

SAFETY AND LOSS PREVENTION SUBJECT GROUP NEWSLETTER

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EDITORIAL

Many of the older members of the S&LP Subject Group will remember the ICI Safety Newsletters which were published continuously by Trevor Kletz from 1968 to his retirement in 1982. Further copies were published up to 1983. All 171 issues of the Newsletter are being scanned and will be available on the IChemE web site shortly. Issues 1 to 50 will be available first followed by the others as they are processed.

This will be a valuable site for identifying hazards and many other uses as it will be fully searchable. Are there any other safety documents that may linger in Company offices that we could put onto this web site?

IMPROVING OPERATIONAL SAFETY AND COMPETENCE THROUGH HUMAN FACTORS.

This meeting was held at 1 Portland Place on the 20 February 2007 and was the Fourth in the series of Human Factors Seminars, the First being held in 2004.

Mr. Ian James, HM Specialist Inspector HSE spoke on "Competence Assurance. A regulator's Viewpoint." and outlined why HSE thought competence was important, what inspectors looked for and gave practical examples/case studies. At the Esso inquiry on the Longford fire in Australia Esso claimed that their operators had been well trained and were competent. Consequently Esso stated that the cause of the accident was operator error and hence the operators were to blame. There were many causes but competence of operators and supervisors was a key issue. The operators and supervisors did not have an adequate understanding of the system and did not fully understand the possible consequences of their actions. It was clear that the operators did not understand brittle fracture, did not have the knowledge of the dangers associated with loss of lean

oil flow – even though they had been assessed as competent. The competency assurance system did not test for real understanding of the system. Another contributing factor to the lack of understanding available was the prior relocation of engineers away from the plant. Competency was also a root cause of the fire at the BP Texas City Refinery.

The stages of acquiring competence are:

- Unconscious incompetence (Unaware of limitations when faced with new task/role)
- Conscious incompetence (during training and development)
- Conscious competence (trained and assessed as competent)
- Conscious competence (develops good habits)
- Unconscious incompetence (develops bad habits or lapses)

Competence assurance systems have to take account of these stages eg monitoring and reassessment to detect and correct bad habits.

A competence assurance system was defined as a system for measuring the competence of employees against agreed standards. Under the COMAH requirements competence is the continuing ability of individuals and *teams* to perform reliably the elements of their roles, responsibilities and tasks, and for this to be demonstrable against the standards. Like most management systems, managing competence involves designing, planning, implementing and monitoring and reviewing. The starting point is an analysis of safety critical tasks so that causes of human failure can be identified and their potential reduced (initially by equipment and plant design, and then by developing adequate procedures). Once developed, the procedures form the basis for the competency management system. There are two very important issues here that are often not dealt with very well. Firstly, training and competence assurance do not prevent unintentional errors (slips and lapses) – these are better dealt with by plant/equipment design eg all valves are turned clockwise to close, or adequate provision for error recovery eg alarms, error checking. And secondly, many companies spend considerable resource on a competence management system without applying equal rigor to ensuring that procedures are fit for purpose.

These are the key issues that an inspector would look for during an inspection:

Do operators/supervisors/managers/engineers etc:

- Have the right understanding (the 'why?')? e.g. do they know the major accident hazards and the potential consequences of not following procedures?

- Know their related tasks, roles and responsibilities (for all foreseeable modes of operation)?
- Have the right skills, knowledge & experience? Are they confident? e.g. at night?
- Have key competences maintained & improved?
- Know their limits....?

The inspector would also want to see that the system showed clear links to e.g.

- Identification and assessment of safety critical tasks,
- Roles and responsibilities from risk assessments and procedures,
- Corresponding rigour in the training, assessment, verification arrangements
- Realism about human abilities

The presentation was based on this publication:

“Developing and Maintaining Staff Competence” Railway Safety Principles and Guidance Part 3 Section A ISBN 0-7176-1732-7 [equally applicable to chemical plants]

Further information on competence (and other human factors topics) is available here:

www.hse.gov.uk/humanfactors/comah/index.htm

The second talk was given by Mr Micheal. Wright of Greenstreet Berman Ltd on “Competence Assessment in the Hazardous Industries.” He outlined the position prior to 2003 as a situation with poor and lapsed competency assurance systems, lack of resource and commitment, poor training arrangements, no links in the system to major accident hazards or risk assessments and no monitoring arrangements. The Esso Longford explosion was an example of operators lacking knowledge despite being assessed as competent. Competence was expressed as an assessment of the ability to perform the activities within an occupation or function to the standards expected in employment. COMAH sites were required to show that competence was the continuing ability of individuals and teams to perform reliably the major accident hazard elements of their roles, responsibilities and tasks, and for this to be demonstrable. A generic framework was given:

- Identify safety critical tasks
- Define measurable performance standards
- Select assessment method
- Assessor needs
- Re-assessment needs
- Monitor performance outcomes & modify assessment

The level of assessment and the re-assessment for operators, senior technicians and managers was given. Frequently companies only acted on training issues when there has been an incident or enforcement; as part of wider organisational change or to pre-empt problems and achieve best practice. The GSB survey found that since 2003 the competence assessment systems could be:

- Disproportionate, impractical & hence ineffective;
- Unwieldy, paper based, too many SOPs;
- Operations oriented or aimed at supporting career progress rather than validating safety competence;
- Modules may be optional;
- Key safety critical tasks may be under weighted or missed;
- Not linked to MAPP;

- Can be disjointed as not seen as a competence assurance SYSTEM;
- No overall strategy, few connections or link to MAPP.

Most firms could handle ‘technical’ aspects of competence assessment. The key lessons learnt were prioritisation and gap analysis. Recent developments had shown that behavioural factors were most important including trust, involvement, leadership, positive reinforcement, communications, openness to ideas, leading by example, commitment, continual review and shared expectations. These factors covered everyone in the company.

In conclusion he believed that there was a need to integrate major hazard risk assessment with competence assessment, training and safety. There was emerging good practice in area of behavioural standards for managers, directors and supervisors as well as workers.

The third talk was given by Mr. Jan Maarten Schraagen of TNO on “Structured Troubleshooting.” He outlined the work that TNO had done in the Dutch naval fleet where there had been high turnover of people and insufficient training of corporals. The TNO approach was to observe the troubleshooters with varying levels of expertise, observe current training practices, develop a new approach to training and evaluate the new approach. They concluded that there was a gap between the theoretical instruction and the practice and that the training courses were based on the technical documentation. There was a lack of practice in actual troubleshooting and there was not enough practical experience. New methods which concentrated on the development of troubleshooting skills were developed and introduced. After one week of extra training they found that:

- Technicians solved more than twice the number of problems
- Were more systematic in their reasoning
- Had a far greater functional system understanding
- Were faster troubleshooters
- Were enthusiastic about this new approach

The course was later reduced from 6 weeks to 4 weeks with further increases in effectiveness.

The Fourth talk was given by Mr. Ronny. Lardner of the Kiel Centre Ltd on “A Human Factors Analysis Tool” who posed the question “Why do people do what they do? – influencing the human factors in accidents at work.” He gave some thoughts on organisational culture and capability where the development of an improved safety culture would lead to fewer violations but could leave the errors at the same level. He gave the key point as a need for more focus and tools to tackle error, more traditional behavioural safety will not help. It was also important to remember that human error includes management error. The problem was why do people do what they do and how to analyse, understand and influence their actions. As an example he gave the air traffic controllers had been shown to make 2% violations but 98% errors including management errors. He asked the audience if they had knowingly broken the speed limit? Also if they had gone

into a room, and forgotten why they went there? People processed information by:

Perceive information from outside world or Memory of training, procedures of recent events etc
 Making decisions based on perceptions and information from memory
 Take action based on decision

Error types were found to be:

Unintentional behaviour - Dialling the wrong phone number from your mobile
Perception error - Mistaking a '3' for an '8' on the display screen
Memory error - Recalling 0131 667 8059 as 0131 677 8059
Decision error - Dialling home from abroad, and getting connected to a local number
Action error - Miss-keying two adjacent numbers

ABC analysis helps you to understand behaviour from the other person's perspective.

ANTECEDENT - Something that comes before a behaviour, and sets the stage for the behaviour to occur

BEHAVIOUR - What the person does

CONSEQUENCE - What happens to the person as a result of the behaviour. Certain types of consequence strongly influence behaviour

In association with a number of major companies the Keil Centre had developed an incident investigation tool to identify the human factor contribution to accidents. Industry reaction had been positive:

- Re-analysis of incidents yielded better recommendations
- Trained and experienced investigators judged that methods added value
- Regulator commended methods and output. Regulator's own specialist inspectors recently trained
- Good avenue to raise awareness of value of a human factors approach, and promote proactive use

The final talk was given by Mr. David. Dryer of ABB on "Showing the way to peak performance." Firstly he discussed the model for managing organisational change efficiently. The steps required were an understanding and a quantification of the problem, implementation of the standards and the assurance system, sustaining the system and creation of continuous improvement, with the outcome being a world where competence is assured and reviewed. Various models and theory were then outlined.

