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Organisational Change and Major Accident Hazards

Introduction

This document gives guidance for organisations responsible for major hazard processes - including offshore and onshore oil, gas, chemicals and nuclear installations - on how to manage the impact of organisational change on human performance in the control of major hazards.

Organisational change is a normal and inevitable part of business life in all sectors. But organisations associated with major accident hazards have an extra dimension to deal with – potentially disastrous societal and legal costs of mistakes. These consequences mean that businesses responsible for major hazards must aim for a far lower probability of mistakes than is normally necessary in commercial decision-making.

Case Study

The fires that killed two employees at Hickson and Welch in 1992 resulted from the cleaning of a vessel containing potentially unstable sludge. Because of a recent reorganisation, this task had been organised by inexperienced team leaders reporting to an overworked area manager. (Ref the report)

The published report of the incident said:
 “Companies should assess ... the workload and other implications of restructuring ... to ensure that key personnel have adequate resources, including time and cover, to discharge their responsibilities”.

Organisational change is an opportunity to improve health and safety, for example by clarifying personal accountabilities or increasing workforce participation. However HSE’s experience is that organisational changes have not traditionally been analysed and controlled as thoroughly as plant changes, and mistakes are made which can reduce defences against major accidents. Some of these mistakes have had fatal consequences (see text box); others have led to enforcement action by the Health and Safety Executive. This might partly be because, compared to management of *plant* change, how to go safely about *organisational* change has up to now been less well understood, and has lacked generally accepted risk assessment methods. This document aims to address that.

It should be read by senior managers leading organisational change in these sectors, and by anyone involved in planning or implementing such change. This should always include employees and safety representatives. It describes common pitfalls to look for, suggests a three-part framework for managing organisational change, and sets out some of the legal context. It is

aimed at organisations managing both onshore and offshore major hazards, including the oil, nuclear and chemical industries.

Following the guidance will help to ensure compliance with legal responsibilities, as outlined later in this document, which may include nuclear Licence Condition 36, the Offshore Installations (Safety Cases) Regulations 1992 (SCR) or the Control of Major Accident Hazard Regulations 1999 (COMAH).

Scope

Many forms of organisational change can affect management of the major hazard. Changes that come within the scope of this document include, for example, changes to roles and responsibilities, organisational structure, staffing levels, or any other change that may directly or indirectly affect the performance or behaviour of people in control of the hazard. The following are some common examples:

- ◆ Business process re-engineering
- ◆ Delaying
- ◆ Introduction of 'self-managed' teams
- ◆ Multi-skilling
- ◆ Outsourcing / contracterisation
- Mergers, de-mergers and acquisitions
- Downsizing
- Changes to key personnel
- Centralisation or dispersion of functions
- Changes to communication systems or reporting relationships

The focus of this document is on change at site or operational level, but it should also be considered by those involved in changes at corporate level which can have a significant impact on safety at operational level such as changes in objectives, resources, management system, available expertise and so on. Although the guidance is specifically about major accident prevention, often abridged to 'safety' in this document, the processes outlined should have benefits for other aspects of health, safety and environmental management too.

This document sets out a three-step framework;

Step 1 - Getting organised for change

Step 2 - Assessing risks

Step 3 - Implementing and monitoring the change

Framework for managing the major hazard aspects of organisational change

Step 1: Getting organised

1.1 Policy

Pitfalls to avoid when getting organised for change

Unnecessarily making too many simultaneous changes, resulting in inadequate attention to some or all Marginalisation of safety compared to other aspects considered more pressing, because...

- ◆ it is seen as a side issue
- ◆ it is delegated to people with inadequate influence
- ◆ it is not considered early enough in the change process
- ◆ Inadequate time or resource is allocated to the assessment
- ◆ assessment is too inward looking – there is lack of objectivity or ‘groupthink’
- ◆ objectives are passive, maintaining rather than improving standards

The organisation should have a clear policy setting out principles, commitments and accountabilities in relation to the management of organisational change and health, safety and environment and its impact on human performance. It is expected that the policy should apply to *all* organisational changes, large and small; as even those not at first sight connected to safety need to be given consideration to confirm whether or not they may have indirect safety impacts.

