Cranes and Passenger Ropeways) Regulations 1999. Items not addressed under PECPR, e.g. separation distances, firefighting and record-keeping will form part of the location test certificate criteria. ERMA New Zealand is working with test certifiers to establish a process for this.

Do not agree as believe that for public safety there must always be regular and independent inspections and certification in particular to the New Zealand HSNO requirements which are not covered in most of the pressure vessel engineering standards.

Hopefully the review team will take suitable notice of NZIHSM concerns especially in light of the regular potentially dangerous instances involving gaseous hydrocarbons (eg; 47 in Sept 2010 from the ERMA numbers Test Certifier Update Issue #95).

The recent Pike River mine disaster provides another reminder of the high risks of a potentially flammable hydrocarbon atmosphere.

ERMA's reply

ERMA replied to the NZIHSM submission that the move towards no independent certification of LPG cylinders up to 300kg was a result of submissions made by the LPG Association and took into account "costs, benefits, safety and ongoing compliance costs".

It is suggested that NZIHSM comment on the proposed LPG Association's code of practice in lieu of independent inspections that is out for public consultation until 12 December 2010.

NZIHSM urges members to submit proposals individually and to office@nzihsm.org.nz for inclusion in the proposed code of practice for the controls of flammable gases.

Firefighters not impressed

The New Zealand Professional Firefighters Union remains concerned that there was no obvious risk assessment included in the LPG Association's submissions to relax the controls surrounding LPG. The PFU also expressed concern over what effect this would have on emergency workers where the reduction in controls will have their greatest impact.

Impartiality removed

Ongoing impartial compliance review of LPG installations has been removed, said the union.

"The only party to have an ongoing review of an installation will be the LPGA's members who clearly have an financial interest in ensuring LPG supplies continue. Effectively, the LPGA submission sought, and has been granted, the green light to make it easier to store ever larger amounts of LPG on the outside of houses by reducing the safety oversight of such installations.

"Can modern high and medium-density housing accommodate such a change? This is unanswered, as is the effect on emergency services workers who are the people most immediately put at risk by these changes, and who have in the past have had to pay the ultimate price for poor controls on this substance."

Firefighters remain unconvinced that this proposal has the risk and benefits claimed when the LPGA submissions, and the Environmental Risk Management Authority's decision, allowed such significant questions to be ignored. There does not appear to be a mechanism to gauge the industry effectively policing itself.

"Firefighters have seen the effect of self-regulation in the likes of property management where it is essentially self-policing. Many property owners now don't address issues in their properties as they ought to because of issues such as time, costs etc, and we now see the results in buildings that are non-compliant. It's hard to see how the self-compliance of LPG installations won't follow that trend."

On the positive side, firefighters are pleased the regulations around the use of hydrocarbon gases in refrigeration systems have been strengthened, the union said. Changes limiting the amount of LPG stored within commercial and residential properties should also ensure a safer environment for the people working/living in those environments.

"Firefighters fear that issues with LPG will only be dealt with after the event, then it will be too late. Firefighters would much rather see the approach to issues surrounding LPG dealt with proactively."

Shake proves precautions at chemistry faculty

by Prof Bryce Williamson

New Zealanders live with prospect of 'The Big One', a once-every-few-hundred-years Richter 8 rupture of the major fault line that runs along the western edge of South Island and through the southern part of the North Island.

The closest approach of this fault to Christchurch is about 130 km, so Christchurch is not regarded as being particular earthquake prone. GNS data confirm that its locale is seismically rather quiescent in comparison with other parts of the New Zealand.

When Christchurch and surrounding districts were viloently shaken at 4.35 am on Saturday 4 September, thoughts naturally turned to The Big One and, "if it's this bad here, it must be devastating at the epicentre." We soon learnt that it was 'only' a magnitude-7.1 event. But it was shallow (focal depth 10 km) and close, involving a previously undetected fault with an epicentre just 40 km to the west of the city.

Remarkably, and perhaps uniquely for such a strong shock in a moderately populated area, there were no deaths and only a couple of major injuries – again a testament to a combination of good luck (regarding the time of the quake) and excellent building standards.

Since that day, there have been a vast number of aftershocks, many of them of a magnitude 5 or greater. Throughout this, the city has largely managed to function very adequately, despite the focus of the news media on toppled older buildings and the liquefaction of land near estuaries and rivers.

This is absolutely not to disparage the trauma that many residents have suffered through loss of homes and occupations, but we can be genuinely thankful that our situation is vastly better than those resulting from events of similar magnitude in other parts of the world.