He then discussed how one could ensure that competences developed for operational safety maintained alignment with the organisational strategy. A check list was given

- Standards of competence
- Assessment criteria
- Underpinning knowledge
- Range statements
- Direct observation
- Indirect assessment
- Assessors

- Verifiers

He then moved to show how team based competence development is more effective than top-down diktat. Cross functional teams provided the right levels of engagement, empowerment, local knowledge, technical skills, commitment of all stakeholders and systems awareness.

Finally he discussed the importance of performance management and competence assurance systems to review and validate the competences in use. A checklist was given but lots of passion and commitment was required.

John Bond

OFF SITE RISKS FROM MAJOR HAZARD SITES

This well attended meeting of the Hazards Forum was held in London on the 12 March 2007 and was sponsored by the Safety and Loss Prevention Subject Group of the Institution of Chemical Engineers and the Safety and Reliability Society. Dr D. Goodman chaired the meeting.

Dr. M. Considine, Head of Major Hazards and Fire at BP International started the meeting on "Assessing the Offsite Risk from Major Hazard Facilities". There were about one major incident with over 10 off site fatalities per year involving hazardous chemicals including Bhopal in 1984 involving methyl isocyanate and 2,800 fatalities, Enschede in 2000 with fireworks and 20 fatalities, Toulouse in 2001 with ammonium nitrate with 29 fatalities, China in 2004 with 243 fatalities, and Belgium in 2004 with a gas pipeline failure with 15 fatalities. There has been no offsite fatalities in the UK last year. An example of a major offsite disaster involving more than 500 fatalities was given a short film presentation of the Pemex disaster in Mexico in 1984. This showed the devastating effect of a Boiling Liquid Expanding Vapour Explosion. Examples of experimental gas releases from 50 mm diameter pipework were shown. Steady state releases of propane reached 12 kg/sec and a plume extending 110 metres down wind were shown. Similar heavier than air toxic gas releases were shown where they spread over the ground after release from a 50 mm diameter pipe. Pictures of a release at a marine terminal were also shown. Ignited releases were shown from a 50 mm diameter pipe where the flow reached 8 kg/sec with a radiation of 365 megawatts and a 35 meter fire length. A crude oil tank fire with a boilover giving a flame reaching 3000 ft into the sky was shown and explosions showing the acceleration resulting from obstacles.

The duties of operators and regulators were discussed. The role of the operator was to prepare the inventory of hazardous substances and then prepare the worst case release, the more likely release based on frequency assessments and prepare the Safety Report. The frequencies of events were based on generic failures from experience, operational events such as vessel failures and external factors such as earthquakes and aircraft impacts. Escalation from these events had to be considered. Having identified the events the consequences had to be evaluated

using a variety of criteria. The passive and active mitigating measures had to be identified including the management systems in force on the site. The COMAH requirements on the operator required the company to demonstrate that suitable controls were adopted to ensure acceptable risks. There was now a necessity to ask the questions: What more can I do to reduce the risks? Why have I not done it? The Operator's role was defined by the COMAH regulations to take all measures necessary to prevent major accidents and limit their consequences to persons and the environment. The Regulator's role was to control the location of hazardous inventories by consents and to mitigate the consequences of major accidents by emergency response and land use planning.

The effect of the Bruncefield fire showed that the individual risk had been taken care of but there was concern for the societal risk which had serious results in the area surrounding.

Mr. John Boulter, Head of the Safety, Emergency and Risk Management Unit, Hertfordshire County Council gave an account of "The Buncefield Incident - Aspects of emergency planning, response and recovery." The site was first constructed in 1968 on an open site but later planning allowed some housing and a large industrial park very close to the storage tanks. The site supplied jet fuel for Heathrow and local petrol stations in the south of the country



The emergency plan for the site which covered two local authorities was drawn up on the basis of one tank catching fire and possibly three. They had not envisaged the escalation of the fire to the whole site nor the explosion that occurred and which caused extensive damage to the surrounding houses, businesses and warehousing. A table top emergency exercise had been held in October 2005 and a live exercise planned for May 2006. The fire started on the 11 December 2005 in one tank and spread to 22 tanks. 2000 people were evacuated and it took 4 days to extinguish the fire which involved 1000 firemen and used 600,000 litres of foam. The site fire fighting capabilities were knocked out by the initial explosion. 370 businesses were affected by the fire.

