

# RISKworld

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the newsletter of risktec solutions limited

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Welcome to Issue 11 of RISKworld. If you would like additional copies please contact us, and feel free to pass on RISKworld to other people in your organisation. We would also be pleased to hear any suggestions you may have for future editions.

Contact Steve Lewis (Warrington)

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Risktec

## Risktec - The Next Chapter



Risktec operates from 7 offices world-wide

This 11<sup>th</sup> edition of RISKworld marks a major milestone in the development of Risktec. The company has recently finalised the purchase of the minority shareholding of Falck and is now a fully independent employee owned company.

Managing Director, Alan Hoy, explains, "Risktec benefited greatly from the support of Nutec and subsequently Falck in our early years of trading. However following a strategic review, it was concluded that the future interests of Falck and Risktec would be best served by the share purchase. We look to the future with a great deal of confidence, with a clear focus on providing a high quality service to all our clients."

Risktec's core activity is to support our clients in making their businesses safe by preventing accidents. We specialise in major accident hazards, which receive considerable attention from regulators around the world. We advocate a clear understanding of

hazards and risks, controlled through effective engineered and management systems, and implemented by competent facility personnel. In this way safe operations of inherently hazardous technologies can be achieved.

We acknowledge that this is a challenge for large organisations operating complex facilities, but success results in a strong and sustainable culture and a much reduced exposure to major accidents and associated business risks.

Following this theme, this edition of RISKworld has a particular focus on major hazards. The recent publication of the Baker report into the explosion at the Texas refinery is a stark reminder of the dangers inherent in many industrial operations and the high human cost and financial impact of major accidents.

For further information, contact Alan Hoy (Warrington)

# Texas City Refinery Explosion

## Findings from the Independent Safety Review Panel

On March 23, 2005, the BP Texas City refinery experienced one of the most serious U.S. workplace disasters of the past two decades, resulting in 15 deaths, more than 170 injuries, and significant economic losses. During the startup of an isomerisation unit, the associated raffinate splitter tower was overfilled and overheated. A substantial volume of hydrocarbon liquid and vapour were forced into an adjacent blowdown stack, rapidly exceeding its capacity. Ignition of the resulting vapour cloud caused an explosion that extended to nearby temporary trailers.

On October 24, 2005, following the accident investigation, BP announced the formation of the BP U.S. Refineries Independent Safety Review Panel chaired by Former Secretary of State, James A. Baker, III. The Panel was charged with making recommendations to improve BP's corporate safety culture, corporate oversight of process safety, and process safety management systems.

### The Panel's Recommendations

The resulting report, published in January 2007, provides a number of key recommendations:

#### Safety Leadership

The Board and other members of management must provide effective leadership and establish appropriate goals for process safety, both with the policies they adopt and the actions they take.

#### Safety Management System

An integrated and comprehensive process safety management system should be established and implemented that systematically and continuously identifies, reduces and manages process safety risks.

#### Safety Knowledge & Expertise

A system should be developed and implemented to ensure that its executive management, its refining line management above the refinery level, and all refining personnel (including managers, supervisors, workers, and contractors) possess an appropriate level of process safety knowledge and expertise.

#### Safety Culture

Relevant stakeholders should be involved in developing a positive, trusting and open process safety culture within each U.S. refinery.

#### Expectations & Accountability

Expectations should be clearly defined and accountability strengthened for process safety performance at all levels in executive management and in the refining managerial and supervisory reporting line.

#### Support for Line Management

More effective and better coordinated process safety support should be provided for the refining line organisation.

#### Safety Performance Indicators

An integrated set of leading and lagging performance indicators should be developed, implemented, maintained and periodically updated for more effective monitoring of process safety performance by the refining line management, executive management, and Board of Directors.

#### Safety Auditing

An effective system to audit process safety performance should be established and implemented. Beyond compliance, audits should ensure that management systems are delivering the desired safety performance or a site's performance should be assessed against industry best practices.

#### Board Monitoring

The Board should monitor the implementation of the recommendations of the Panel (including the related commentary) and the ongoing process safety performance. The Board should, for a period of at least five calendar years, engage an independent monitor to report annually to the Board on the progress in implementing the Panel's recommendations (including the related commentary). The Board should also report publicly on the progress of such implementation and on the ongoing process safety performance.

#### Lessons Learned

Lessons learned from the Texas City tragedy and from the Panel's report should be used to transform the company into a recognised industry leader in process safety management.