After the initial quake, and having established that my family and neighbours were shaken but unhurt, my thoughts turned to the University of Canterbury and my workplace in the Department of Chemistry. Although it didn't occur to me till later, this is certainly the first time that a New Zealand university has been subjected to anywhere near the shaking that Canterbury and Lincoln universities experienced that morning.

In retrospect we have learnt many lessons, and it is the objective of this article to share some of those lessons with a wider community.

With electricity and water off, and electronic security systems defeated, the campus was almost immediately closed down and the emergency management plan activated. The university's emergency response team was on-site and functioning within 90 minutes of the event and, as qualified staff arrived on campus, an initial assessment of the situation was undertaken and response priorities identified.

Recovery process

By early the next day, engineers had verified the structural soundness of chemistry building and the Head of Department, Professor Alison Downard, accompanied by Associate Professor Emily Parker, Professor Peter Harland and two members of the University Facilities Management Unit, inspected the department. Their assessment was that there were no particular chemical, biological, fire, explosion or flooding hazards; and their recommendation was that the department should implement its recovery process.

The first step was to ensure critical equipment (mostly refrigerators and freezers) was

Due to its location at the boundary of the Pacific and Australian tectonic plates, New Zealand is regularly jolted by earthquakes. The strongest since scientific records began was in the Wairarapa region in 1855, and is estimated to have been of a magnitude between 8.1 and 8.3 on the Richter (MW) scale. Every one to three years there is a quake of magnitude greater than 7, but generally these have caused little in the way of damage to society or loss of life, due largely to the happenstance of epicentre locations and (more recently) informed and conscientiously implemented design and construction standards.

Superficial mess in an upper-floor office.

connected and switched on to protect valuable samples and minimise hazards when the power was returned to the building. All non-critical equipment was disconnected until electrical testing could be conducted.

On the Monday, senior technician Wayne Mackay and I were given the tasks of performing a more detailed assessment and formulating a recovery plan. From the fifth floor down (mostly administration and the teaching laboratories) damage was negligible; but it was significant and progressively worse on the three higher floors. Books, computer monitors, pot plants and filing cabinets were strewn around offices.

Damage in the research labs was widespread but apparently superficial, principally involving broken glassware, toppled bench-top instruments and silicone-oil spills. Chemical containment vessels and cabinets appeared to have stood up well, though some had migrated a few metres across laboratory floors. From a cursory external inspection, there was no glaring evidence of damage to major instruments, although subsequent testing was to reveal significant and irreparable internal damage to a new mass spectrometer and lesser damage to several other instruments.

The major part of the recovery process was implemented over the next four days as follows: Tuesday 7 September: Seven staff members (Wayne Mackay, Laurie Anderson, Alistair Duff, Matt Polson, Rob Stainthorpe, Nick Oliver and I), with skills in areas ranging from photography to hazard management, worked to identify, document and undertake first-order mitigation of hazards.

Principal aim

Our principal aim was to make the department safe for other workers to start their clean-up procedures. Secondary aims were to generate records for insurance purposes (and posterity) and to establish priorities for action over the following days. Most of the work involved photography, picking up equipment and containers, sweeping up broken glassware, and initial efforts at cleaning up oil and chemical spillages. Freezers and refrigerators were sealed, to be dealt with by a more specialised group on the next day.

Wednesday 8 September: In the morning, appropriately skilled technical and academic staff made initial assessments of the condition of major equipment (X-ray diffractometer, NMR and mass spectrometers) prior to contacting manufacturers and service companies. At the same time, a subgroup of the departmental Safety Committee collated and examined inventories of refrigerator, freezer and cold-room contents, to identify toxic or particularly reactive substances.

During the afternoon this latter group unsealed and inspected most of the refrigerators and freezers, leaving a couple of especially hazardous substance to be dealt with later when breathing apparatus were available. In the event, those materials had been very securely protected and isolated, and presented no actual hazard.

Thursday 9 September: Academic and technical staff were invited in to tidy their offices and workshops, and to inspect their laboratories. A small group of PC-trained

Wheeled storage cabinets in research laboratories had migrated by as much as several metres. All of the cabinets in this photo had originally been under fumehoods or benches.

research students assisted with the assessment and tidying of the department's PC2 lab and technical staff started the testing and safety certification of electrical equipment. General clean-up procedures continued and by the end of the day the laboratory floors were completely cleared of oil.

Spilt silicone oil presented a major slip hazard and was very difficult to clean up.