The Gold (at police headquarters), Silver (at Watford) and Bronze (at Hemel Hempstead) command centres were quickly established with supporting emergency services including the Environment Agency, the HSE, County Council, Highways Agency, Casualty, Health and Ambulance services. Waste water plans to contain the output from the site was established and water supplies

using high volume pumps established. Road closure plans affected the M1 which was closed for 12 hours and diversions set up. Catering facilities, reception centres for the 2000 evacuated and a web site providing information were set up. Catering consumed £30,000 of food (including 6 litres of tomato sauce and 1 litre of brown sauce!) for the firemen and emergency services. Group homes for adults with learning disabilities were evacuated, 8 Day Service centres were closed resulting in 580 clients having to be contacted by telephone or personal visit to ascertain their support needs. Spare Day Service Staff from Residential Homes were redeployed.

Local superstores gave great support for the services. Public health advice was provided and resulted in the shutting of local schools.

Recovery plans for the site started two days after the start of the fire with Recovery Sub-Groups for Business, Infra structure and Community needs. They included County and Local Authorities, Dacorum Primary Care Trust, Business Link, East of England Development Agency, Environment Agency, Govt. Office East of England, HSE, Chamber of Commerce, Hertfordshire Constabulary, Herts. Fire & Rescue, Hertfordshire Prosperity and Job Centre Plus groups.

Lessons have been learnt from the incident and include the importance of flexible generic planning arrangements, relationships, links with schools, Gold/Silver joint meetings, "Communicate 'til your teeth bleed", more integrated pre-planning with "Health" and do not let the past dictate the future.

The meeting was then opened to questions which emphasised the importance of companies and services recognising the hazards. An example included a hospital which had its IT contractor provider knocked out by the explosion. An important lesson learnt on the Health side was for one person to be knowledgeable on NHS bed situation and one person to give health advice and monitoring. On changes in training it was thought that they should be based on greater disasters than sometimes considered. On handling the press it was found that Chief Fire Officer and Chief Consultable was most suitable for handling the press and TV.

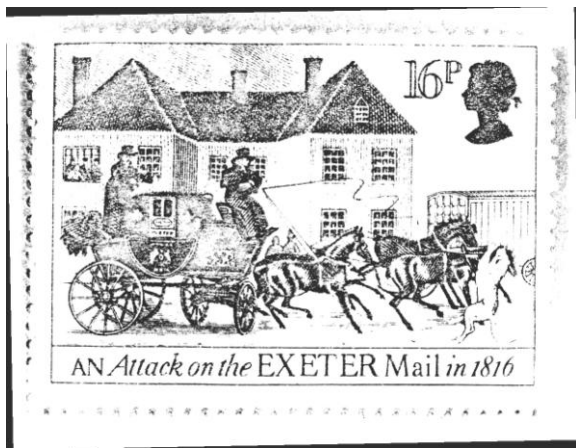
John Bond

CORRESPONDENCE

None received

THE HAZARDS OF ESCAPED ANIMALS

An incident was reported on 20th October 1816. The mail coach from Exeter to London had just left Salisbury when what appeared to be a calf was seen to be loping along beside the horses and causing them some distress. As the coach pulled up at the Pheasant Inn, between Stockbridge and Salisbury, the guard on the coach hauled out his blunderbuss to shoot the creature. It then became apparent that it was a lioness.



It attacked one of the horses, called 'Pomegranate', by putting its claws around the horse's neck and going for the throat. The other horses lashed out at the lioness and might have driven her off had not a group of men arrived with a mastiff which they set on the lioness. The dog was no match for the lioness, who quickly killed it and dragged the body away to a nearby granary where the lioness was recaptured. Pomegranate survived the attack and became a fairground exhibit, presumably at the same fairground from which the lioness was unleashed. A passenger who had been brushed by the lioness 'went off his head' and was confined to an asylum for the next twenty-seven years. This bizarre event was commemorated by a stamp issued by the Royal Mail in 1984 and should be noted by those carrying out risk assessment on transportation problems

A more unusual death-by-animal is recorded on the tombstone of Hannah Twynnoy at Malmesbury Abbey in Wiltshire. She was a servant employed at the White Lion Inn and was mauled by a tiger at a local circus.

