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Development of Aids for Drawing Up and Assessing the Plan for the Prevention of Hazardous Incidents

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16. Abstract

With the Twelfth Ordinance on the Implementation of the Federal Pollution Control Act, which came into force on 3.5.2000, the Hazardous Incidents Ordinance in the version of 20 September 1991 was reformulated. The reason for this new version was the need to implement Council Directive 96/82/EC of 9 December 1996 on the control of major accident hazards (Seveso II Directive) in German law.

The new Hazardous Incidents Ordinance contains as a major new provision in Article 8 the requirement for a "Plan to Prevent Hazardous Incidents". This concept must be drawn up in writing by the operator before commissioning, implemented and – where the plant concerned is subject to the basic obligations – kept available for examination by the authorities. Plants subject to the extended obligations must document fulfilment of this requirement in the safety report.

There has to date been little experience which would relate to drawing up a plan for the prevention of hazardous incidents or to an official assessment of the plan.

The present R&D project is intended to provide the operators of the relevant plants with assistance in drawing up a plan for the prevention of hazardous incidents and in documenting it and to provide the competent authorities with assistance in assessing such a plan. For this purpose more detailed specifications have been drawn up on the basis of the requirements of the Hazardous Incidents Ordinance both for the plan for preventing hazardous incidents and for the written document intended as documentation. These specifications have been implemented in five practice-based examples.

In addition a comprehensive checklist was drawn up in the R&D project. This is intended o support the operators both in drawing up and implementing the plan for preventing hazardous incidents and in its regular review and assessment. With the checklist the authorities have an aid to assessing the operator's plans, e.g. within the framework of the inspection systems according to Article 16 of the Hazardous Incidents Ordinance.

In the conduct of the R&D project consideration was given to different company structures and sizes and to facilities with different hazard potential.

The R&D project proceeded in the following stages:

1. Establishment of the substantial requirements for the plan to prevent hazardous incidents
2. Establishment of the substantial requirements for the written document to describe the plan to prevent hazardous incidents
3. Preparation of 2 sample plans to illustrate the plan to prevent hazardous incidents in two actual plants
4. Preparation of an interim report on the R&D project and conduct of a technical meeting
5. Preparation of 3 sample plans to illustrate the plan for the prevention of hazardous incidents for different plants according to the agreements arising from the technical meeting
6. Preparation of aids for drawing up and assessing plans for the prevention of hazardous incidents in the form of checklists.

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1. Introduction

With the Twelfth Ordinance on the Implementation of the Federal Pollution Control Act, which came into force on 3.5.2000, the Hazardous Incidents Ordinance in the version of 20 September 1991 was reformulated. The reason for this new version was the need to implement Council Directive 96/82/EC of 9 December 1996 on the control of major accident hazards (Seveso II Directive) in German law.

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The present R&D project is intended to provide the operators of the relevant plants with assistance in drawing up a plan for the prevention of hazardous incidents and in documenting it and to provide the competent authorities with assistance in assessing such a plan.

The research project was conducted by RWTÜV Anlagentechnik GmbH. RWTÜV Anlagentechnik GmbH was assisted by a grant from the Federal Environment Agency in Berlin, Department of Plant Safety and Hazardous Incident Prevention.

Two companies from industry participated in this R&D project. This meant it was possible to compile sample sets of documentation of plans for the prevention of hazardous incidents in practice.

2. Task

With the research project it is intended to develop aids for drawing up and assessing the plan for the prevention of hazardous incidents.

These aids are to have the following features:

- Different plant types and different hazard potentials must be taken into account. For this purpose plans for the prevention of major accidents are to be described in example from for various plant types and various substance-related hazard potentials. These sample descriptions are to based in terms of structure on the guidelines of the Hazardous Incidents Commission.

- In addition to sample plans it is intended to compile general criteria for drawing up, implementing and assessing the safety plan in the form of checklists.

- The aids must be capable of being integrated in the different management systems already introduced, for example those according to EN ISO 9000 ff, DIN EN ISO 14001 or occupational safety and health management systems.

3. Basic specifications

The basic specifications for conduct of the research project are:

1. Council Directive 96/82/EC on the control of hazards from major accidents with hazardous substances, dated 9 December 1996 (Seveso II Directive)
2. Twelfth Ordinance on the Implementation of the Federal Pollution Control Act, dated 26 April 2000 (Hazardous Incidents Ordinance)
3. SFK-GS-23 Guidelines for the Description of a Plan for the Prevention of Hazardous Incidents under Article 7 in combination with Annex II of the Seveso II Directive – Directive of the Management Systems Working Party of the SFK (at the time the research project was commissioned as a draft, June 1999)
4. The UBA/BMU research project "Improvement of Safety Management in Small and Medium-Sized Enterprises (SME) in order to Satisfy the Organisational Safety Obligations of the Hazardous Incidents Ordinance", Research Report 29648422 UBA-FB 98-101; Umweltbundesamt Texts 67/98, Berlin, 1998.

In addition to these requirements of the Hazardous Incidents Ordinance for the plan to prevent hazardous incidents, there are also requirements for safety plans laid down in various regulations and codes or recommendations, such as the specimen VVAwS (Administrative Regulation for Facilities for Water-polluting Substances), the regulations of the Laender regarding liquefied gas installations and TRGS 300. These requirements or recommendations were examined within the R&D project to establish what relevance they have with respect to the implementation of Article 8 of the Hazardous Incidents Ordinance.

Annex 2 gives a list of examples for the provisions or recommendations on the drawing up of safety concepts as examined in the R&D project.

Specific matters to be taken into account, such as those taken from the

"Guiding principle for Chemical Accidents,

Section A.2 Operators of Plants subject to Mandatory Licensing"; OECD/GD(92)43,

were considered when drawing up the sample plans for the prevention of hazardous incidents and when drawing up the checklist for assessing the plan for the prevention of hazardous incidents.

4. Definitions

For the terms used in the rest of this report the following definitions are taken within the meaning of the present R&D project:

Normal operation (from /5/, No. 2.2)[1],:

"... admissible operation for which a plant is intended, design and suitable in accordance with its technical purpose. Operating states which are not in accordance with the licence issued, enforceable retrospective orders or statutory regulations are not covered by the term normal operation.

Normal operation covers

- normal operation including operationally necessary interventions, such as sampling and including storage with filling, transfer and emptying operations,
- commissioning and start-up and shut-down modes,
- trial operation,
- servicing, inspection, maintenance and cleaning work, as well as
- the condition during temporary decommissioning."

Facility (from /4/, Article 3 (5a)):,

[1] The First General Administrative Regulation of the Hazardous Incidents Ordinance ceases to apply with the coming into force of the Hazardous Incidents Ordinance 2000, but the substance of the definitions of the Administrative Regulation continue to apply.

" ...the whole area which falls under the supervision of an operator in which hazardous substances in the meaning of Article 3, No. 4 of the Council Directive 96/82/EC of 9. December 1996 on the control of hazards from major accidents involving hazardous substances (OJ of the EC 1997 No. L 10 P. 13) in one or more plants including common or connected infrastructures and activities including storage in the meaning of Article 3 No. 8 of the Directive in which quantities indicated in Article 2 of the Directive are actually present or provided for or will be present, where it can be assumed that the hazardous substances mentioned arise with an industrial chemical process that has gone out of control; this does not include the installations, hazards and activities listed in Article 4 of the Directive 96/82/EC."