Friday 13 September: all staff and research students were permitted back into the department to proceed with cleaning up and damage amelioration, with the proviso that no research was to be undertaken until laboratories had been certified safe by the department's safety officer, Professor Ian Shaw.

By the end of that week, the department was well down the track to recovery. With the assistance of facilities management personnel, most of the infrastructure had been restored. Fume hoods were still switched off awaiting confirmation that ducting was intact, and the restarting of major instruments was stalled while advice was sought from manufacturers and service companies.

We could have resumed undergraduate teaching in the following week, but other sections of the university (particularly the libraries) were taking longer to recover. With the added stress of the ongoing aftershocks, it was determined that undergraduates would not be permitted back on to campus till the following Wednesday, with teaching starting on 20 September.

Guards and lips

We learned several things from the situation. Firstly, due to numerous incremental earthquake mitigation modifications prior to the event, we were actually very well prepared. Perspex guards mounted around chemical shelving and laboratory bench dividers were extremely effective at preventing chemical containers from spilling on to the floor or bench tops.

Storage-shelf lips of a little as 2-cm height seem to have entirely prevented equipment falls, whereas books and papers stored on office shelves with no lips were liberally scattered around offices. Evidently, items on flat surfaces had mostly shuffled laterally during the shake rather than bouncing. Substances in refrigerators and freezers had been well contained in plastic trays and sealed plastic containers proved to be particularly safe for holding hazardous materials

A few things didn't fare so well. Chains used to fix light fittings to the ceiling and (in a couple of instances) gas cylinders to walls had been shaken off open-loop hooks. Items left on un-lipped bench tops fell to the floor resulting in a lot of broken glassware. The latter problem was exacerbated by the fairly extensive spillage of silicone oil (used as an inert heating-bath medium). The mixed glass and oil was both the greatest hazard and the most difficult thing to clean up.

Our response plan and action went well, without resulting in any harm to personnel or additional damage to the building or its contents. The photographs of the affected rooms prior to, and during, cleanup provided comprehensive records for insurance claims and also an opportunity for a post-clean-up departmental slide-show.

The stepped progression of activities meant that we could exercise control over access, particularly at the time when some potential hazards had not been specifically identified and aftershocks were at their most numerous. Staff and students were generally very patient about being excluded in the early stages.

The only flaw

Perhaps the only real flaw in our arrangements was the difficulty of obtaining a list of contact phone numbers. We had such a list on a university server, but infrastructural disruptions meant that we could not access that list for the first few of days after the quake, the period when we trying to check on people's welfare as well as form task teams and gather information about stored materials.

In light of our experience,

recommendations we would suggest to similar departments are:

1. For items (such as gas cylinders) secured by chains, closed-loop chain-hooks should be used with attachment by way carabiner-like shackles. Open-loop hooks permit the risk that the chain will jump free during shaking.

2. Guards (for example perspex or wire) should be affixed to any shelves or sills where loose items (sample vials, chemical jars, desiccators etc.) are likely to be stored. This includes the tops of cabinets, refrigerators, ovens and any other places that are likely to provide tempting storage spots.

3. Low lips should be considered for the edges of research-laboratory benches to limit the possibility of items rolling off the bench on to the floor. Bench-top instruments (chromatographs, ovens, spectrometers etc.) should be fixed to the bench and stacks of such items should be strapped down.

4. Spilt silicone oil is very problematic. Where appropriate, alternatives to oil-bath heating should be used. If oil-bath heaters are required, splash-proof baths should be employed (we need a design) and the oil should be returned to a sealed container when not in use.

5. Items and substances stored in freezers, refrigerators and cold rooms should be contained in (preferably sealed) plastic boxes or trays. Refrigerators and freezers should carry physical identification information that clearly specifies any hazardous substances they contain and the person who should be contacted in case of an adverse event.

6. Wheeled storage cabinets had migrated by as much as a few metres. We wonder whether such cabinets should be fitted with wheel locks. However, it is possible the motion of the cabinet as a whole dampens the risk of items toppling within the cabinet. This is a question that could do with investigation.

7. Half-sized filing cabinets should not be stacked on top of each other. Filing-cabinet drawers should be closed with the key in the locked position to prevent drawers from shaking open and overbalancing the cabinet.

A consequence of stacked filing cabinets. Toppled cabinets would have presented significant threat to personnel if offices had been occupied during the earthquake.

8. Several specified members of staff should carry a full list of contact phone numbers in a cell phone directory. All staff in the department should know who carries those directories and how to contact them.