'In memory of Hannah Twynnoy who died October 23rd 1703, Aged 33 years.

*In bloom of life
She's snatch'd from hence
She had not room
To make defence:
For Tiger fierce
Took life away
And here she lies
In a bed of clay,
Until the resurrection day."*

Legend has it that she was trying to balance a bun on the nose of the tiger.



ARTICLES IN THE NEXT ISSUE OF THE LPB

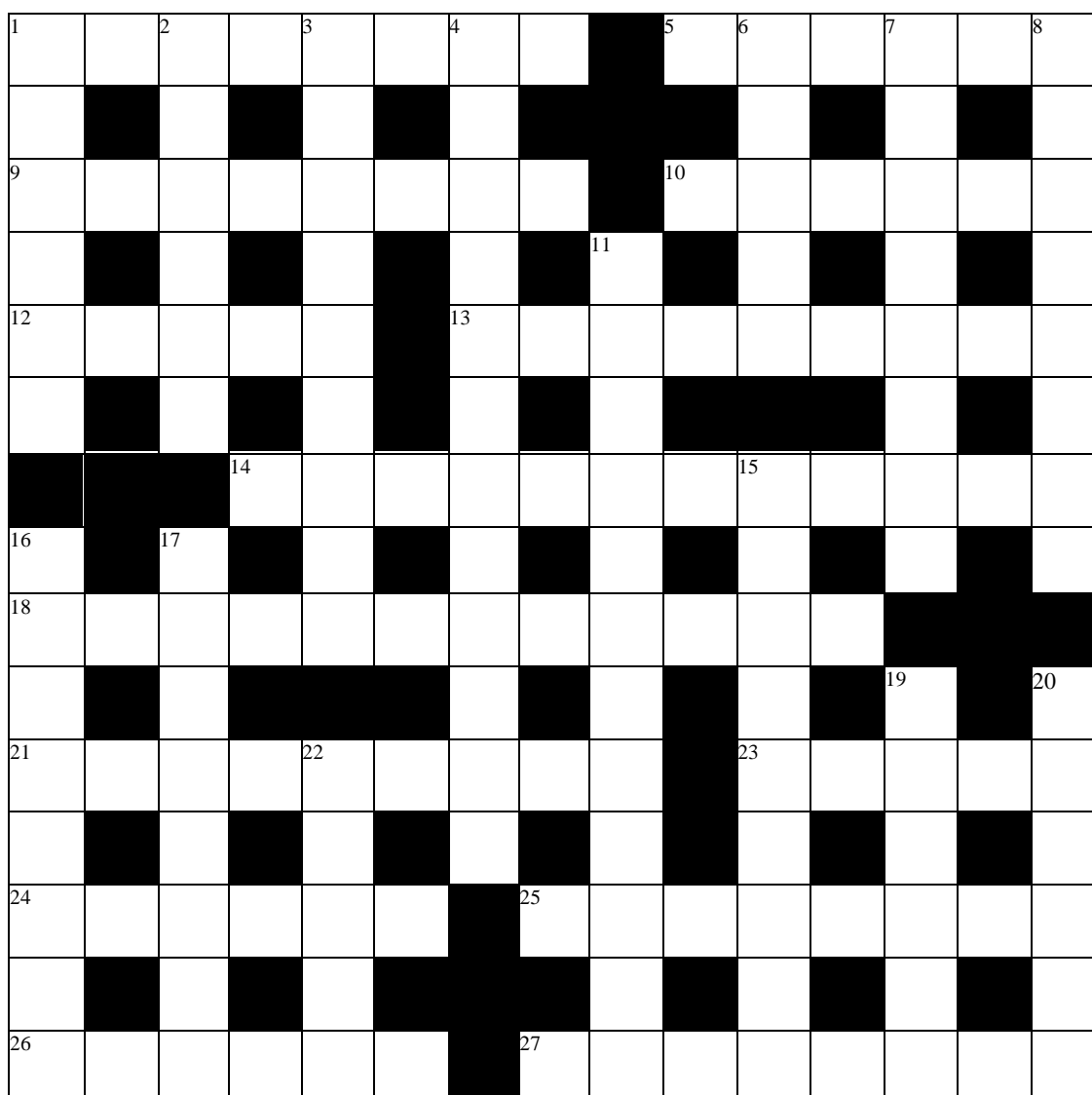
Loss Prevention Bulletin, Issue 194, April 2007