1.2 Commitment and Resources

Although the motivation for the change may be commercial, and not obviously connected with safety, major accident prevention must be

regarded as core business, not a side issue. Senior management need to demonstrate a clear commitment to safety by their actions, from the outset.

There should be a distinct safety focus within overall change processes, with positive objectives. Make a senior, highly influential manager the sponsor or champion for this. They should ensure the protection of human and other resources that are allocated to the safety effort and ensure that any barriers to the safety aspects of the change are removed. The effort and resource put in must be **proportionate** to the complexity of the change, the scale of the hazards concerned, and the degree to which the change may impact on the management of major hazards.

1.3 Clear, Rigorous Process

Organisational change should be planned in a thorough, systematic, and realistic way. Companies should follow a clear, structured procedure for this, just as for plant change, which will help to make clear, both before the event and after when reviewing,

- What processes or activities are carried out to ensure that risks that may arise as a result of the change are identified, assessed and controlled to a level as low as is reasonably practicable, and the protocols they follow

- Who is accountable and who is responsible for these
- Who else is involved, and how
- What potential risk factors are taken into consideration
- Who reviews the change process, when and how

The design of the procedure should take into account this guidance, previous experience of change, and, as much as possible, the experiences of other organisations.

For nuclear licensees the procedure will need to ensure compliance, and demonstration of compliance, with License Condition 36. This will be expected to include analysis of variation from a clearly documented baseline. As change can be almost constant for larger organisations, maintenance on a permanent basis of a register of individuals and their tasks, roles and responsibilities related to the major hazard has practical benefits in any sector. This eases assessment of the continuous changes - large and small - that bigger organisations experience, rather than starting the process of 'from scratch' with each change.

All stages of the MOC process should be adequately documented, including all relevant inputs, responses, decisions and reasons for decisions. This has a number of benefits,

- ◆ Transparency
- ◆ Auditability of process
- ◆ Traceability of decisions

A clear **implementation plan must be produced which should be reviewed on a regular basis**. Avoid trying to do too much too quickly.

1.4 Participation

The process of change should be as participative as possible from the earliest stage. This is not only for industrial relations reasons, staff at all levels will have unique knowledge of what their own work involves and how it is really done. This may include contractor and agency staff. Wide participation may also help to ensure more widespread acceptance of the outcome.

Whilst there may well be sensitivity about debating the fact of a given business need to change with employees and their representatives in the early stages, failure to make the process of assessing *how* to make the change safely truly participative means that important, sometimes crucial, information will not be heard.

Participation in this context means active participation in decisions, not just passive consultation. The HSE publication HSG217 '*Involving Employees in Health and Safety: Forming partnerships in the chemical industry*' gives examples of active involvement.

1.5 Review and challenge

Changes with any degree of complexity will involve some learning, and should therefore be iterative processes, with a mechanism for senior management to be given adequate information to review progress regularly.

It can often be very difficult to be objective during organisational change. This might be because of enthusiasm for a particular vision of the outcome, pressures from the organisation such as corporate budget challenges, or simply the stress of high workload and uncertainty. Arranging for independent peer, or expert, review of plans and assessments, by technically qualified and experienced personnel preferably from another organisation, should help to overcome such problems.

Step 2: Risk Assessment

There are two aspects of the change requiring risk assessment, they are related but different and must not be confused:

Pitfalls during assessment

- ◆ Unnecessary mistakes from failure to use the experience of others, relying on assessment from first principles
- ◆ Failing to listen adequately to employees, missing or dismissing serious issues hidden among all the natural concerns and complaints
- ◆ Reliance on arrangements that make unrealistic, over-optimistic assumptions about human performance and reliability
- ◆ Staffing for normal operation only, leaving inability to respond adequately to foreseeable crises and emergencies
- ◆ Failure to consider realistically the burden of the whole role of people in the new organization, including extra-delegated tasks.
- ◆ Not ensuring that *all* key tasks and responsibilities are identified and successfully transferred to the new organisation.

- a) risks and opportunities of the final, changed organisation
- b) risks arising from the process of change

Point a) is dealt with in this section, point b) is dealt with in Step 3 below.