Serious hazard (aus /1/, Article 2 No. 4):

"a hazard where

a) the life of people is threatened or major impairments to human health are to be feared,
b) the health of a large number of people may be adversely affected or
c) the environment, especially animals and plants, soil, water, the atmosphere and cultural and other assets may be damaged if the general good were to be at risk from a change in their stock or their usability;"

Plan[2]:

Overriding intentions and orientation with respect to attainment of a specified objective and the establishment of basic rules and procedures for attaining this objective

Plan for the prevention of hazardous incidents[1]:

Overriding intentions and orientation with the objective of preventing hazardous incidents and establishing rules and procedures for attaining this objective

Management[3]:

Harmonised activities for steering and controlling an organisation

Safety management system[4]:

System for establishing the safety policy and safety objectives and for the harmonised activities intended to ensure attainment of these objectives

[2] Based on the term used in Art. 7 of the original version of the Directive 96/82/EC "Major-accident prevention policy" the term "Plan" was defined with reference to the definition from /6/ for the quality policy.
[3] Definition in conformity with /6/ for Management
[4] Definition based on the definition in /6/ for quality management system

State of safety technology (from /1/, Article 2 No. 5):

"the status of development of advanced processes, installations and modes of operation which makes it appear certain that a measure to prevent hazardous incidents or limit their effect is suitable in practical terms. In determining the state of safety technology reference must be made in particular to comparable processes, installations or modes of operation which have been successfully tried and tested in operation."

Hazardous incident (from /1/, Article 2 No. 3):

"an event such as an emission, fire or explosion of major proportions arising from a disturbance in normal operation in a facility falling under this Ordinance or in a plant falling under this Ordinance which results immediately or at a later time inside or outside the facility or plant in a serious hazard or to material damage according to Annex VI Part 1 Item I No. 4 and in which one or more hazardous substances are involved;"

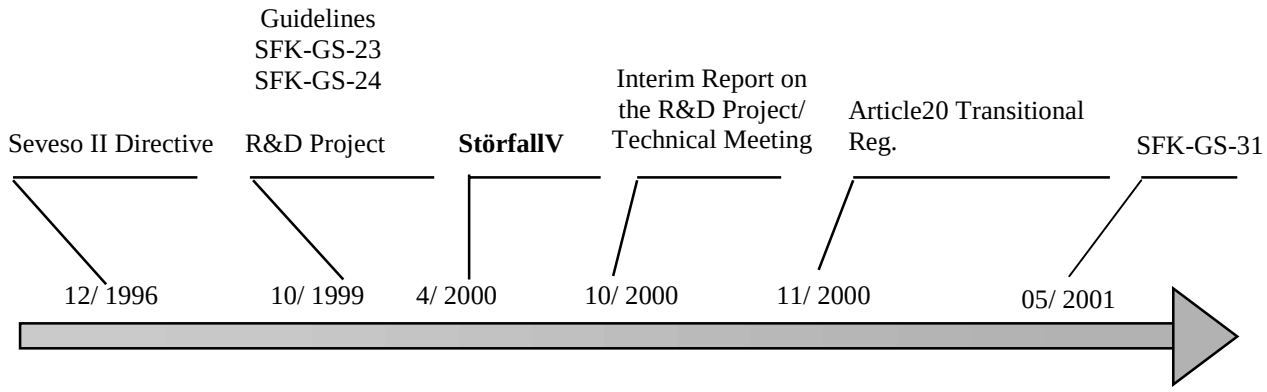
Disturbance of normal operation (from /5/[1]):

"any deviation form normal operation which is significant in terms of safety, including deviations which are deliberately brought about."

5. Planning and sequence of the R&D project

The sequence and the chronological classification of the research project against the background of the implementation of the Seveso II Directive in German law can be seen from the Figure below:

Figure 1:



The research commission "Development of Aids for Drawing Up and Assessing the Plan for the Prevention of Major Accidents" was assigned before the new Hazardous Incidents Ordinance came into force, i.e. it relates at the time when the R&D project began to the requirements for the plan to prevent major accidents in accordance with the Seveso II Directive.
As the R&D project was being processed the Seveso II Directive was implemented in German law in the form of the new version of the Hazardous Incidents Ordinance.

The differences in the requirements regarding the plan to prevent hazardous incidents between the Seveso II Directive and the Hazardous Incidents Ordinance are compared and discussed in Annex 1.
From these differences there arose the following consequence for the sequence of the R&D project:
All facilities for which the plan to prevent hazardous incidents has to be illustrated by practical examples under the task assigned were initially only facilities subject to the basic obligations were planned and selected.
After the Hazardous Incidents Ordinance had come into force it was no longer possible, given the schedule for the R&D project, to record an actual facilities subject to extended obligations as a sample facility.
For this reason it was only possible to consider sample plans for facilities subject to extended obligations only with reference to the fictitious sample facilities selected.

6. Conduct of the R&D project

6.1 Procedure

The R&D project proceeded in the following stages:

1) Establishment of the substantial requirements for the plan to prevent hazardous incidents
2) Establishment of the substantial requirements for the written document to describe the plan to prevent hazardous incidents
    a) structure of the written document
    b) descriptive depth of the individual sections
3) Preparation of 2 sample plans to illustrate the plan to prevent hazardous incidents in two actual plants
4) Preparation of an interim report on the R&D project and conduct of a technical meeting
5) Preparation of 3 sample plans to illustrate the plan for the prevention of hazardous incidents for different plants according to the agreements arising from the technical meeting
6) Preparation of aids for drawing up and assessing plans for the prevention of hazardous incidents in the form of checklists

6.2 Establishment of the substantial requirements for the plan to prevent hazardous incidents

The general requirements for the plan to prevent hazardous incidents arise from the wording of Article 8 of the Hazardous Incidents Ordinance 2000, /1/:

Article 8 Plan to prevent hazardous incidents

2. .....It shall be appropriate in terms of the dangers from hazardous incidents in the facility and shall take full account of the principles laid down in Annex III.

The principles laid down in Annex III specify the susbtantial requiremetns for the plan:

Annex III: Principles for the plan to prevent hazardous incidents and the safety management system

1. The plan to prevent hazardous incidents shall be drawn up in writing; it encompasses the overall objectives and general principles of the operator's procedure for limiting the dangers from hazardous incidents.

2. The safety management system shall incorporate that part of the general surveillance system which includes the organisational structure, areas of responsibility, modes of

action, procedures, processes and means, in other words the items of relevance for establishing and applying the plan for the prevention of hazardous incidents.

The matters given under No. 2 of Annex III are specified further by No. 3, a) to g).

From this the following substantial requirements are to be obtained with respect to the plan to prevent hazardous incidents:
The plan encompasses the overall objectives and general principles of the operator's procedure for limiting the dangers from hazardous incidents, in other words for preventing hazardous incidents and limiting their impact. The specific requirements for preventing hazardous incidents and limiting their impact, including the supplementary requirements are laid down in Articles 4 to 6 of the Hazardous Incidents Ordinance. The plan thus lays down in principle the operator's procedure for fulfilling these specific requirements. Individual measures arise during implementation of the plan, but are not part of the plan itself. The plan this represents a procedure whose application leads to the laying down of suitable individual measures, such as the fitting of plants with safety installations.
The points relevant to laying down (and applying) the plan include the organisational structure, areas of responsibility, modes of action, procedures, processes and means which are part of the operator's general surveillance system.