- Information for authors and readers
- Loss prevention in LPG aerosol filling plants. Part 1: The risks
- Fatalities result from a hydrogen sulphide release
- Loss of sulphuric acid into a bunded area
- Ammonia offloaded from tanker into a nitric acid tank
- Fatal explosion in a polyethylene plant
- Explosion hazards and protection in the use of Intermediate Bulk Containers
- Obituary
- Book review
- Bulletin briefing
- Events

ARTICLES IN THE NEXT ISSUE OF PSEP

- 117 Study of Major Accidents Involving Chemical Reactive Substances: Analysis and Lessons Learned. - J. Sales, F. Mushtaq, M.D. Christou and R. Nomen
- 125 Planning an Emergency Response Centre in Southern Taiwan Science Park. - J.M. Tseng, C.M. Shu, J.J. Horng, C.M. Kuan and H.I. Hsu
- 133 Loss Prevention Programmes of the Hazardous Work Place Review and Inspection Act of Taiwan. - D.H. Tsai, J.M. Tseng, C.M. Shu, H.J. Wu and T.S. Su K. Kawasaki, A. Matsuda, S. Tanabe, N. Katagiri and E. Iritani
- 181 Removal of Anions, Heavy Metals, Organics and Dyes from Water by Adsorption onto a New Activated Carbon from Jatropa Husk, an Agro-industrial Solid Waste. - C. Namasivayam, D. Sangeetha and R. Gunasekaran
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CROSSWORD PUZZLE No. 22



ACROSS

1. Tiny amounts from the Ministry in charge of odd total (8)
5. Average dry astronomical distance
9. Job of work with nothing somehow put back in toxic gas. (8)
10. Some malign influence promotes an organic polymer. (6)
12. Go one better in the open air without alternatives. (3, 2)
13. Identifying oxygen is enough to make a chemist lose his head. (9)
14. With no spare bonds, does ruined auditor steal some? (9, 3)
18. Like layman's language. (3-9)
21. Strange tribes seen drinking from it. (9)
23. Idi had nothing chemical. (5)
24. PC part of body. (6)
25. Hydrochloric used to be. (8)
26. Curved surface to trick and irritate. (6)
27. Can the wolf gulp back the product of this process. (4, 4)

DOWN

1. Michael and Ronald when small were very small indeed. (6)
2. Cross out permit in the river. (6)
- 3., 4. Company Director's merriment is pretty criminal. (9, 12)
- 6 Bailiff endlessly provides proof of innocence. (5)
7. Star protection in the car ... (3, 5)
8. ... where the dashboard supervises. (8)
11. Highly responsible for much global warming. (8, 4)
15. Coming from a chap in the process of dining
16. A coal bin adapted for storing steroids. (8)
17. Unfasten the German inside to give added support. (8)
19. Beginning of day is lit up to enable essence to be extracted. (6)
20. Doctor's source of milk is capital. (6)
22. Part of a gismo kept for detecting dangerous hazard. (5)

Answers to Crossword Puzzle No. 22

Across

1. Autoignition
9. Rotameter
10. Email
11. Lasers
12. Metallic
13. Casein
15. Fireball
18. Hologram
19. Sphere
21. Security
23. Polish
26. Opted
27. Collision
28. Under Control

Down

1. Acrylic
2. Titus
3. Immersing
4. Nuts
5. Turmeric
6. Omega
7. Fail-safe
8. Glycol
14. Silicate
16. Explosion
17. Particle
18. Hyssop
20. Ethanol
22. Radon
24. Icier
25. Alec

DIARY OF SAFETY EVENTS

GROUP	TITLE OF MEETING	PLACE AND CONTACT	DATE
Hazards Forum	Improving Risk Management of Critical Computer Controlled Systems	Institution of Electrical Engineers, London Tel: 0207-665-2202 www.hazardsforum.co.uk	Postponed
Future Programmes	Ageing Assets Management of Alarms and Trips		
IChemE and EFCE	12 th International Symposium Loss Prevention and Safety Promotion in the Process Industries	Edinburgh International Conference Centre Contact R. Cragg IChemE Tel 01788-534476 Email rcragg@icheme.org.uk	22 – 24 May 2007
Hazards Forum	Learning from Accidents - Just Culture Prof J. Reason & other speakers	TBA Simon Whalley Hazards.forum@ice.org	19 June 2007

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