#### Overall Conclusion

The Panel concluded that all companies in the refining, chemical and other process industries should give serious consideration to its recommendations and related commentary.

*For further information, refer to 'The Report of the BP U.S. Refineries Independent Safety Review Panel', January 2007 available at [www.safetyreviewpanel.com](http://www.safetyreviewpanel.com), or contact Kris Smith (Houston)*



Aftermath of the Texas City refinery explosion, 23rd March 2005

# The New Safety Assessment Principles

## New Principles for a New Age of Nuclear Energy

Shortly before Christmas last year the UK's nuclear safety regulator, the Nuclear Installations Inspectorate, published its new Safety Assessment Principles [Ref 1]. As the benchmark against which NII inspectors assess nuclear safety cases, their revision could influence the future of existing nuclear facilities, which require periodic safety review or decommissioning, as well as the emerging new build programme, which will be expected to follow modern standards. The NII's view of modern standards is embodied in the new SAPs, so understanding the significance of changes is key to establishing a measured response.

### All Change?

Superficially, the new SAPs are almost unrecognisable, having been completely restructured and amplified in certain areas. The main material changes (see Table 1) are:

- Consistency with IAEA Safety Standards.
- Expanded principles on decommissioning and waste management.
- New principles for managing safety.
- Tightened and additional numerical criteria.
- Greater applicability to nuclear facilities regulated by the Defence Nuclear Safety Regulator.

At a seminar for the nuclear industry held on 26th January 2007, the NII explained that the new principles largely reflect a combination of the 1992 edition and the supporting Technical Assessment Guides. Noting that all principles do not apply equally to each facility, the NII particularly emphasised that the level of compliance and supporting analysis should be

proportional to the risk.

### Safety in Numbers

One area where the NII concede there is genuine change is the numerical safety criteria. Except for legal limits, which are explicitly identified, all criteria are now referred to as targets, to be met as far as is reasonably practicable. This includes the BSLs, renamed from Basic Safety Limit to Basic Safety Level. Where previously these represented the limit of tolerability, now they may be exceeded provided there is an extremely robust ALARP assessment in place.

This new flexibility is offset to some extent by changes to criteria. Here, normal dose criteria have been tightened to reflect improved industry practice, and accident criteria have been added to (see Table 2). Potentially the most controversial of these is the new design basis assessment criterion (Target 4), and the new societal risk criterion (Target 9). For lower dose accidents, Target 4 could substantially increase the deterministic analysis effort required, and suggests that greater defence in depth should be considered. For high hazard facilities, Target 9 implies that a Level 3 probabilistic safety assessment may be required, or alternatively, that containment is effective against all credible accidents.

### Reaction Time

At the recent seminar, the NII stressed that, as before, the new SAPs are for its internal use only and have no legal status. However, the NII also stated that the new SAPs are being used for all future assessment with immediate effect. It would clearly be prudent, therefore, for existing and potential

Table 2 – Changes to Safety Criteria

<b>Target 1 – Normal operation, any person on site</b>	BSL & BSO for site employees and BSO for classified radiation workers reduced.
<b>Target 2 – Normal operation, any group on site</b>	BSO reduced by a factor of two.
<b>Target 3 – Normal operation, any person off site</b>	No change.
<b>Target 4 – Design basis fault sequences</b>	This new frequency vs dose criterion replaces the simple 100mSv consequences cut-off for design basis sequences implied by the 1992 SAPs.
<b>Target 5 – Individual accident risk, any person on site</b>	BSL & BSO values are unchanged, but the criterion applies explicitly to any person on the site rather than any person on the plant.
<b>Target 6 – Frequency vs dose for any single accident, any person on site</b>	This is a new criterion, which may require additional post-processing of PSA results or PSA model restructuring.
<b>Target 7 – Individual accident risk, any person off site</b>	This is a new criterion, but is consistent with Target 8.
<b>Target 8 – Frequency vs dose for a facility, any person off site</b>	No change.
<b>Target 9 – Total risk of 100 or more fatalities</b>	This new criterion replaces the large release criterion in the 1992 SAPs.

Licensees (and eventually Authorisees) to undertake a critical review of the new SAPs against their own safety assessment principles.

Deviation from the new SAPs does not necessarily imply a requirement for huge amounts of additional safety justification, however. In many cases, existing arrangements may be acceptable, or simply need augmenting, for example by increasing the degree of ALARP justification. In other instances, alternative approaches or criteria can be justified quite legitimately. In all cases it is advisable to notify and, if necessary, engage the NII before committing resources to safety assessment that could be rejected or superfluous.