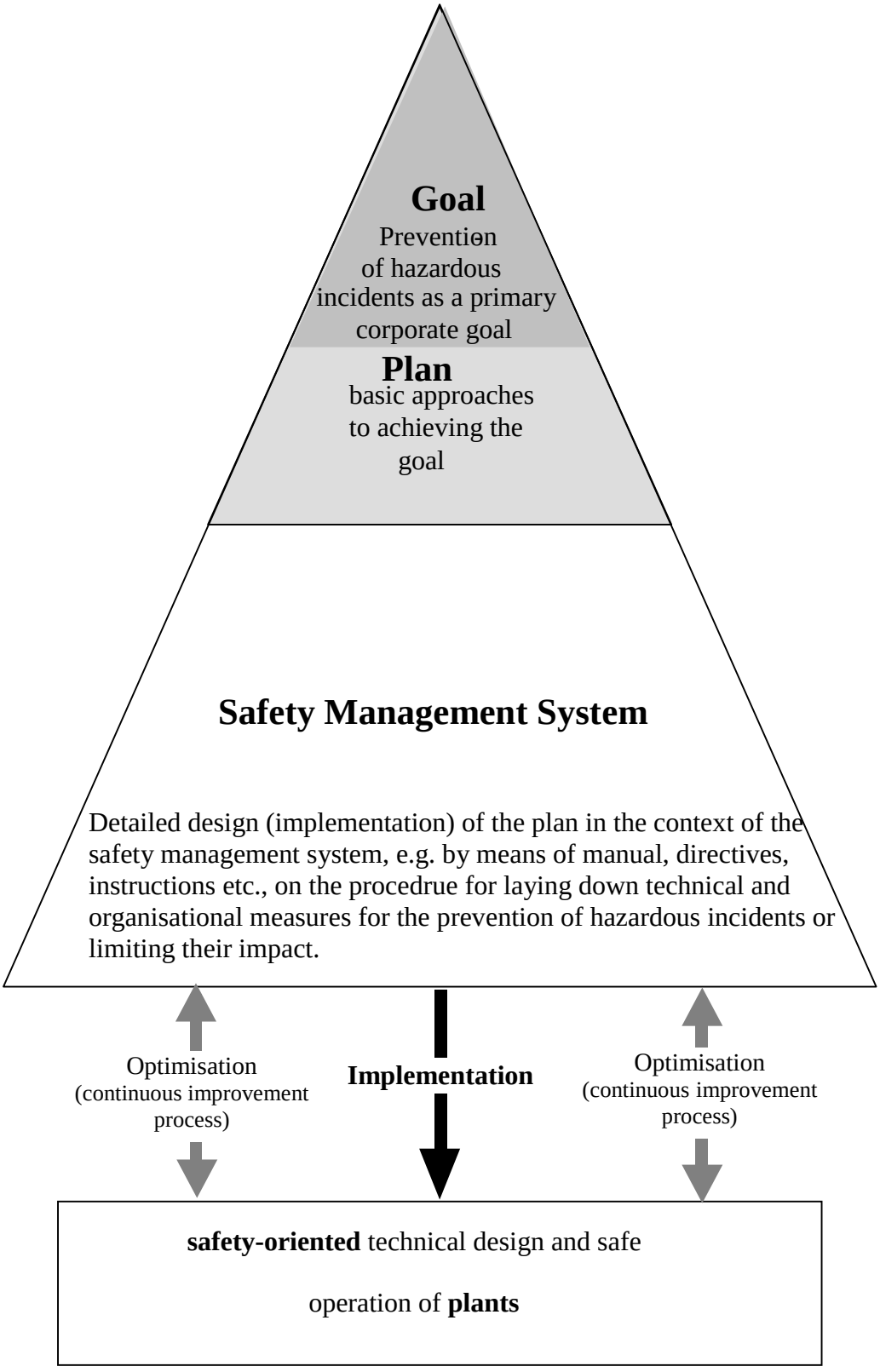
Other specifying requirements for the plan to prevent hazardous incidents arise from the following Articles of the Hazardous Incidents Ordinance:

Article 6 (3): (Domino effect)
The operators shall exchange among themselves all necessary information in consultation with the competent authorities so that they can take full account of the nature and extent of the overall danger of a hazardous incident in their plan to prevent hazardous incidents, ...,

Article 8 (3): (Changes to facilities)
Where changes are made to a facility in the meaning of Article 7 (2) Nos. 1 to 3 the plan to prevent hazardous incidents including the safety management system on which the plan is based and the procedures for its implementation shall be reviewed and, where necessary, updated.

The boundary between the plan and the safety management system or the connection between the two instruments is illustrated in the following Figure:

Figure 2: Connections between the plan to prevent hazardous incidents and the safety management system



As the Figure shows, the plan to prevent hazardous incidents is the starting point for the safety management system of an operator. The plan to prevent hazardous incidents and the safety management system are instruments of the operator in the running of a safe plant.

From the aforementioned requirements of the Hazardous Incidents Ordinance it is possible to formulate the major content of the plan for preventing hazardous incidents as follows:

1. The prevention of hazardous incidents must be laid down as a prime corporate objective and it must be ensured that all levels of the hierarchy are aware of this.

2. It must be laid down that and how potential hazard sources are determined and measures to prevent their becoming effective and to limit their impact if they become effective are taken in all phases of the plant's life.

3. The basic prerequisite for preventing hazardous incidents and limiting their impact is compliance with existing laws and ordinances and the existing technical rules and standards, so that the establishment of structures which are suitable for ensuring compliance with existing regulations in the company is a major, but not merely an adequate part of the plan. Furthermore the state of safety technology[5] must be observed in all a plant's phases.
   This means any gaps or any need for further specification[6] in safety with respect to special hazards in the operator's own company must be uncovered and initiative must be taken by the operator to fill such gaps of satisfy such needs with his own provisions. The aforementioned requirements must be implemented within the framework of the plan by means of concrete instructions for action.

4. The plan must contain provisions on checking and analysing the operator's own effectiveness and , if required, it must be developed further and updated.

5. The plan is based on a safety management system or it is implemented within the framework of one.

6. Relevant points for laying down, implementing and applying the plan for preventing hazardous incidents are: organisational structure, areas of responsibility, modes of action, procedures, processes and means.

[5] With regard to the state of safety technology see also /7/

[6] General requirements contained in statutory regulations, such as "safe operation, "prevention of accidents", are mostly, but not for each special case, specified more closely by subordinate regulations, e.g. administrative regulations, and the technical rules and standards; these must be implemented within the framework of the plan by means of concrete instructions for action and hence the indefinite elements must be eliminated.

This plan – seen as a "plan" which lays down the basic procedure for attaining the objective of "preventing hazardous incidents" – is to be documented in a written document.