9. The department should have a generic emergency response plan that can be readily adapted to any adverse event. It should be known which teams of which people should be assigned to tackle each type of predictable task.

10. In case of a power outage, an accessible list should be available as to which instruments should remain switched off or be urgently restarted when power is returned.

Our department has weathered the earthquake very well due to a combination of good luck, good planning and dedicated effort. We owe a great deal to university emergency response team and facilities nanagement personnel. The overall emergency preparedness of the university was tested to a degree far beyond anything else in its history and shown to be well up to scratch. A strong co-operative relationship between the pan-campus controlling body and the departmental response teams greatly facilitated our efforts.

Information and assistance was provided promptly, as and when we needed it without unnecessary bureaucratic overheads. At the departmental level we are indebted to the technical staff who implemented the invaluable pre-quake mitigation measures and carried the majority of the post-quake clean-up workload.

These people put aside their personal concerns and anxieties at a time when magnitude-5 aftershocks were still a regular occurrence.

***Professor Bryce Williamson* – College of Science, Canterbury Uni.**

Quake skakes moths out of preparedness

by Dave Lascelles

The need for emergency preparedness plans is generally well understood: the difficulty is anticipating all possible scenarios and how to respond to them.

Seismic issues generally do not feature very high in the richter scale in emergency planning, as most have had no experience on which to draw in formulating eathquake emergency response plans. The earthquake in Christchurch on 4 September brought a lot of things and people down to earth – literally. All things seismic, and everyone's emergency preparedness were severely tested.

Specifically from my experience, the earthquake potentially shook out some issues around transport operators, and provided the opportunity for HASNO certifiers to drive some real change into the performance of those transport operators who store mixtures of hazardous substances in transit for multiple clients.

I was commissioned to assist insurers acting for a multi-national company with some hazardous chemicals stored in transit in a transport operator's warehouse. Racking in the warehouse failed during the earthquake, spilling a large quantity of liquid hazardous substances onto the surrounding warehouse floor.

The owner's product mix consisted predominantly of Class 6 & 9 agricultural chemicals stored in 5, 10 & 20L containers on pallets. Recovery of the spilled material was relatively straightforward. It involved containment and recovery of the spilled matter into an absorbent media; abstraction of containers from the racking; cleaning of unbroken containers for resale; and disposal of damaged containers and their contents to a chemical waste destructor.

However, the owner's products were interspersed with a second company's products (similar hazardous substances) within the failed racking. The second company was not in attendance on the clean-up operation. The second company had, by default, abrogated its responsibilities in the clean-up to the first. The first company was left to second-guess the significance of the second company's products with regard to hazardous interactions and the like.

The transport operator manages the storage of hazardous substances on through the warehouse behalf of its clients; which implies a level of training and experience. However, when questioned, staff could not produce an emergency preparedness plan for the site. They too took no active role in the clean-up of the hazardous substances.

A metal waste recovery contractor was seen on site cutting up damaged racking and loading it for despatch; while contamination from the racking was washed into a nearby stormwater drain! Again the transport operator appeared to take no accountability for this activity, although it had ordered the work.

Failed and collapsed storage meant mingling of goods with unknown consequences.

The underlying learning experience from this case, is the need for stringent requirements to be placed by HASNO certifiers on all transport operators who warehouse mixtures of hazardous substances for multiple clients. A procedure should be in place requiring the close interaction of multiple clients in an emergency (e.g. spill scenario), storage systems (e.g. racking systems) should be seismically certified, and appropriate emergency preparedness and response plans should be in place, along with verifiable training regimes.

David Lascelles is a chemical engineer, and formerly engineering manager of Orica and ICI.

Quake lifts petrol tanks

At least six service station sites were directly affected by the 7.1 earthquake in Christchurch. Lyn Osmers says the worst affected was in Bexley (pictured) where empty tanks were lifted half a metre out of the ground by liquefaction, fracturing underground pipe work. The Christchurch City Council used the Civil Defence Act to have the tanks removed.

Fire Door COP

ERMA is consulting on a code of practice for the selection of fire doors where flammable substances are stored. This code has been designed in response to recent concerns by enforcement agencies regarding fire doors and two specific issues: the fire resistance rating used for walls do not apply directly to doors, and doors with the fire resistance ratings specified in the regulations are not available. Submissions close on 28 January 2011.

