

GUIDELINES FOR MAJOR HAZARD FACILITIES



H - MODIFICATIONS

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(i) Sections of Act Relevant to Guideline

Dangerous Goods Safety Management Act 2001

PART 2—SAFETY OBLIGATIONS

Division 2—Obligations of occupiers and others

23 Obligations of occupiers

- (2) The occupier of a major hazard facility or large dangerous goods location also has the following obligations—

(a) is not directly relevant

- (b) in consultation with the employees at the facility or location, to review and update emergency plans and procedures before any modification of the facility or location that would significantly alter the risk associated with the facility or location.

PART 4—MAJOR HAZARD FACILITIES

Division 2—Notification to the chief executive about possible major hazard facilities

38 Obligation to notify chief executive of modification to a major hazard facility

Before the occupier of a major hazard facility undertakes modifications of the facility that will significantly alter the risk associated with the facility, the occupier must notify the chief executive about the modifications, unless the occupier has a reasonable excuse.

Maximum penalty—200 penalty units.

Division 3 – Other obligations of occupiers of major hazard facilities

41 Occupier must carry out systematic risk assessment

(1) and (2) are not directly relevant

- (3) The systematic risk assessment for a major hazard facility must be reviewed and updated before the facility is modified in a way that significantly alters the risk associated with the facility.

44 Occupier must provide education and training

- (1) For section 23(1)(d), for a major hazard facility, education and training must—

(a), (b) and (c) are not directly relevant

(d) be conducted before any modification of the major hazard facility that significantly alters the risk associated with the facility is carried out.

45 Safety management system for major hazard facility

(1), (2) and (3) are not directly relevant

(4) The safety management system must be reviewed and updated for the major hazard facility before any modification of the facility that significantly alters the risk associated with the facility is carried out.

47 Occupier must give safety report to chief executive

(1) and (2) are not directly relevant

(3) The occupier must review the safety report and give an update of it to the chief executive before any modification of the major hazard facility that significantly alters the risk associated with the facility is carried out.

(4), (5) and (6) are not directly relevant

(ii) Sections of Regulation Relevant to Guideline

Dangerous Goods Safety Management Regulation 2001

None specifically relevant

1 Introduction

The purpose of the Dangerous Goods Safety Management (DGSM) Act 2001 is to protect people, property and the environment from harm from hazardous materials. The DGSM Act imposes certain safety obligations on occupiers of Major Hazard Facilities (MHFs).

These obligations include conducting and documenting a Systematic Risk Assessment (SRA) of the operations, the implementation of appropriate risk reduction measures, consultation with the community and the submission of a safety report. There are also certain requirements that an occupier of MHFs must do before any modification or change is carried out at the facility that significantly alters the risk associated with the facility. Such alteration to the risk profile of the facility can have an impact on the appropriateness and accuracy of the SRA, the risk reduction measures in place, consultation with the community and the safety report.

For the requirements regarding modifications to be met, arrangements should be established at the facility which include processes for the management of change. These management arrangements should include requirements to take appropriate actions as obligated under the DGSM Act.

This guideline provides information on the management of modifications at an MHF with respect to the occupier's obligations under the DGSM Act. This information is provided for guidance only and is not designed to impose a particular management arrangement for handling modifications at a MHF, however does identify the general issues that should be considered.

2 Key Safety Management System Legislative Issues

2.1 Safety Obligations

Under the DGSM Act, the occupier of a MHF is required to fulfil certain obligations before any modification is carried out at the facility that significantly alters the risk associated with the facility. These requirements include:

- notifying the regulatory authority;
- reviewing and updating the SRA;
- implementation of specific employee training and education;
- reviewing and updating certain risk reduction measures such as emergency plans and relevant components of the Safety Management System (SMS); and
- reviewing the safety report and providing an update to the regulatory authority.

2.2 Timeframe

The DGSM Act requires that the occupier's obligations with respect to modifications of the facility be fulfilled prior to undertaking a modification that significantly alters the risks associated with the facility.

3 Changes and Modifications

3.1 Definition of a Modification

All operational sites, for a variety of reasons, make changes. These changes are implemented to provide some benefit to the business; whether it be productivity, operational or financial improvements or indeed for a reduction in health, safety or environmental risks.