6.3 Establishment of the written documents for presentation of the plan for preventing hazardous incidents

6.3.1 General requirements for the written document

Specific requirements for the scope and descriptive depth and for the structure of the written document to present the plan for preventing hazardous incidents cannot be obtained directly from the Hazardous Incidents Ordinance itself.
Since the written documentation of the plan is a subject of official surveillance under Article 16 of the Hazardous Incidents Ordinance[7], it must be plausibly shown therein that the aforementioned requirements are met.
As an aid to presenting the plan for preventing hazardous incidents the MANAGEMENT SYSTEMS working party of the Hazardous Incidents Commission has developed a set of guidelines (SFK-GS-23).
Under these guidelines the written document must "not be so detailed and amenable to assessment **in its own right** as a safety report according to Article 9 of the Hazardous Incidents Ordinance, but together with other available documents it must describe in comprehensible form the fulfilment of the requirements."

The SFK guidelines propose the following (rough) breakdown for the written document:

1. Company policy and guidelines
2. Hazard potential of the facility
   - location
   - substances
   – nature of the process or activity
3 Technical and organisational measures to prevent major accidents or limit their consequences

Annex 1: Characteristic data for substances and reactions
Annex 2: Information for the assessment of the hazard potential
Annex 3: Information on technical safety measures
Annex 4: Information on organisational safety measures

[7] The Hazardous Incidents Ordinance, in contrast to Article 7 (2) of the Seveso II Directive: *"....and make it available to the competent authorities,especially with respect to the application of Article 5 Par. 2 and Article 18."* **does not make any direct link** between the written document and the application of Article 16 (Monitoring System). But this link areises directly from Article 16 (1) No. 3 "...that the data and information information given in the safety report or **in other reports submitted** appropriately reflect the circumstances in the facility.“

The lists in the annexes to the guidelines should "not be regarded as checklists which have to be completely worked through, but as a set of aids for the operator to indicate what he should possible "think of"." (SFK-GS-23, page 6).
With the 3 sections the scope of the description in the written document is merely outlined. The sample list of possibly relevant data or aspects the operator should possibly refer to in the annexes of the guidelines does not give any specific help in establishing the descriptive depth.

The guidelines for describing a plan for preventing hazardous incidents and a safety management system according to Article 9 Par. 1a i. V. with Annex III of the Seveso II Directive of the SFK Management Systems working party (SFK-GS-24, /15/) contains points, in the form of a list of check items, which must be taken into account in the introduction and implementation of a safety management systems, but it does not contain any details of a description of the plan in a written document.

On the basis of the significance of the term "plan" and the formulation in Annex III of the Hazardous Incidents Ordinance "General Principles for **Procedure**" and the contents of the plan itself as described in chapter 6.2 of the present report, the authors are of the opinion that it is not necessary to give a description of special technical measures in the written document. this also accords with the remarks in the "Guidelines on a Major Accident Prevention Policy and Safety Management System, as required by Council Directive 96/82/EC (SEVESO II)" of the Technical Working Group 4 on Safety Management Systems of the European Commission /3/. Feldhaus also says the same in his contribution "Introduction to the new Hazardous Incidents Ordinance" in /8/, where he describes the plan as a "pure procedural instrument whose subject is as safety management system".

Basic and detailed measures are laid down within the framework of a mostly iterative process (advance assessment of the hazard potential, if necessary detailed hazard analysis). The provisions on the **implementation** of this process must be included in the plan, but the process itself and the results of the process are, in the author's view, not a subject of the plan.

It is appropriate for the plan as a "plan" of the operator's procedure for preventing hazardous incidents to be drawn up during the planning of a plant and covers all life phases of the installations in the facility, such as:

- planning,
- production and erection, commissioning, trial operation,
- operation,
- shut-down.

6.3.2 Structure of the written document

It is not possible to find any specific requirements for the structure of the written document in the Hazardous Incidents Ordinance. To obtain a comprehensible description of the requirements for the plan to prevent hazardous incidents there are in principle various possibilities; in the present research project the following possibilities were considered and applied in the sample written documents:

a) Structure according to the contents of Annex III of the Hazardous Incidents Ordinance

For a comprehensible description of the aforementioned requirements for the plan to prevent hazardous incidents the contents of Annex III of the Hazardous Incidents Ordinance can be taken as a model for the structure of the written document.
This then yields the following contents for the written document:

1. Overall objectives and general principles
2. Organisation and personnel
3. Determination and assessment of the dangers from hazardous incidents
4. Monitoring of operation
5. Safe implementation of changes
6. Planning for emergencies
7. Monitoring the efficiency of the safety management system
8. Systematic review and assessment.

A brief description of the facility containing details of the technical purpose, the surrounding areas, substances etc. serves to give an overview and should precede the points given above.

b) Breakdown of contents according to installations' life phases

The example for a breakdown of contents as shown below yields a more self-enclosed description of a plan which ensures prevention of hazardous incidents in all phases of the facility and also includes a process-oriented approach to a safety management system.
With this structure in the written document, safety-related relations are shown which give a logical sequence to the individual requirements for the plan to prevent hazardous incidents in accordance with the usual operational sequences.

The allocation of the matters to be taken into account under Annex III of the Hazardous Incidents Ordinance to the individual content items in the written document can be found in the following table:

Table 1:

Requirements of Annex III	Content items of the written plan acc. to Article 8
	1. Brief description of the company and the facility
	2. Prevention of hazardous incidents and limitation of their impact
1. Overall objectives of the operator in limiting the dangers from hazardous incidents	2.1 Corporate policy and guidelines/instructions
3. a) Organisation and personnel	2.2 Organisation and personnel
3b) Determination and assessment of the dangers from hazardous incidents	2.3 Determination of the dangers and establishment of the basic measures for preventing hazardous incidents and limiting their impact 2.3.1 Planning/modification phase
3c) Monitoring of operation	2.3.3 Operating phase 2.3.3.1 Monitoring of normal operation 2.3.3.3 Maintenance plan 2.3.3.4 Training and courses of instruction
3d) Safe implementation of modifications	2.3.1 Planning/modification phase 2.3.2 Implementation phase 2.3.4 Shut-down phase
3e) Planning for emergencies	2.3.1 Planning/modification phase 2.3.3.2 Procedure to be adopted in the case of disturbances to normal operation and hazardous incidents
3f) Monitoring the efficiency of the safety management system	2.3.3 Operating phase 2.3.3.5 Review of the effectiveness of measures laid down
3g) Systematic review and assessment	2.4 Review of the effectiveness of the plan

6.3.3 Descriptive depth in the individual sections

The remarks in the written document must make clear that in the company there are the structures and regulations required to ensure safe operation and that they are laid down in a safety management system. The written document should in itself be plausible and should be

an extract from the specific provisions for the safety management system. To avoid dual stipulation of the individual matters concerned, reference should be made in the written document to the documentation on the safety management system and to other relevant documents. Major elements of the principles of action on which the safety management is based should be given here. To facilitate assessment, however, mention must necessarily be made in connection with these principle of action of the regulations and instructions of the safety management system of other documentation which implement these principles.

To provide a comprehensible explanation that and how the operator's plan for preventing hazardous incidents is implemented, reference must be made in the written document both to the corresponding provisions on concrete specification of these principles of action and to sets of documentation which verify implementation of the plan. In particular the following sets of documentation must be referred to:

- documentation of the safety management system and other relevant organisational regulations,
- operating documentation,
- operational records,
- technical documentation

(see also chapter 6.5 of the report "Implementation of the Plan").