### Field Testing

The NII has openly admitted that there have been no trials to establish the potential impact of the new SAPs and their new numerical targets, maintaining that they represent minimal change. Ultimately, their reasonableness will be tested on real safety cases, perhaps even for future nuclear power stations in the UK.

Ref 1 – HSE, Safety Assessment Principles for Nuclear Facilities, 2006.

*For further information, contact Greg Davidson (Warrington)*

Table 1 – New SAPs at a Glance

Section	Changes
Fundamental principles	These modified high-level principles align with the IAEA's fundamental principles and WENRA reference levels, but are unlikely to lead to working level changes of themselves.
Leadership & management for safety	These new high-level safety management principles relate to leadership, organisation, decision making and learning.
Regulatory assessment of safety cases	New safety management principles that focus on the safety case content, production process and through-life maintenance.
Regulatory assessment of siting	The original siting principles are recast at a higher level and expanded.
Engineering principles	Largely a recasting of 1992 safety principles, but with some new principles (e.g. for graphite components), some detailed differences and a large amount of guidance.
Radiation protection	Generally covers the same ground as the previous radiological protection principles.
Fault analysis	A reworking of the fault analysis and assurance of validity principles from the 1992 SAPs.
Numerical targets & legal limits	Grouping together of all numerical criteria, some of which have been revised and some of which are new (see Table 2).
Accident management & emergency preparedness	This short section includes the three original accident management principles, but also references the Radiation (Emergency Preparedness and Public Information) Regulations 2001.
Radioactive waste management	An update and expansion of the previous radioactive waste principles, with a new requirement for a radioactive waste management strategy.
Decommissioning	The original single principle has been greatly expanded to address the requirement for a decommissioning strategy & plan, its timing and safety.
Control & remediation of radioactively contaminated land	These new principles are concerned with the safe management of radioactively contaminated land.

# Societal Risk Criteria

## When is too big too often?

All fatal accidents are a cause for regret, but society generally tends to be more concerned about multiple fatalities in a single event. While such low-frequency high-consequence events might represent a very small risk to an individual, they may be seen as unacceptable when a large number of people are exposed. Such incidents can significantly impact shareholder value and, in some cases, the company never recovers [Ref 1].

Where the people exposed are members of the public, the term societal risk is often used. Where workers are isolated and members of the public are unlikely to be affected, the term group risk is often used. Here, the term societal risk is used to encompass both public and worker risk.

Criteria may be defined to limit the risk of major accidents and help target risk reduction measures such as restrictions on concurrent activities or land use, enhanced engineered safeguards, and improved building siting or protection. But what should these criteria be?

### FN-Criteria

A common form of risk tolerability criteria for societal risk is the FN-diagram, where two criteria lines divide the space into three regions – where risk is intolerable, where it is broadly acceptable and where it requires further assessment and risk reduction as far as is reasonably practicable, as shown in Fig 1.

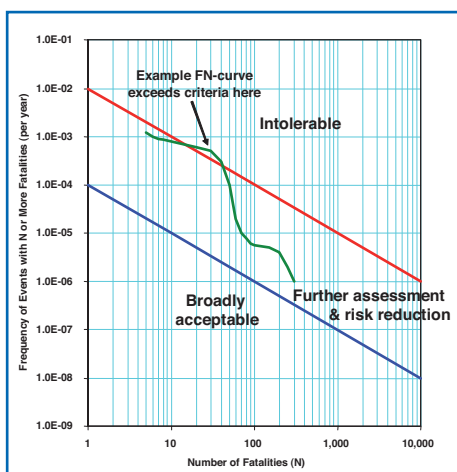


Fig 1 – Illustrative FN-Criteria

FN-criteria are not without their drawbacks but they are undoubtedly helpful when used in context. They clearly show the relationship between frequency and size of accident. A steep criterion slope also builds in multiple fatality aversion and favours design concepts with lower potential for large fatality events.

### Industry Criteria

Unfortunately, there are no single “one-size-fits-all” criteria for societal risks in use by operators and regulators in the major hazard industries world-wide. Indeed, the variation in regulatory criteria is especially wide, as shown by the upper tolerability criterion lines in Fig 2, which span a factor of over 100. The Dutch criterion is so restrictive that it raises a question about its merits.