2.1 Objectives of the risk assessment

The key objective of the risk assessment is to ensure that the changed organisation has the **resources** (human, time, information etc), **competence** and **motivation** to deliver all of the following, without making unrealistic expectations of people:

- ◆ Safe process start-up, operation and shutdown in the full range of foreseeable conditions and scenarios, including upsets
- ◆ All activities required to

maintain plant in a safe condition

- ◆ All activities required for a fully functioning health, safety and environmental management system, including all aspects required for major accident prevention or 'process safety'
- ◆ Effective emergency response

2.2 Assessment Procedures

The risk assessment will often require two complementary approaches to ensure that the main risks are identified. These are **mapping** of tasks and individuals from the old to the new organisation (see 2.2.1 below) and, where the reorganisation impacts staff who may have a role in handling or

Case Study

Management wished to down-man a hazardous continuous process. In allowing a reduction of the number of panel operators, they introduced a new 'crash' shutdown procedure.

They checked with the operators that this was possible to do. What they did not recognise was that, given very high costs for each process shutdown, operators would be extremely hesitant at best to shut the plant down in a developing crisis.

responding to crises such as upsets and emergencies there should also be **scenario assessments** (see 2.2.2).

In both cases it is important that organisations use all of the knowledge and expertise available to them and involve the workforce in the risk assessment process.

2.2.1 Mapping

Mapping is the painstaking process of understanding and tracking the detail of the change. It involves;

a) identifying all people in the existing and proposed organisations who will be affected by the change. It is important that this baseline data is accurate and complete. As discussed in 1.3 above, this will be particularly important for nuclear licensees in ensuring compliance with License Condition 36 and making . If wished, a 'coarse filter' can be applied at this stage, so that for individuals who clearly do not have roles or responsibilities with implications for the management of major accidents, either before or after the change, the assessment is formally concluded. For the rest;

b) tabulating and recording;

- ◆ the **tasks** each carry out, including non-production tasks such as communication or paperwork
- ◆ relevant **responsibilities** they have, such as emergency response
- ◆ the working time required for the tasks identified
- ◆ special knowledge or skill that each task or responsibility requires

c) mapping across, carefully checking;

- ◆ Whether any tasks or responsibilities have been overlooked
- ◆ What training will required, especially with relation to health, safety and environment
- ◆ What the total accumulated workload is likely to be for people in the proposed organisation

This process becomes more complex in larger organisations where there may be simultaneous changes that may interact with each other, for example roles or responsibilities passing from one area that is changing to another. In these cases it is recommended that a specific person or body is allocated responsibility to ensure that these cross-organisation issues are tracked and coordinated.

2.2.2 Scenario assessments

This means informed, realistic, structured appraisal of the ability of the proposed new arrangements to manage adequately a range of

foreseeable upsets, incidents and emergencies. An example of a method for doing this is outlined in HSE Contract Research Report 348/2001 which assesses staffing arrangement at chemical sites. This document does not always provide a complete or perfect assessment, but can provide useful lessons and should be considered.

An alternative is to conduct a task analysis and human reliability assessment of how each scenario would be handled. Specialist advice may be appropriate for this in complex or highly critical cases.

2.3 Factors to consider during the assessment

2.3.1 Past experience

Although we inevitably look forward during change, full account should be taken of what experiences or data from the past can tell you about future risks. For example looking at past incidents and accidents experienced, would each become more or less likely to happen again. Where relevant, look at maintenance or repair work, whether there had been any stress points in the past organisation, that might be alleviated or exacerbated by the planned change.

2.3.2 Risks of outsourcing

When considering whether to outsource activities, it is normal to consider not only straight cost, but also what is 'core' to your organisation, in other words what you are, or need to be, good at. In high hazard industries, your policy for outsourcing needs to be clear and *major accident prevention has to be seen as 'core' business*.

When outsourcing, you are inevitably losing some degree of direct control. The key issue to bear in mind when making decisions about outsourcing

an activity is: how important to your prevention of major accidents could this be? You may be losing control without losing responsibility (for example see *R v Associated Octel*).