Envirostep released

The Ministry of Economic Development has developed Envirostep, an online assessment tool to help small and medium enterprises improve their environmental performance. ERMA has been working with MED to develop a HSNO module for Envirostep, and this is now available. This module has been designed to help SMEs better understand what they need to do to keep safe and comply with HSNO. http://www.eco-verification.med.govt.nz/envirostep

Performance standard (explosives) certificates

ERMA is currently consulting on the Test Certifier Performance Standard for Content of Class 1 (Explosives) Approved Handler Test Certificates. This standard was the review of several hundred Class 1 approved handler test certificates. The review encountered wide variations in the way test certificates were written and in particular uncertainty of definitions of the lifecycle phases.

This standard sets out the expectations of ERMA for the content and format of Class 1 approved handler test certificates. Copies of this standard will be distributed to the relevant test certifiers, shortly.

Submissions close on 28 January 2011.

continued from p1

In this magazine specific aspects of the HSNO regime are covered, concerning storage of differing classes of chemicals in earthquake conditions, LPG control proposals, managing methane in mines and some actual LPG installations.

On a brighter note, as this is our final publication for the year, best wishes to you all for an enjoyable holiday and Christmas season, and a safe and wonderful 2011.

John Hickey,
Institute president

Defining hazardous area zones

This is the second in a two-part series by Bruce Durdle.

In the first article, (Winter 2010 issue) the need to define hazardous area zones where flammable substances are used was discussed. In this article, he looks at the methods of defining the zones set out in AS/NZS 60079.10.1.

To define a hazardous area zone, possible sources of release need to be identified, and the conditions under which a release might occur.

In the IEC system, sources of release are graded according to the likelihood of a release:

Continuous grade release

A continuous grade source will release a continuous flow of flammable material, or will release material for long or short periods that occur frequently. It will typically be a part of the process operation where flammable material is allowed to mix with air under controlled conditions, rather than arise from a leak or failure. One example is the surface of a solvent bath – the surface of liquid inside a storage tank is another.

Primary grade release

A primary grade source will release flammable material periodically or occasionally during the normal operation of the plant. Typical primary grade sources are vents or a sample point that is used weekly.

Secondary grade release

A secondary grade release is unlikely to occur in normal operation and, if it does, the release will be infrequent and only for short periods. Typically, secondary grade releases are result from some sort of failure. Joints in pipes or ducting that are normally sealed but may leak are the commonest examples – the discharge piping from a safety valve is another.

Multi-grade sources

Some sources may have more than one grade to account for releases under different conditions. For instance, a control valve stem may leak a small amount of gas in normal service and be classed as a primary grade source with a small associated zone.

However, on a packing failure or flange leak, the valve could also give rise to a secondary grade leak with a much larger release rate. The zone associated with the primary grade source will be relatively small, and will be surrounded by a larger area due to the secondary grade release.