To distinguish on the one hand the principle of action and, on the other, verification of the specification and implementation, two sample written documents describing plans for preventing hazardous incidents ("liquefied gas store A of Flüssiggas AG" - Annex 3 - and "Plant A of company B“ - Annex 4 -) are taken and each section is subdivided into "procedure" and "implementation/measures realised". This means that, on the one hand, the principles of action of the facility can be clearly described and, on the other, the authorities receive assistance in assessing implementation.

6.4 Drawing up of sample plans for describing the plan for preventing hazardous incidents for various plants

6.4.1 Selection of sample facilities

Within the framework of the research project sample plans for preventing hazardous incidents were described for the following types of plant:

- Plant for the exclusive storage of highly-inflammable substances (Annex 3)
  The plan for an actual plant was examined for which regulations governing a safety plan have already been laid down in various sets of rules and standards.
  The sample plant taken was a liquefied gas plant. The plant under consideration is a facility belonging to a centrally managed company; the major processes and sequences are controlled by the company's headquarters. There is no documented safety management system, the procedure for preventing hazardous incidents is largely based on custom and practice.
  In the sample written document the operator's procedure for preventing hazardous incidents is described in accordance with item b) under 6.3.2 of the present report. In this plant the individual sections are subdivided into "procedure" (principles of action of the company) and "implementation/measures realised" (implementation of the principles of action in the plant).

- Plant for the chemical conversion of substances in a largely automated production plant (Annex 4)
  A plan for an actual production plant was examined with a largely automated process control. The production plant includes storage of substances according to Annex I of the Hazardous Incidents Ordinance, which leads to application of the basic obligations of the Hazardous Incidents Ordinance.
  The plant under consideration is a facility belonging to a centrally managed company; the processes and sequences are laid down by the management of the facility. The company has a clearly defined business unit; there is a documented management system.
  In the sample written document the operator's procedure for preventing hazardous incidents is described in accordance with item b) under 6.3.2 of the present report. In this plant the individual sections are subdivided into "procedure" (principles of action of the facility) and "implementation/measures realised" (reference to corresponding instructions which specify these principles of action).

- Plant for the storage of hazardous substances (Annex 5)

  The plan for a fictitious plant was examined in which various hazardous substances are stored and handled. The safety management system consists essentially of basic, overall specifications from the company management and of an operating manual for the plant. In the sample written document an extensive description is given of the operator's procedure for preventing hazardous incidents in accordance with the breakdown in Annex III of the Hazardous Incidents Ordinance.

- Facility with a number of installations for chemical conversion (Annex 6)

  The plan for a fictitious facility was examined which is subject to the extended obligations of the Hazardous Incidents Ordinance.
  It is assumed that the facility has a documented safety management system. for the example under consideration the specimen manual of the research report 29648422 (UBA text 67/98) was taken as the documentation of the safety management system.
  Fulfilment of the corresponding requirements of Annex III of the Hazardous Incidents Ordinance is described with reference to the corresponding regulations in the safety management manual.

- Research plant (Annex 7)

  The plan for a fictitious plant was examined in which substances with a wide variety ot hazardous properties and quantities can be used; the sample plant taken for this is a research ("Technikum") plant.
  The plant under consideration has a documented safety management system and again the specimen manual of the UBA research report 29648422 was taken.
  The breakdown corresponds to the life phases of the plant (item b under 6.3.2).

6.4.2 Discussion of the sample plans for preventing hazardous incidents

The preparation of sample written documents for various plants or facilities has shown that, for the purpose of describing the plan for preventing hazardous incidents, the structure of the written document corresponding to the breakdown in Annex III of the Hazardous Incidents Ordinance is suitable, as is that corresponding to the major corporate processes.
The latter breakdown supports a more conclusive description of the safety-related relations as compared with that taken from Annex III of the Hazardous Incidents Ordinance becasue it adopts a more process-oriented approach and can be correlated with no problem with the existing elements of management system already introduced.

Whichever breakdown is selected in an individual case by the operator to describe his plan for preventing hazardous incidents, the crucial factor is fulfilment of the substantial requirements for the plan (see chapter 6.2 of this report).
If the breakdown selected for the written document is according to the respective operational sequences, it is advisable to compare the individual sections with the items given in Annex III of the Hazardous Incidents Ordinance so as to ensure that the requirements of Annex III of the Hazardous Incidents Ordinance are completely fulfilled.

For the descriptive depth two different premises are important here:
- the presence of a documented management system and/or
- safety organisation as living practice.

As explained in chapter 6.3.3 of the present report, in the written document a description must be given of the principles for action on which the safety management system is based with reference to corresponding stipulation for their implementation in the documentation for the safety management system or in other relevant organisational regulations.

The description in the written document is therefore necessarily all the more detailed the less informative the documentation of organisational regulations is, and especially that for the safety management system.

The reference to corresponding provisions governing implementation of the principles of action may be made in the course of the description, as in the sample plan to prevent hazardous incidents in Annex 7 or, as in the sample plans in Annexes 3 and 4, it may be extracted for the sake of easier assessment and placed in its own section "Implementation". The decision as to whether such a subsection is of appropriate for the user must be taken in each individual case.

A further possibility is shown in the sample plan in Annex 6, in which the respective provisions are correlated in tabular form in the context of a documented safety management systems with the corresponding requirements of Annex III of the Hazardous Incidents Ordinance. The written document thus also serves as a "navigation system" through the documentation of the facility for implementation of the requirements for the plan to prevent hazardous incidents.

Conclusion:

While drawing up the sample plans for preventing hazardous incidents the authors assumed that all facilities must fulfil, as expected, the same safety objectives regardless of their size, the nature of the installations in a facility or their hazard potential.

This means that the principles of action for fulfilling the safety objectives do not differ basically for the different facilities. The size of the facility, its nature and the hazard potential influence to a major extent, however, implementation within the context of the safety management system (e.g. scope and breakdown of the instructions as a function of facility size) and also the plant design (measures for preventing hazardous incidents as a function of the hazard potential).

6.5 Implementation of the plan for preventing hazardous incidents

As explained in the preceding chapters of the present report, the plan should be regarded as a plan for the operator's procedure when preventing hazardous incidents.

Basically planning describes the notional penetration of a future patter of events with the aim of preparing and taking those decisions needed to achieve a desired state. The desired state is defined with due regard to conceivable future developments as an objective.

The aim in the present case is laid down in Article 8 of the amended Hazardous Incidents Ordinance as the prevention of hazardous incidents and (on the assumption that hazardous incidents will still occur), the limitation of the possible impact of disturbances and hazardous incidents.

The plan to prevent hazardous incidents is a plan laying down the basic procedure for preventing

- major emissions,
- fires and
- explosions,

with such an impact that they may represent a hazardous incident, and for limiting the possible effects of disturbances and hazardous incidents.

The main feature of this plan is a systematic and retraceable procedure – as opposed to improvisation.

The basic procedure laid down in the plan must be specified more concretely within the framework of a safety management system. The corresponding, company-specific organisational structures and, where relevant, management systems already introduced must be taken into account. As an aid to setting up and introducing a safety management system use can be made here of the research report of the Federal Environment Agency (UBA) "Improvement of the safety management in smaller and medium-sized companies in fulfilment of the organisational safety obligations of the Hazardous Incidents Ordinance", /13/. Further assistance is provided by the guidelines "Possible improvements in the effectiveness of safety management", /14/, which was drawn up on behalf of the Federal Ministry of Research and Technology.
A further aid to setting up and introducing a safety management systems in the meaning of the Hazardous Incidents Ordinance, taking into account various existing management systems, is provided by the SFK-GS-31 guidelines "Aids for integrating a safety management system

according to Annex III of the Hazardous Incidents Ordinance 2000 in existing management systems", /16/.