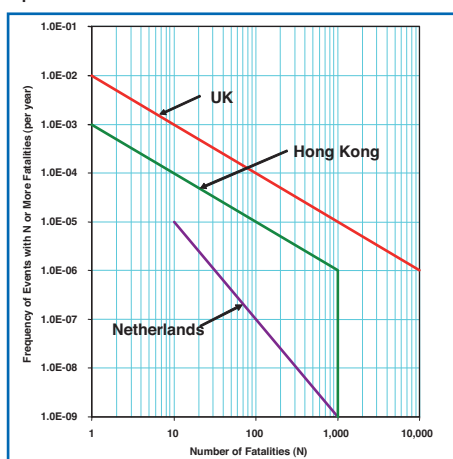


Fig 2 – Regulatory FN-Criteria

For a company operating in regions where there are no regulatory criteria to meet, the choice of criteria to help decision-making largely comes down to one of company values, i.e. the perceptions of the stakeholders directly affected by the decision and the values of the company in terms of its safety commitment and reputation.

Expressed from a dispassionate business perspective, the company needs to decide how frequently large-fatality accidents would need to occur before the company's survival is put severely at risk due to the adverse reaction of shareholders, the regulator, media and public.

### Current Industry Initiatives

Societal risk is currently very topical:

- The Center for Chemical Process Safety (CCPS) in the USA will, this year, develop a guideline book providing a framework for establishing quantitative safety risk tolerance criteria. The book will show how to develop criteria reflecting company-specific operating needs, while maintaining consistency with industry-wide practices.
- The UK safety regulator has recently issued a consultative document on societal risk which builds on the current regulatory requirements.

### Summary

A single accident at an industrial facility that causes multiple fatalities can seriously threaten the future of the operating company. Criteria can help to identify where risk reduction measures need to be targeted to limit the societal risk to a level that the company is comfortable with. In the absence of regulatory criteria, the choice of risk level largely comes down to one of the company's values.

But whatever criteria are selected, they need to be workable in practice – if they are too severe or too relaxed they will lose their usefulness – and should be based on a sound assessment of current good practice in industry.

Ref 1 – The impact of catastrophies on shareholder value, Sedgewick Group, 2002.

## Did you know ...

...that major accidents can seriously affect share value?

In 2002, the Sedgwick Group published a study by Oxford University into the impact of man-made catastrophes on shareholder value [Ref 1 above]. For example:

- The Exxon Valdez oil spill cost Exxon an estimated \$8.7bn in damages, \$2.5bn in clean-up costs and \$0.3bn in compensation to the victims. The share price dropped overnight by 10% and fell more than 20% at its lowest.
- The Bhopal gas leak caused Union Carbide stock to plummet by an immediate 30%. Recovery took the best part of a year.
- The total financial cost of the Piper Alpha explosion is estimated at \$1.4bn. Occidental stock lost more than 10% over the next year.
- Following the capsizing of the Herald of Free Enterprise, shares in P&O fell by 20%, and took over a year to recover.



For further information, contact Steve Lewis (Warrington)

# Method Not Madness

## Rail Method Statement Process Overhauled

Media coverage of rail accidents tends to focus on those involving operational trains, like the Virgin train derailment in February. In recent years, however, there have also been a number of fatalities at railway work sites, such as Hednesford and Fareham in 2004 [Ref 1]. These incidents called into question the effectiveness of method statements used to present safety-critical information to workers involved in rail projects.

A method statement is a working level document that provides a description of the work to be undertaken, and should highlight any significant site hazards, as well as hazards that could result from the associated activities. Over time, however, method statements lost focus, became overburdened with supporting information not directly relevant to workers, or attempted to cover too many activities.

### Changing Course

To overcome these issues, specialists in a number of disciplines drawn from Network Rail, industry contractors, and the Rail Safety and Standards Board (RSSB), formed a Method Statement Steering Team. The team's role was to oversee the development of an improved process for creating method statements to make safety-critical information as accessible and easy-to-use as practicable.

### Box 1 – Task Briefing Booklet Contents

#### Task Details

- Description of work
- Competencies
- Personal Protective Equipment
- Control of activity risks
- Resources
- Permits

#### Site Details

- Control of site risks
- Protection & isolation
- On-track plant & machinery movement
- Access
- Site layout
- Communications & contact details
- Emergency arrangements
- Welfare
- Interfaces
- Additional notes

The project was supported by Network Rail's Project Safety Leadership Group and the Network Rail Safety Improvement Team. The RSSB, together with Risktec Solutions, provided facilitation and secretariat services.

The starting point was a series of workshops to capture the disparate requirements of all groups involved in developing, reviewing and using method statements. After much consolidation and filtering of user requirements, the Steering Team arrived at the concept of a sharply defined Task Briefing booklet, containing all key information for workers [see Box 1]. The concept is supported in detail by a template and guidance, which makes clear what information is required.