To properly manage such changes to process, equipment and systems, the meaning of what is meant by a ‘change’ or ‘modification’ must be established.

Generally, modifications include changes to equipment, materials, procedures and process conditions, other than those which could be described as ‘replacement in kind’. The DGSM Act definition of a modification is provided in Guide Note 1. The particular focus of the DGSM Act is on those changes which can potentially impact on risk to people, property and the environment.

Guide Note 1 – DGSM Act definition of a Modification

Modification: of a major hazard facility or dangerous goods location includes-

- A change to plant, processes or quantities of hazardous materials at the facility or location; or
- The introduction of different hazardous materials or new plant, processes, or operating procedures at the facility or location; or
- Organisational change at the facility or location; or
- A change to the safety management system at the facility or location.

3.2 Unforeseen Consequences

Many accidents at chemical facilities have occurred due to the unforeseen consequences resulting from the implementation of modifications. Without appropriate consideration of all possible implications, such modifications may introduce a new hazard. (see Guide Note 2)

Guide Note 2 – Flixborough Disaster 1974

Modifications and temporary changes have been the cause of a number of catastrophic accidents in the past. The most notable example was the vapour cloud explosion and fire at the Nypro facility at Flixborough UK in 1974. The accident killed 28 people and injured in excess of 400. The release and explosion of 50 tonnes of hot cyclohexane was due to the failure of a temporary bypass pipe connecting two reaction vessels.

There were six reactors in series at Flixborough, liquid flowed through the reactors by gravity from No.1 to No.6. Due to the development of a crack in the fifth reactor, it was removed. The temporary bypass was used to connect reactor No.4 to No.6.

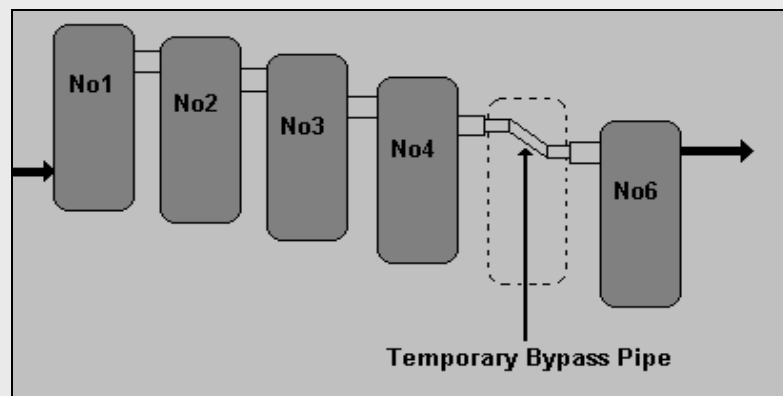


Figure: Schematic of reactors and the bypass arrangements at Flixborough

The processes for the control of such modifications was deficient at Flixborough and the following issues are worthy of note:

- The bypass design was inappropriate, supported by scaffolding and free to rotate or twist if the pressure increased (this apparently caused the bypass arrangement to fail) – no appropriate design, design review & hazard assessment;
- There was no suitably qualified mechanical engineer on site to co-ordinate the appropriate design and installation of the bypass – no management of change for personnel;
- There was no design information apart from a sketch in chalk on the workshop floor – no appropriate modification documentation;
- The modification was only temporary (the failure occurred 2 months after it was installed) – design approached influenced by the permanency of the change?

The potential for problems arising from modifications can be influenced by a number of factors related to the implementation of the modification. Such factors include:

- the timing of the modification – the modifications may be well planned during a plant design phase or rushed during a time of stress such as commissioning or a plant breakdown situation;
- the requirement for sanctioned capital – a greater degree of consideration may be given to potential impact of the modification when justification for the sanctioning of capital is required; and
- the permanency of the change – modifications which are considered temporary may not receive the same level of scrutiny as a permanent modification.

3.3 Significant Alteration to Risk

Apart from the appropriate management of change provisions as part of the facility's SMS, specific regulatory authority interest in modifications surrounds those modifications that significantly alter the risk associated with the facility. This does not necessarily relate to the size or significance of the modification, but rather the potential impact on risk due to the modification (see Guide Note 3).