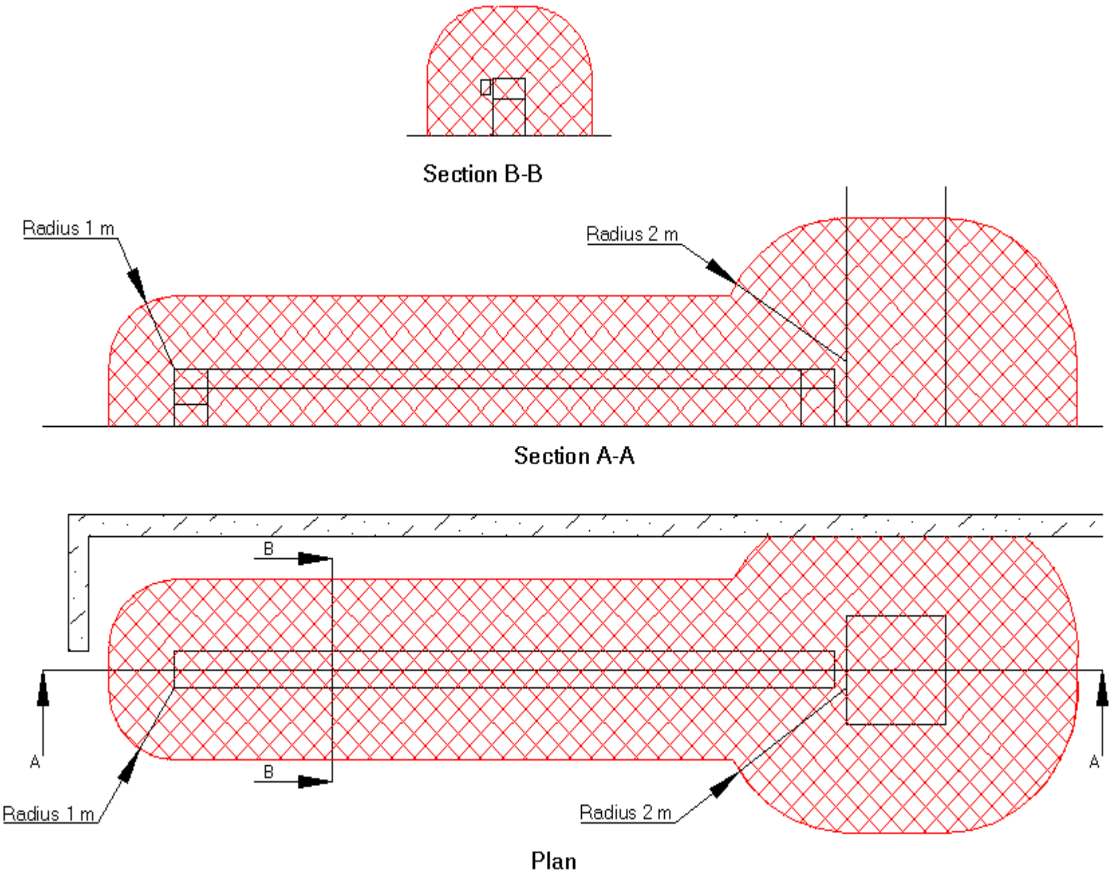
Grade and zone

The grade of release indicates how likely it is that fuel is present: the other factor determining the zone is the degree of ventilation.
If an area is adequately ventilated, then a continuous grade release will give rise to a Zone 0 or Zone 20 area; a primary grade to Zone 1 or 21; and a secondary grade to Zone 2 or 22.

However, if ventilation is inadequate a primary grade release can result in Zone 0, and a secondary grade Zone 1. Areas such as sub-surface drains or pits will usually be assigned to Zone 1 even if the releases in the area are secondary grade.

By ensuring a high rate of ventilation with high reliability, the area around a primary **grade**

A board spray painting unit, together with the appropriate area classification drawing.



release may be assigned to Zone 2 or even rated as non-hazardous.

Zone extents from examples

Many situations are relatively standardised, and can use a "cook-book" approach to determine the extent of zones. Several organisations have produced standards or recommendations covering a number of standard situations. Annex ZA of AS/NZS 60079.10.1 contains illustrative examples, which were formerly published as AS/NZS 2430.3.

These examples cover many different types of process. Examples have to be used carefully to make sure they are not applied to cases where they are not valid. For instance, examples will be based on standards governing design, construction and maintenance of the facility.

Zone extents from release rates

Where an illustrative example does not apply, a more complex method must be used. The procedure used in AS/NZS 60079.10.1 is based on a simple concept that is extremely difficult to apply.

The approach taken is to determine a 'hypothetical volume' of space around a release point with a boundary where the concentration of the fuel/air mixture has fallen to its lower explosive limit (LEL). This volume can be estimated by considering fuel flowing into it at an expected release rate, and air flowing at an assumed minimum air-flow rate.

Estimating release rate

In some cases, the release rate of flammable material can be easily assessed: for example, when filling a tank, the rate of vapour emission from vents will equal the filling rate. However, the release rate will usually depend on a number of variables that are very difficult to quantify or predict ahead of time. Estimates must be made using worst-case values.

AS/NZS 60079.10.1 gives complex equations based on

fundamental fluid mechanics principles to estimate release rates for liquids and for gases under choked and non-choked flow conditions. These ignore factors such as fluid resistance and give a release rate that should be higher than will occur in reality.

From these equations, an indication of the 'hypothetical volume' can be found by then considering the effects of ventilation. This volume indicates the size of the possible flammable cloud. However the benefit of this approach is questionable as the Standard then states:
"... the volume of hazardous area from a given source of release will generally be several or even many times larger than the hypothetical volume VZ."

This approach is therefore not a lot of use in determining the zone extent. It does however allow us to identify the factors that contribute to the extent. This will depend on the size of opening, and is inversely proportional to the molecular weight for a gas. It will also increase if internal pressure increases.

More specific zone extents can be obtained by carrying out dispersion modelling on the expected release. This is a specialist task, not generally used for most situations.
However, extensive modelling and verification tests have been carried out on a number of petrochemical fluids and the results published by the Energy Institute in London, in their Model Code of Practice IP15 "Area Classification Code for Installations handling Flammable Liquids".