### Tangible Benefit

The full benefit of a safety case is unrealised unless it becomes embedded in the actions of personnel. For rail projects, the Task Briefing booklet fulfils this role. Not only are the new method statements user friendly, they are small enough to fit into a worker's pocket. Aside from the obvious safety benefits, the new process is also much more streamlined and efficient [see Box 2].

### Successful Roll-out

The new-look Work Package Planning Process [see Ref 2] was presented to industry at a Network Rail Supplier Forum in June 2006,

### Box 2 – New Process: Benefits

- Better organisation of information
- More concise documentation – Task Briefings are now designed to fit on a single double-sided sheet that can be easily referred to on site
- More flexible documentation, taking into account both the need for planning at a project level and changes on a day-to-day basis
- Developed in consultation with all relevant parties and organisations from Network Rail to sub-contractors
- A streamlined acceptance process
- Better interface with contractor-generic work instructions and risk assessments
- Avoids potentially confusing duplication of information
- Provision of 'fit for purpose' briefing material
- HMRI support for the new process

where it was very positively received. Moreover, the initiative has been welcomed by the Rail Inspectorate.

After successful piloting, the new process is being rolled out across Network Rail and its supply chain and is currently being monitored.

Ref 1 – [www.rssb.co.uk](http://www.rssb.co.uk)

Ref 2 – [www.tracksafety.info/wpp](http://www.tracksafety.info/wpp)

*For further information, please contact Martin Fairclough (Warrington)*





One of the most understated risks to a business is the potential for loss of corporate memory or expertise. Reduction of this risk can be achieved by applying Knowledge Management (KM) principles.

Knowledge is an understanding of and the ability to use information. KM is the business philosophy and its supporting processes that help people share and use their knowledge to meet business objectives.

KM is one of those subjects, though, that can seem shrouded by mysterious buzz words and ambiguous concepts. For those who prefer plain English, Risktec has recently published a booklet called 50 Secrets of Successful Knowledge Management that introduces the topic and provides pragmatic advice. Here's a selection of tips inspired by 50 Secrets:

## 1. Understand fully what KM means and what it covers

It is vital to have a good grasp of the full scope of activities that KM covers including people, technology and processes. KM is not just about storing information or the latest IT solution.

## 2. Do things that lead directly to business benefit

This may seem obvious but too many KM initiatives are undertaken without proper consideration of whether tangible benefits will be realised at the end of the project.

## 3. Benchmark!

To understand existing strengths and weaknesses an independent audit against best practice is an excellent means of identifying useful areas to focus effort. The audit should involve a balanced proportion of staff and processes to ensure that information obtained is representative of the company as a whole.

## 4. Direct KM practices towards solving known organisational problems

Using KM techniques to solve known problems in the organisation is a sure way to get the attention of executives and senior managers and leads directly to real business benefit.

## 5. Use KM in conjunction with project & change management

Managing change is a necessary consideration when implementing new KM practices. Likewise, it is always a good idea to use project management techniques to keep the initiative on track and to budget.

## 6. Communicate openly and widely

Most KM initiatives will involve some kind of change in attitude and behaviour, so winning hearts and minds is a key success factor.

## 7. Don't follow the latest IT fad

Remember to use IT as a supporting tool for KM rather than a solution in its own right. Don't be tempted to buy an off-the-shelf software product to solve your business problems without looking at the bigger KM picture.

## 8. Go for a progressive, but integrated approach

Don't try to do everything at once. A phased approach to new initiatives is usually feasible. Schedule first those that can be implemented easily and which deliver the most benefit. In doing so, make sure each new roll-out is consistent and compatible with a coherent plan.

## 9. Do as much as you can "in-house" – get expert help when you need it

Much can be done using internal resource without the help of external consultants. Use this help sparingly and focus it on areas where internal expertise is lacking.

## 10. Build KM into business processes

When KM practices are integrated into your day-to-day activities and you no longer have to use the KM word, you know you've succeeded.

## More Secrets

For more secrets of knowledge management, visit [www.risktec.co.uk](http://www.risktec.co.uk) (Downloads) or contact Gary Cairns (Warrington).



For further information, contact Risktec Solutions at: **Email** - [enquiries@risktec.co.uk](mailto:enquiries@risktec.co.uk) **Website** - [www.risktec.co.uk](http://www.risktec.co.uk)

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