Guide Note 3 – Significance of Modification

Major changes to the office area of a facility involves major construction work, disruption of employees and significant change to the appearance of the site. This project could be considered a significant modification, but may have little if any impact on risk at the facility.

Alternatively, the seemingly minor increase in production at a facility to meet increasing demands may impact adversely on the pressure relief capacity and thereby significantly impact on risk.

The significance of the modification does not necessarily significantly alter risk.

The determination of whether risk is significantly altered due to a proposed alteration needs to be quantified in some way and not solely on judgement or 'gut feel'. The post modification level of risk should be compared to the pre modification (i.e. from the SRA) to determine the significance or importance of the difference.

In comparing pre-modification and post modification levels of risk the same risk assessment techniques assumptions must be employed in both cases. Further information regarding risk assessment techniques is available in *Guidelines for Major Hazard Facilities, C – Systematic Risk Assessment*.

The following factors should be considered in determining the significance of the modification and hence to requirement to inform the regulatory authority.

Off site risk

A significant alteration in risk would be identified by a noticeable change in the cumulative risk associated with the facility's operation, e.g. a noticeable change to the individual risk of fatality when comparing the pre modification and post modification results. See Figure 1.

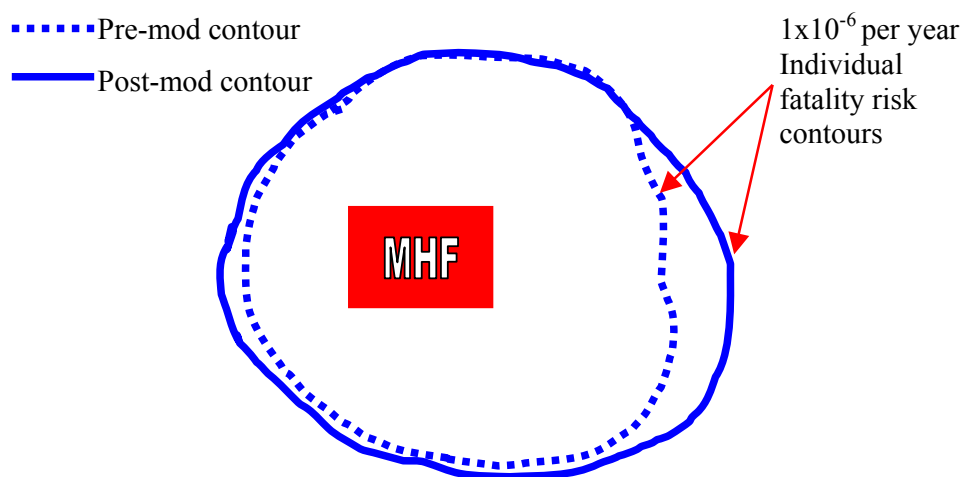


Figure 1: Example of Change to Individual Risk of Fatality Contours due to the implementation of a modification

Inherent level of risk

Changes to the hazards present at a facility change the inherent level of risk associated with the facility. While appropriate risk reduction measures can be employed to manage this risk to an acceptable level, significant changes to the hazards at the facility are of interest to the regulatory authority. Are the introduced risks being managed appropriately?

Significant changes to hazards, and hence significant changes to the inherent level of risk may include:

- Changes to the inventory of a hazardous material – generally a change of 10% or greater would be considered significant;
- Changes to process conditions, e.g. processing temperature, pressure etc.; and
- Changes to equipment, e.g. reliability, containment integrity etc.

As risk is a function of consequence and likelihood, the alteration to the inherent risk at a facility, due to the implementation of a modification, may be influenced by changes in consequence, likelihood or both. (see Guide Note 4)

Guide Note 4 – Alteration to Risk – Consequence & Likelihood

A facility intends increasing the inventory of a hazardous material. Depending upon how the increase is implemented, the risk at the facility may be affected in the following ways:

Consequence – if a storage system (tank, packaged store area) at the facility is increased, the impact of a potential major accident involving this system will increase accordingly. i.e. increase in the amount of material that could be released.

Likelihood – if an additional storage system (tank, package store area) is constructed at the facility, the likelihood of a failure that may lead to a major accident will increase accordingly. i.e. increase the number of storage systems increases the number of potential areas for failure.