Clearly, the more significant or safety critical a given activity to major accident risk, the more control needs to be exerted. If safety-critical work is outsourced, two important issues to plan for are,

- Retaining adequate resources to closely supervise and monitor the

expertise of people employed, and the quality and safety of their work.

Pitfalls from outsourcing

- ◆ Erosion of competence in client organisation leading to unhealthy dependency and reduced client control of risks
- ◆ Contractor, aware that resources for monitoring of work are low, avoids compliance with agreed procedures or rules
- ◆ The contractor, or their sub-contractors loses the competence or financial resource to undertake work to required level of safety or quality

- Remaining an ‘Intelligent Customer’, in other words retaining adequate *technical competence* to judge whether, and ensure that, work done is of the required quality and safety
- Contingency plans to maintain risks ‘ALARP’ should the contractor lose the capacity or willingness to deliver to requirements

Capturing and retaining essential information and knowledge held, often informally, by the staff who will be lost to the organisation through the outsourcing.

2.3.3 Human Reliability

As some of the pitfall illustrations and case studies show, it has often been the case that human factors are understood less well, and analysed with less rigour, than is traditionally applied to plant and control system hardware. The risk assessment procedures outlined above should lead the assessment teams through proportionate consideration of the full range of potential human failures (ref HSG 48, James Reason) and the factors that may make these more or less likely to occur. This will generally require at least informed guidance. In high hazard environments, consideration should be given to seeking advice from human factors specialists when establishing protocols through which these issues will be considered.

2.4 Outcome of risk assessments

The risk assessment should identify whether there will be risks in the planned new organisation that require, for example compensatory changes to plant or processes that would compensate, such as increased automation, or even reappraisal of the plan itself.

2.4.1 Assessing workload

The mapping exercise will help in assessing individual workloads in the new organisation. This must be realistic, taking into account all required tasks. Most work comes in peaks and troughs rather than evenly, and any plan that will occupy employees for more than around 70% of the time may risk overloading which can have consequences such as:

- Omission or poor execution of safety-related tasks such as plant checks or shift hand-over
- Fatigue from working excess hours, leading to reduced reliability, errors, or rule violations
- Bunching of tasks preventing quick response or adequate execution

Where changes will include altered shift arrangements, or may result in longer hours worked for staff with safety critical work, potential effects of fatigue on human reliability needs to be considered. Techniques for doing this are becoming better understood (ref. fatigue index).

2.4.2 Planning for Competence Assurance

One of the most critical tasks to face during many organisational changes is assurance of the competence of people with changed or additional

roles. This assurance should make full use of the information generated by the mapping exercise and will include;

- Identifying any gaps in skills and knowledge, particularly skills and knowledge required for roles in relation to the major hazard
- Identifying how these gaps will be addressed, for example by reallocation of roles or training
- Selecting suitable methods for training and assessment
- Planning for availability of competent trainers
- Planning cover for those involved in training
- Verification that the training meets requirements
- Ensuring that adequate time and resources are allowed for necessary training prior to implementation of the new organisation
- Setting clear criteria with regard to competence levels to judge when it is safe to 'go live'

One danger that is easy to overlook is the loss to the business of informal knowledge and processes. At most sites there will be important knowledge, skills, relationships and activities that are not recorded and which can be lost unless specific effort is made to capture them through discussion with the people involved, for example during their participation in the mapping process.

Remember that **competence issues do not only apply to operators**. The business needs to have a clear idea of the **core level of technical competence** it requires amongst engineers and scientists to ensure that it continues to be in control of its hazards and technology. It must also remain an 'intelligent customer' for outsourced services related to the major hazard, able to judge whether risks are being adequately controlled on its behalf, so far as is reasonably practicable.

2.4.3 Action tracking

Mechanisms should be in place to ensure that accurate information is collated and available to senior management on progress with all actions identified by risk assessments and reviews as required before the transition is completed.

2.5 Choosing Performance Indicators

As well as resulting in action plans, milestones etc., the risk assessment process should identify key performance indicators that can be used to monitor the impact of the change process. This is particularly important where consequences could be subtle or long-term, such as lowering of maintenance staff or the time or commitment applied to project risk assessments. Examples of indicators could include levels of overtime, maintenance backlogs, quality of maintenance or activities related to the safety management system.