The results can be applied with care to most flammable liquids provided the effects of differences in properties such as molecular weight, viscosity and density are taken into account.

Area classification to determine the zones of flammable areas around a facility is a specialist area, and must be carried out by a team with suitable knowledge of the process and its usual operation, and of the behaviour of materials used in it.

Most classifications will make assumptions about operating practices, maintenance and other factors that may change during the life of the plant. Zoning can alter if operating practices change, if equipment is not adequately maintained, or if alterations are made. Any changes must be carefully considered for the effect they may have on zoning.

Ventilation or the lack of it can have a major impact on zoning. This can be positive or negative, but using ventilation to reduce zone severity means that the ventilation has to be extremely reliable.

Bruce Durdle has been involved with hazardous areas for more than 25 years. He was the Senior Instrument/Electrical Engineer on the Petralgas from 1985 to 1991, and then after a period with a UK consulting engineering firm returned to New Zealand. He has carried out area classifications for a number of organisations, and has also presented courses on the subject.
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Cyclinder survival in quake zone

by Rob Savory

THE GOOD – Kaiapoi Mill

Various rooms and out-buildings at the old Kaiapoi Mill are rented out to small businesses. About a year ago, mill management did a great favour for the community group to which I belong. In return, I pointed out to them that their unrestrained and unsecured LPG cylinders were in non-compliance with HSNO and would be bloody dangerous in the event of an earthquake.

Guess what? Management actually took my advice! The cylinders were restrained and caged within a couple of days. This response probably prevented a catastrophic fire for the mill and the nearby houses early on the morning of Saturday 4th September.

The properly restrained and caged LPG cylinders were unaffected by the earthquake.

THE BAD – Kaiapoi Lifeboat building

Two 45 kg LPG cylinders at the Kaiapoi Lifeboat building were stored in a small cage attached to an outside wall. When the earthquake struck, the concrete footpath broke up and dropped away. Fortunately, there was just enough slack in the LPG hoses to accommodate this 450 mm drop.

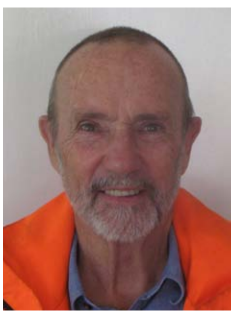
The concrete smashed and the LPG cylinders dropped by approx 450mm.

THE UGLY – One of Kaiapoi's veterinary clinics

On the night in question, my little dog was in cage at one of the local vets, recovering from surgery. Two oxygen cylinders were being stored in the recovery room. The cylinders were unrestrained and had a 240 volt power lead installed across in front of them. When the earthquake struck, the cylinders crashed to the floor, half ripping the socket out of the wall. Fortunately no further damage was sustained except for the fact that little Missy was in deep shock for the next 24 hours.

The consequences could have been far worse.

Dr Rob Savory worked on BHP's manganese mine in the Northern Territory and then did six years as an environmental officer with the Queensland Department of Mines & Energy. He is now a Kaiapoi-based consultant specialising in independent environmental and hazchem auditing with clients such as Solid Energy (coal mines)and is the author of the company's hazardous substances management standard.



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Uncle Archie

Hello HS practitioners! I'm Uncle Archie, an HS practitioner with good lungs!

As I travel, I am approached by many safety practitioners, enforcers, designers, certifiers and legislators from within the hazardous substance industry, all of whom have opinions on different aspects of the HSNO industry. I am happy to present your opinions in the interest of progress, provided that it raises a useful issue concerning the hazardous substance and related industries. You can send comments to me at archie@nzihsm.org.nz.

Retail code of practice

A bouquet to the NZ Retail Assoc, ERMA & Hazknow on the "Code of Practice for the Storage of Class 3.1 Flammable Liquids in Retail Stores" for manufactured products, such as paints, where only less than 25l is open at any time.

Sense has prevailed and up to 8000 litres of closed storage of manufactured products (eg: oil-based paints, glues, etc) can be stored before zoning is required rather than the previous 100 litres.

This result is practical and sensible for the large ground floor retail facilities, provided the facility is checked regularly according to the 'Location certificate' criteria.

Silver bullet gone rusty!

It appears the silver bullet of 'conditional certificates' may be becoming a little tarnished.

While many possible HS sites are still not certified, this was proposed as a method of getting some of those 'tardy but trying' HS sites onto the HSNO database without going to the extent of a formal complaint to enforcement.