4 Control of Modifications

To minimise the impact of modifications, procedures should be established for the safe management of change at the facility. These procedures should cover changes / modifications to plant, systems, processes and people to ensure that such changes do not compromise safety.

The management of change procedures should include provisions for the assessment of risk associated with intended changes or modifications. Appropriate risk reductions measures should be identified and implemented to maintain risk at an acceptable level.

The procedures should include:

- definition of what constitutes a change or modification;
- the process for initiating change;
- authority for approving intended changes;
- documentation of the change;
- safety implications / assessment of risk associated with the change including requirements for HAZOP of the modification as appropriate;
- implementation of risk reduction measures to risk is managed appropriately;
- communication processes established to ensure information of changes is appropriately disseminated; and
- post change review.

The procedures should ensure that appropriately qualified and experienced personnel are used in the modification design, review of the design, hazard assessment and the final approval of the modification.

An occupier of a MHF should include within their procedures the requirement that the regulatory authority is notified prior to the implementation of the modification if the modification will significantly alter the risk associated with the facility.

5 Modifications - DGSM Act Requirements

5.1 Summary of Obligations

Before any modification is carried out that significantly alters the risk, the occupier must:

- review and update the emergency plans as per Section 23(2)(b) of the Act;
- notify the chief executive regarding the modification as per Section 38 of the Act;
- review and update the systematic risk assessment as per Section 41(3) of the Act;
- conduct education and training relevant to the modification as per Section 44(1)(d) of the Act;
- review and update the safety management system as per Section 45(4) of the Act; and
- review the safety report and give an update of it to the chief executive as per Section 47(3) of the Act.

5.2 Notification of Changes

As a minimum, the occupier must provide the regulatory authority with the following information about the intended modification before the modification is carried out-

- a comprehensive description of the proposed modification including a scaled diagram(s) showing the location of the modification within the facility;
- details of any new hazards introduced and changes to the risk associated with the facility;
- details of the risk reduction measures employed to manage the risks associated with the modification;
- the level and appropriateness of information, education and training provided to employees who may be affected by the modification; and
- a demonstration that the implementation of the modification continues to provide an acceptable level of risk.

5.3 Education and Training

The occupier should establish processes to ensure that employees would be potentially affected by modifications, are provided with the appropriate level of information, education and training regarding the modification. This training should be provided to ensure that employees can continue to perform their roles and duties safely.

The information, education and training should cover issues such as:

- the nature of the hazards associated with the modification;
- the processes used to identify, assess and control the risks associated with the modification; and
- the use and maintenance of the processes to control the risks associated with the modification.

5.4 Safety Report Update

The occupier must provide an update of the safety report to regulatory authority prior to implementing a modification that significantly alters risk at the facility. The update of the safety report can be either:

- a new safety report document written incorporating the intended modification; or
- an appropriate addendum to the current safety report addressing specifically the areas of the original document affected by the implementation of the intended modification.

In each case the update of the safety report must address the impact of the intended modification on the following:

- the SRA of the facility and a demonstration that risk is at an acceptable level;
- the induction, information, supervision education and training at the facility;
- the emergency plans and procedures at the facility;
- the safety management system at the facility; and
- the community consultation arrangements for the facility.

H – Modifications

Further information regarding the content of the safety report is available in *Guidelines for Major Hazard Facilities, J – Safety Report*.

6 Summary of Occupier's Requirements

The occupier may use the following as a checklist.

The occupier should be able to demonstrate the following:

- Processes have been established for the control of modifications and changes at the facility
- Suitably qualified and experienced personnel are involved in the approval and implementation of modifications
- All hazards associated with intended modifications are identified and their risks assessed prior to the implementation of all modifications
- Appropriate risk reduction measures are employed to ensure the risks associated with the intended modification are managed to an acceptable level
- The obligations under the DGSM Act with respect to modifications are included in the control of modification processes at the facility

7 Further Reading

Frank P Lees

Loss Prevention in the Process Industries 2nd Ed

Volume 1 Hazard Identification, Assessment and Control

Butterworth Heinemann

Trevor Kletz

What Went Wrong? Case Histories of Process Plant Disasters

Third Edition

Gulf Publishing Company

ISBN 0-88415-027-5

Trevor Kletz

Learning From Accidents in History

Butterworths

ISBN 0-408-02696-0