From the implementation and constant monitoring and optimisation of the procedures laid down within the framework of the safety management system there results a plant and process design geared to safety and a safe operation beyond the total life of a plant.

The safety of the installations of a facility is therefore the result of

- a detailed analysis of the possible hazards in plant and process development and its consideration in the design of the installation (planning phase),
- a precise implementation of the planning results in the design of the installation, selection of suitable materials and quality-assured production and assembly of the installation (realisation phase),
- conscientious selection of suitable personnel on all levels (organisation and personnel),
- qualified plant management and plant monitoring and maintenance during operation of the installation (operating phase),
- the planning of the necessary emergency measures (emergency management),
- and the proper planning and implementation of all modifications to processes and installations, including their shut-down.

Documentation of the regulations and specifications for the structural and sequential organisation serves to verify the implementation of the plan in a safety management system. This documentation contains the required specifications within the framework of the safety management system in the form of higher-level directives, procedures and work instructions.

A major part of the documentation within the framework of the safety management system is the operational documentation, which encompasses all specifications and data relevant to the operation of a plant.. The following documents are examples of parts of an operational documentation:

- characteristic data for substances and reactions
- hazard zone plans
- flow charts and characteristic data of plant parts
- measuring, sampling and analysis regulations

- instructions (operating instructions) especially for
  - commissioning

- start-up and shut-down operation
- trial operation
- normal operation
- maintenance and cleaning activities
- sampling and analysis
- servicing and maintenance work.

To verify the application of the regulations of the safety management system the processes laid down there must be documented in (operational) records.
Examples of such operational records are

- records of the sequence of trial operation/testing and commissioning,
- records of operational sequences / safety-relevant parameters in normal operation (e.g. shift log, records),
- records within the framework of maintenance,
- reports on the investigation of extraordinary events,
- training verifications,
- records of plant inspections,
- test documentation.

The technical documentation of an installation serves to verify a technically safely planned installation, i.e. consideration of the necessary measures to prevent the effectiveness of hazard sources and limitation of the impact of hazard sources.
Examples of documents which are part of the technical documentation are listed in Annex 8 of the present report.

To verify implementation of the principles of action laid down in the plan the written document must refer to the documentation available in the company.

6.6 Assessment of the plan for preventing hazardous incidents

An assessment of the plan for preventing hazardous incidents can be conducted form the following points of view or for the following reasons:

1. Assessment by the operator of its completeness as the plan is being drawn up
2. Assessment by the operator of the effectiveness of the plan for preventing hazardous incidents in at regular intervals
3. Assessment by the authorities of the completeness and effectiveness of the plan at regular intervals, e.g. within the framework of the monitoring system according to Article 16 of the Hazardous Incidents Ordinance.

The assessment of the plan must in all the above cases encompass an assessment of the suitability of the plan itself – with respect to the completeness of the aspects to be considered – and an assessment of the plan's implementation.
The "yardstick" for the appropriateness and effectiveness of the plan of a facility is finally the permanently safe operation of the installations of the facility. The plan and the safety management system it is based on must ensure permanently safe operation and take account of and compensate for any negative influencing factors acting on safe operation.
Assessment of the plan's implementation is therefore also part of the assessment of the plan.
Paying due regard to these requirements, it is appropriate to conduct the assessment with reference to the written document belonging to the plan and the facility documentation referred to there, as well as to surveys conducted among personnel and spot checks of the installation (part) on the spot.
The surveys or interviews conducted among the personnel serve, on the one hand, to assess the knowledge and practical implementation of provisions and also to record the actual safety organisation of a facility as practised.

A plan can be assessed in the following stages:

1. Assessment of the general principles of action described in the plan as a procedure to establish whether they implement the principles laid down in Annex III of the Hazardous Incidents Ordinance

2. Assessment of whether the measures described in the written document to the plan which are intended to ensure implementation of the general principles described are put into practice and are suitable. For this purpose the following is required in particular:

- an assessment of the operational documentation referred to regadding implementation in the written document to the plan with respect to the suitability of the measures laid down there for ensuring implementation of the general principles described,
- the surveys conducted among personnel on different levels of the hierarchy.

For this purpose use can be made of the "Checklist for the assessment of the plan for preventing hazardous incidents“ in Annex 9.

3. In individual cases it also may be necessary to completely assess the implementation of individual technical or organisational measures which have been laid down within the framework of the plan's implementation, and to do this on site as a spot check, and in exceptional cases also completely.

The checklist for an assessment of the plan for preventing hazardous incidents is geared to the breakdown in Annex III of the Hazardous Incidents Ordinance. The checklist serves to determine fulfilment of the requirements for the plan to prevent hazardous incidents, in that the core requirements of Annex III of StörfallV for the safety management system have been formulated as individual questions. Explanatory notes on individual questions were added to the question concerned - in italics.
Regarding retraceability of the assessment verification of implementation of the relevant requirements must be given by indicating the corresponding regulation, instruction or similar in column 3 /"implemented by"). With corresponding identification ("Assessed with reference to") it is also possible here to indicate the interview partner for the description of actual practice – in addition or just for the case where there are no documented regulations.
The examples given in column 3 of the checklist in annex 9 serve as instructions regarding the subject of assessment of measn of assessment (interview) and should not be regarded as a specification for implementation.

Any need for action established can be given in the column "Assessment/Remark/Miscellaneous", and where relevant information can be given here on the random samples assessed, e.g. in the on-site assessment of the installation.

The checklists assesses the substantial requirements for the plan to prevent hazardous incidents and can be applied regardless of the structure of the plan being assessed.

7. Concluding remarks

With the sample plans for preventing hazardous incidents drawn up in the research project and with the checklist for assessing the plan for preventing hazardous incidents operators of facilities subject to the Hazardous Incidents Ordinance are given an aid for drawing up a plant for the prevention of major accidents and for its documentation as are the competent authorities for assessing such a plan.

The aids were drawn up on the basis of the realisation that in their application such aids must be sufficiently flexible, for example to take account of the different operational sequences that already exist in companies.
The aids are therefore indications as to what must be regulated when drawing up a plan for preventing hazardous incidents and in what detail, but not how it must be regulated. Here the aids should only be regarded as examples.

The individual sections both of the sample plans and of the checklist can be used module by module as a basis for the need for regulation when plans for preventing hazardous incidents are being drawn up and in safety management.

With the implementation and assessment of plans for preventing hazardous incidents experience still needs to be accumulated. As this is done it will then be possible to optimise the description of the plan written document or in the safety report.
When corresponding experience is available consideration should be given to updating the research project.

The authors wish to thank all companies involved for their active support in this research project and for the opportunity to draw up practice-based aids.