Measurement should begin *before* implementation, so that there is meaningful baseline data.

Step 3: Implementing and monitoring

3.1 Safety during the transition

The transition phase of the change process can be difficult and challenging. Pressure will generally increase for all involved. It is important that plans are carefully reviewed to ensure that exposure to risks is not significantly increased during this time. Even where a planned change involves reducing the workforce, you will usually need to plan for an *increase* in workload during the transition. You should consider:

- ◆ Phasing changes wherever possible, to prevent loss of control through over-complexity
- ◆ Ensuring that there is adequate cover to allow necessary extra work such as training and writing new procedures
- ◆ Arranging for ample support and/or supervision by competent people for all people doing safety-critical work

Pitfalls in transition

- ◆ Underestimating training burden, and required cover
- ◆ Demanning or reorganizing before required actions completed
- ◆ Lack of experienced support /supervision for staff with new or changed roles

It must be ensured that the change is **not hurried through before all necessary new measures** (competence in new work, well developed new procedures, engineering changes to compensate for reduced human activity etc.) are in place and functioning. This will require setting clear criteria by which to judge that risks will be as low as is

reasonably practicable to complete each change.

You should have, at an early stage of your change process, decided on the end point of the process. This should be reviewed regularly and progress towards this aim noted. There may be some actions that remain long term, this should be clear to all involved when the new organisation exists.

Clearly there are risks during the change that uncertainty and the effects it may have on individuals will affect performance. It is outside the scope of this document to discuss the management of stress, for guidance on this see (*references*). However, most responsible companies will seek to reduce periods of uncertainty to a minimum, whilst retaining any staff who are to leave long enough to complete a safe transition.

3.2 Monitoring the change

There will always be a degree of uncertainty as to the impact of organisational change. Effects can be subtle and not immediately apparent, for example degradation of activities following increased workload or span of work, or changed priorities. Unrecorded or informal activities or communications that contribute to safety performance can be overlooked and lost.

Risk assessments and plans for both the transition and the outcome should be regularly reviewed. You will have set objectives and devised key performance indicators. Periodic, planned reviews should assess whether

these have been achieved. Be ready ultimately to change or even reverse decisions where there is evidence that there may otherwise be significant risk, however uncomfortable this might be.

The effects of change can be subtle and may not be evident for some time and is therefore important to plan in reviews after for example, 6 months or one year. These reviews should be led by the senior manager responsible for championing the change but should also involve independent reviewers.

It is important that the lessons learnt from the change process are identified (strengths and weaknesses) and used to amend the organisations own change procedure at these reviews.

Legal Requirements

All UK businesses have general legal duties for the protection of employees and others. These include requirements under the Health and Safety at Work etc Act 1974 for employers to ensure, so far as is reasonably practicable, the health and safety of employees and others who may be affected by their activities, and the Management of Health and Safety at Work Regulations 1999 which require assessment by employers of the risks concerned.

For major hazard processes there are also sector-specific requirements, as follows.

Offshore Installations

For organisations operating offshore installations, there is a suite of sector-specific regulations. These came about following the Cullen Inquiry into the Piper Alpha disaster. They consist of the Offshore Installations (Safety Case) Regulations 1992 [SCR], supported by the Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995 [PFEER], the Offshore Installations and Pipeline Works (Management and Administration) Regulations 1995 [MAR], and the Offshore Installations and Wells (Design and Construction etc) Regulations 1996 [DCR].

Under SCR duty holders are required to produce safety cases for their installations which must demonstrate inter alia that there are adequate management systems in place to secure the health and safety of employees and others and the control of major accident hazards. Duty holders must consider whether and how a given organisational change may impact upon the safety management systems set out in the SCR safety case. Examples of more specific considerations can include impacts upon;

- arrangements for ensuring safe plant design and maintenance of plant integrity required under SCR and DCR,
- measures to prevent fires and explosions, and effective emergency response, required by PFEER,
- specific duties and arrangements that MAR require such as use of permits to work, communication arrangements, collection of meteorological information and appointment of installations managers.

Advice on application of the law to a given organisational change should be sought from the HSE inspection team for the installations concerned.