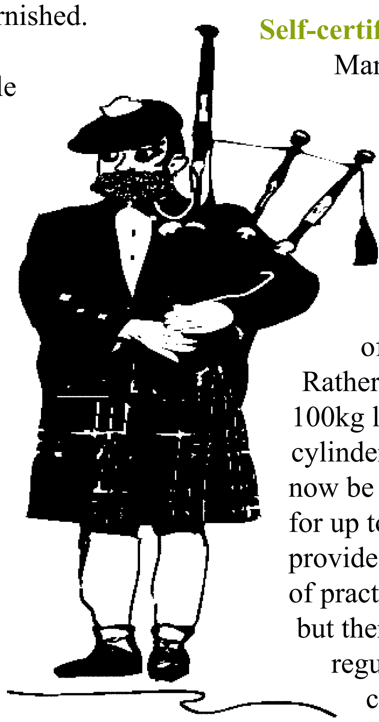
However, if the rumours of a maximum length of 'one month' for a certificate are true then 'trying HS sites' may not thank their friendly certifier for this! Perhaps they should issue a 'compliance order' instead as these can last longer!

But in any case, TC's can't issue compliance orders, which may be lucky, as 'trying HS sites' are not likely to thank you for this either!

Insurance

It is interesting that parts of the insurance industry appear to be awakening to the presence of hazardous substances and the need to advise their clients of HSNO compliance requirements as part of their annual reviews.

This has been evidenced through previously unknown sites contacting test certifiers regarding certification requirements. It appears to be a combined result of the insurance companies and ERMA advising the Insurance industry of HSNO requirements. Whatever the cause, this represents a positive result.



Self-certification for LPG!

Many practitioners have expressed surprise that a result of the Tamahere review was the proposed 'self-certification' of LPG facilities! Rather than the previous 100kg limit, LPG cylinder storage may now be self certified for up to 300 kg LPG provided a proposed code of practice is followed but there will be no regular independent checking of this.

The proposed code out for discussion doesn't refer to adequate ventilation or indeed independent verification and Uncle Archie believes that this may not be a safe practice. Every facility should be checked at least once every two years to stop those incidents in advance.

If you want to send a comment, you can send it to archie@nzihsm.org.nz.

The ideas expressed in this column are not necessarily the views of the NZIHSM or *Flashpoint*, but we will publish 'fair ideas' in the interests of 'free speech'!

200 years of coping with methane

by Rob Savory

The world-wide coal industry has a lamentable record in dealing with the problem of methane in coal mines.

Methane (CH_4) is a colourless, odourless gas that occurs naturally in coal and is released during mining operations. The explosive limits for methane are 5% LEL and 15% UEL. The gas is lighter than air, with a relative density of 0.6.

Open-cast coal mines: Methane does not usually pose a risk in open-cast mines because (a) near-surface coal seams contain lesser quantities of the gas and (b) the released methane quickly dissipates up into the atmosphere.

Underground coal mines: The risk of an explosion in an underground mine is ever-present because (a) deeper coal seams contain more methane (1- 5m3 gas/tonne, or more), (b) methane can rapidly accumulate to above LEL in a stagnant atmosphere in underground workings, (c) sources of ignition associated with mining operations and (d) because of the potential for spontaneous combustion.

Methane detection

Canaries:

The classic method of detecting methane (and carbonmonoxide) in coal mines was with canaries. These birds succumb to toxic gases long before humans; miners were warned to exit the mine when the canary stopped singing, appeared sick or died.

(Photo RC McDonald - www.robirda

Portable gas detectors: Modern day coal miners carry a small, highly-sensitive gas detector that emits a high-pitched beep when even minute traces of explosive gas are present in the atmosphere. This instrument also monitors CO, H2S and oxygen levels.

Continuous gas analysers: Air, drawn to the surface from within the mine, is monitored continuously for toxic gases. The instrument is linked to an alarm system which alerts staff in the control room whenever pre-determined levels of toxic gas are exceeded.

Reducing the risk

Ventilation: good ventilation is the key to keeping the methane content in the mine atmosphere well below the LEL. Dedicated ventilation drives and/or shafts are fitted with massive extractor fans.

The incoming fresh air is carefully directed to operational areas within the mine.

No sources of ignition: all mining equipment used underground should be intrinsically safe. Strictly prohibited is any personal equipment that could cause a spark, eg. cigarette lighters, matches, watches, car keys, aluminium cans.

Spontaneous combustion: monitoring temperatures within the mine alerts management of any increased risk of spontaneous combustion. The hot area is sealed off and the mine is evacuated if necessary.

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