Nuclear Licensees

The Nuclear Installations Act 1965 (as amended) (NIA65) requires HSE to attach conditions to nuclear site licences. Licence conditions define areas of nuclear safety to which a licensee should pay attention to ensure safe operation of the site. While some conditions impose specific duties others require the licensee to devise and implement adequate arrangements in particular areas. The issues covered range from arrangements for ensuring the safety of plant and for controlling operations to management issues such as the supervision and training of staff. Compliance with many of these can be affected by organisational change. Breach of a licence condition is an offence under NIA65 s.4(6).

Of particular relevance to this document is License Condition 36. This requires licensees to “...make and implement adequate arrangements to control any change to its organisational structure or resources which may affect safety”. It also requires changes to be submitted to HSE for approval, with an adequately documented demonstration that safety will be controlled. Following the guidance in this document can help to control risks from the changes and make the demonstration.

Organisational change can affect ability to meet many other License Conditions. Examples are; License Condition 10, which requires operational personnel to be adequately trained, LC 11 requiring adequate emergency arrangements and LC 28, which requires adequate arrangements for the regular and systematic examination, inspection, maintenance and testing of all plant which may affect safety. Complying with this guidance will help to ensure that the consequences to these activities of organisational changes are appropriately assessed and adequately controlled. Licensees are required to submit plans for changes to HSE Nuclear Safety Directorate, it is recommended to seek advice at an early stage, particularly for major changes.

‘COMAH’ sites

Onshore non-nuclear major hazard sites in the UK come within the scope of the Control of Major Accident Hazards (COMAH) Regulations 1999. The Regulations are enforced by a joint Competent Authority (CA) comprising HSE and the Environment Agency / Scottish Environmental Protection Agency. Regulation 4 of these Regulations requires the operators of major hazard establishments (COMAH establishments) to take ‘all measures necessary’ to prevent and mitigate the consequences of major accidents to people and the environment.

Operators of COMAH establishments have to produce a written Major Accident Prevention Policy (MAPP), designed to guarantee a high level of protection for people and the environment by appropriate means, structures and management systems. Schedule 2 of the Regulations sets out principles and issues to be addressed within the MAPP, examples of these relevant to organisational change include the following - organisation and personnel (roles, responsibilities, competence); identification and evaluation of major

hazards; operational control; management of change; monitoring performance; audit and review.

COMAH operators also have to demonstrate to the COMAH CA, on request that ‘all measures necessary’ have been taken. For COMAH establishments that have specified ‘top tier’ quantities of hazardous materials (‘top tier establishments’) demonstration of ‘all measures necessary’ has to be made in the safety report submitted to the COMAH CA for assessment (Regulation 7). Human Factor elements of safety reports (including organisational change) will be assessed against human factor criteria set out in the Safety Report Assessment Manual (SRAM).

Safety Reports and MAPPs have to be reviewed and where necessary revised (Regulations 5(4) and 8(1)) whenever modifications or changes are made to the safety management system that could have significant repercussions with respect to the prevention or limitation of the consequences of major accidents. Any organisational change that may significantly affect the safety management system is likely to require such a review and revision. Further advice on the need for review and revision of safety reports and MAPPs can be obtained from the local HSE HID, EA or SEPA team.

This information sheet will inform staff of the COMAH CA as they assess whether operators of major hazard establishments have taken ‘all measures necessary’. COMAH Regulation 18 places a legal duty on the COMAH CA to prohibit major hazard activities where the CA has concluded that there are serious deficiencies in the control measures designed to prevent and mitigate the consequences of major accidents. Following the framework in this Information Sheet can help to demonstrate that the potential risks arising from an organisational change are being appropriately assessed and adequately controlled.

Further help

For site-specific advice on particular changes, or concerning legal compliance, advice should be sought, as stated above, from the HSE, EA or SEPA inspector for the site.

For general advice on the matters set out in the guidance, contact the HSE HID Human Factors Team 0151 951 (MSDU)

references

COMAH refs

CRR

HSE website

Involving employees in health and safety ISBN 0 7176 2053 0

(there is OIAC guidance on multiskilling which should be referenced)

Filename: Org Change 02.08
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