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Annex 1

Annex 1 to the Research Project 299 48 324 „Development of Aids for Drawing Up and Assessing the Plan for Preventing Hazardous Incidents“

Comparison of the Requirements for the Plant for Preventing Hazardous Incidents in the Seveso II Directive and the Hazardous Incidents Ordinance

Table 2:

Requirements of the Seveso II Directive	**Requirements of the Hazardous Incidents Ordinance**
Art. 7: (1) Member States shall require the operator to draw up a document setting out his major-accident prevention policy and to ensure that it is properly implemented. The major-accident prevention policy established by the operator shall be designed to guarantee a high level of protection for man and the environment by appropriate means, structures and management systems. *(2) The document must take account of the principles contained in Annex III and be made available to the competent authorities for the purposes of, amongst other things, implementation of Articles 5 (2) and 18.* (3) This Article does not apply to establishments according to Article 9.	§ 8 (1) Before commissioning, the operator shall draw up a written plan for the prevention of hazardous incidents. It must be appropriate to dangers arising from hazardous incidents and must take full account of the principles mentioned in Annex III. (2) The operator shall ensure implementation of the plan. Operators of facilities according to Article 1 Para. 1 Sentece 1 must make it available to the competent authorities. (3) In the cases covered by Article 7 Para. 2 No.1 the operator must review the plan for preventing hazardous incidents, including the safety management system on which it is based, and the procedures for its implementation and if necessary update them.

Requirements of the Seveso II Directive	**Requirements of the Hazardous Incidents Ordinance**
Detailed specification in Annex III: For the purpose of implementing the operator's major-accident prevention policy and safety management system account shall be taken of the following elements. The requirements laid down in the document referred to in Article 7 should be proportionate to the major-accident hazards presented by the establishment: a) the major accident prevention policy should be established in writing and should include the operator's overall aims and principles of action with respect to the control of major-accident hazards b) the safety management system should include the part of the general management system which includes the organizational structure, responsibilities, practices, procedures, processes and resources for determining and implementing the major-accident prevention policy *c) the following issues shall be addressed by the safety management system (points I to VII)*	Detailed specification in Annex III: 1. The plan for the prevention of hazardous incidents must be drawn up in written form; it encompasses the overall objectives and general principles of the operator's procedure for limiting the dangers from hazardous incidents. 2. The safety management system is to incorporate that part of the general surveillance system which includes organisational structure, areas of responsibility, modes of action, procedures, processes and means, in other words the items relevant to establishing and applying the plan for the prevention of hazardous incidents. 3. The following points are regulated by the safety management system: (a to g, unchanged in relation to the Seveso II Directive).

Differences between the Requirements

1. The formulation, intended to clarify the purpose of the plan, "The major-accident prevention policy established by the operator shall be designed to guarantee a high level of protection for man and the environment by appropriate means, structures and management systems" has not been incorporated in the Hazardous Incidents Ordinance.
2. Making the plan available is also demanded in the Hazardous Incidents ordinance, but there is no **direct** reference to application of Article 16 (surveillance system) as there is in Article 18 of the Seveso II directive (Inspection).
3. According to the provisions of Article 20 (2) of the Hazardous Incidents Ordinance a description of the plan is required in the form of a separate written document including for plants with extended obligations, while the Seveso II Directive only demands a written description for these establishments in the safety report.

Annex 2

Determination of Existing Provisions for the Safety Plan for Plants
(Extract)

Table 3:

Regulations, Codes, Directives, Guidelines	**Area of Application**	**Definition of a Safety Plan** [8]	**Requirements for the Safety Plan** [1]	**Remarks**
TAA-GS-12 Guidelines »Safety Requirements for Ammonia Refrigeration Installations « as at 4/1997	For old facilities or existing facilities	Totality of all measures taken to ensure safe operation	Specification of operator obligations according to Article 3 Para. 1 and Article 3 Para. 3 of 12. BImSchV dated 1991	Definition and requirements would lead to a scope in corresponding to a safety report
TAA-GS-03 Final Report of the Working Party on »Amendment of 2. StörfallVwV« as at 4/1994	For facilities subject to the extended obligations of the (old) Hazardous Incidents Ordinance	Totality of general principle for the establishment of...measures	Description of protective measures regarding individual hazard sources	Definition is taken into account as appropriate Implementation of the requirements leads to a descriptive scope corresponding to a safety report
SFK-GS-06 Guidelines »Plant Safety in relation to the Safe Design of ... Installations for Substance Transformation Processes « as at November 1995	For chemical plants subject to the extended obligations subject to the extended obligations of the (old) Hazardous Incidents Ordinance	Implementation and constant monitoring of technical and organisational measures laid down	Requirements for process design, plant design, operation, structural and sequential organisation	Definition and requirements are clearly aimed at a safety management system

[8] Summary, not a quotation

Regulations, Codes, Directives, Guidelines	**Area of Application**	**Definition of a Safety Plan [1]**	**Requirements for the Safety Plan [1]**	**Remarks**
Specimen administrative regulations for the implementation of the Ordinance on Installations for Handling Water-Polluting Substances and Specialist Companies of the Water Working Party of the Laender (specimen VVAwS) as at 24 August 1993	Facilities for handling water-polluting substances according to Article 19g Paras. 1 and 2 Water Resources Management Act	–	–[9]	Not relevant for the implementation of Article 8 of the Hazardous Incidents ordinance
BGI 542 (formerly: ZH 1/90) Exothermic Chemical Reactions – Measures of Control as at December 1996 Specification of the "Berufsgenossenschaft" (employers' accident liability insurance association) for the Chemical Industry	Process engineering facilities in which exothermic chemical reactions take place	–	Establishment of protective devices and ensuring the availability and effectiveness of protective devices	Implementation of the requirements leads to a descriptive scope corresponding to a (plant-related) safety report

[9] It must be assumed that the requirements laid down in the specimen VVAwS describe the safety plan of the facility.

Regulations, Codes, Directives, Guidelines	**Area of Application**	**Definition of a Safety Plan [1]**	**Requirements for the Safety Plan [1]**	**Remarks**
Guiding principles for Chemical Accidents; Prevention, Preparednesss and Response OECD/GD(92)43	Facilities subject to mandatory licensing, i.e. for stationary production shops/sites for the production, processing, use, handling, storage or dumping of hazardous substances with a risk of major accidents involving hazardous substances	-	Requirements for the safe planning, erection, management, operation and inspection of the safety performance of facilities subject to mandatory licensing, formulated in 21 guiding principles (section A2)	The 21 guiding principles of section A2 of the OECD Guidelines are basically comparable with the requirements of Annex III. When drawing up a safety plan these guiding principles can be used together with Annex III of StörfallV as an aid / checklist. See comparison in the following Table 3

Correlation of the Guiding Principles for Chemical Accidents according to the Guidelines OECD/GD(92)43 with the requirements of Annex III of the Hazardous Incidents Ordinance

Table 4:

Guiding Principles for Chemical Accidents; Prevention, Preparedness and Response OECD/GD(92)43 **Section A: Tasks in Brief** **A.2 Operator of Facilities Subject to Mandatory Licensing**	**Hazardous Incidents Ordinance** **Annex III**
(a) The operator of an facility subject to mandatory licensing bears the principal responsibility for the safety in design, erection and operation of a facility subject to mandatory licensing and for establishing the necessary measures to ensure this. Safety – including health and environmental protection – should therefore be part of a company's business activity. This also includes developing a corporate safety culture, as well as suitable internal safety policy and procedures, and making sure these are impressed upon the personnel on all levels.	No. 1: Overall objectives
(b) All companies should, as operators of facilities subject to mandatory licensing, endeavour to achieve the final objective of a »zero hazardous incident « and the means available should be geared to this objective.	No. 1: Overall objectives
(c) Daily implementation of the safety plan should be part of the duties of the respective production manager of a company.	No. 3a): Organisation and personnel
(d) Producers of hazardous substances should bear responsibility for promoting the safe handling of all hazardous substances they produce throughout the life cycle of such substances, in accordance with the principle of »the exercise of due care with respect to products «.	No. 1: Overall objectives
(e) In the planning, design and refitting of facilities subject to mandatory licensing, the operator should ensure that risks are recognised and classified and that the most suitable means are applied to limit or eliminate the risks. Similar investigations should be conducted with respect to planned acquisitions or old facilities, where these have not already been subjected to such a safety inspections.	No. 3b) Determination and assessment of the danger of hazardous incidents
(f) The operator should ensure that, for every facility subject to mandatory licensing, the written operating instructions required for its safe operation are available.	No. 3c) Monitoring of operation

Guiding Principles for Chemical Accidents; Prevention, Preparedness and Response OECD/GD(92)43 **Section A: Tasks in Brief** **A.2 Operators of Facilities Subject to Mandatory Licensing**	**Hazardous Incidents Ordinance** **Annex III**
(g) The operator should ensure that the human resources available at facilities subject to mandatory licensing are sufficient to ensure safe operation at all times. The operator should take all appropriate measures to ensure that all those employed at a facility subject to mandatory inspection, including temporary personnel and external personnel, have received adequate instruction and training and are able to perform their duties both in normal operation and during hazardous incidents.	No. 3a): Organisation and personnel
(h) Safety precautions must be planned as far as possible as part of the design of the facility in order to improve its inherent safety. Due account must be taken of the fact that safety is improved by avoiding or minimising use of hazardous substances to an acceptable degree; by replacing the hazardous substances with less hazardous ones; by keeping the stocks of hazardous substances low; by means of simplified sequences; by lowering the pressures and temperatures needed for the process engineering; and by largely separating personnel and hazardous substances.	Not explicitly mentioned, but to be implemented in: No. 3b) Determination and assessment of the dangers form hazardous substances No. 3d) Safe implementation of changes
(i) The operator should pay special attention to monitoring quality assurance during erection.	Not explicitly mentioned, but to be implemented in: No. 3d) Safe implementation of changes
(j) The operator should not engage any contractors to perform tasks if this would impair safety. Only contractors should be engaged who can give the operator evidence that their services can be rendered while complying with the relevant laws and regulations as well as the relevant corporate safety policy. the operator must supervise and monitor the contractor's compliance with specifications.	Not explicitly mentioned, but to be implemented in: No. 3a): Organisation and personnel
(k) The operator should set up efficient paths of communication to pass on information relevant to safety in both directions between the management and other employees in the licensed facility. The regular paths of communication should be reinforced by appointment of a safety commission in order to create an official body to discuss matters of safety.	Not explicitly mentioned, but to be implemented in: No. 3a): Organisation and personnel

Guiding Principles for Chemical Accidents; Prevention, Preparedness and Response OECD/GD(92)43 **Section A: Tasks in Brief** **A.2 Operators of Facilities Subject to Mandatory Licensing**	**Hazardous Incidents Ordinance** **Annex III**
(l) The operator should take precautions to assure safety of the facility, including precautions concerning regular maintenance, inspection and testing so that the installations are suitable at all times for ensuring normal operation.	No. 3c) Monitoring operation
(m) The operator should issue official safety instructions to ensure that no repair or conversion work on parts of the facility, equipment, process sequences, auxiliary equipment or processes does not impair safety.	No. 3c) Monitoring operation No. 3d) Safe implementation of changes
(n) The operator should satisfy himself as to the suitability of storage rooms for hazardous substances and also the skill of the stores personnel responsible.	Not explicitly mentioned, but to be implemented in: No. 3c) Monitoring operation No. 3a): Organisation and personnel
(o) The operator should take precautions to ensure regular and complete inspection of safety in all licensed facilities, including those at subsidiaries and, as far as possible, other affiliates.	No. 3f) Monitoring of the efficiency of the safety management system
(p) In consultation with the competent authorities the operator should make available to the general public useful information on the licensed facility and the measures to be taken in the case of a hazardous incident.	Not explicitly mentioned, but to be implemented in: No. 3e) Planning for contingencies
(q) the operator should be responsible for drawing up, implementing, testing and updating a company hazard defence plan, and also for providing contingency personnel, their equipment, financial and other remuneration as may be needed for the immediate implementation of the plan. The operator should provide those responsible for the external contingency plans with the information available which appears necessary for risk assessment and the drawing up of the contingency plans. There should be a close collaboration between the officer responsible for in-company and external hazard defence and the corresponding in-company or external contingency plans should be harmonised.	No. 3e) Planning for contingencies

Guiding Principles for Chemical Accidents; Prevention, Preparedness and Response OECD/GD(92)43 **Section A: Tasks in Brief** **A.2 Operators of Facilities Subject to Mandatory Licensing**	**Hazardous Incident Ordinance** **Annex III**
(r) As a basis for the in-company and external contingency planning the operator should endeavour to identify and assess the types of accident that may occur in the facility and their probable effects.	No. 3b) Determination and assessment of the dangers from hazardous incidents
(s) The operator should inform employees, contractors and visitors of the relevant regulations taken from the hazard defence plans and of the rules of conduct in the case of a hazardous incident.	No. 3a): Organisation and personnel (training) No. 3e) Planning for contingencies
(t) The operator should ensure that the warning system for the early detection of an accident or imminent hazardous incident and the alarm systems for the immediate mobilisation of contingency personnel are available.	Not explicitly mentioned, but to be implemented in: No. 3e) Planning for contingencies
(u) The operator should investigate all significant hazardous incidents to discover their causes and to take countermeasures to eliminate any technical shortcomings or process deficiencies.	No. 3b) Determination and assessment of the dangers from hazardous incidents

Annex 3

Plan for preventing hazardous incidents according to Article 8, StörfallV (Hazardous Incidents Ordinance)

for the liquefied gas depot A

of Flüssiggas AG

The plan for prevention of hazardous incidents presented here is an anonymous example of written documentation in accordance with Article 8 of the StörfallV (Hazardous Incidents Ordinance) for an existing operating area. This plan particularly serves as an example as regards structure and depth of presentation and cannot be taken as a general rule as far as content is concerned. Please note that with increasing experience in the creation and review of plans for the prevention of hazardous incidents, further adaptation / optimisation of this plan cannot be excluded.

Contents:

Short description of the company and the facility

1.1 Short description of the company

Flüssiggas AG is a medium-sized transport and logistics company with several branches in Germany. The aim of the company is to transport liquefied gas (propane, butane and mixtures of these in accordance with DIN 51622) from refineries or import terminals to corresponding marshalling yards in rail tanker wagons and then to distribute it to consumers by road tanker.
Because of their exclusive and long-term experience with liquefied gas in the Flüssiggas AG facilities, the company has a great deal of experience in handling liquefied gas and knows the risks associated with the activities as well as the relevant safety regulations.

1.2 Short description of facility

1.2.1 Technical goal of facility

Liquefied gas storage depot A belonging to Flüssiggas AG serves for the storage, unloading and reloading of liquefied gas.
The following installations are included in the facility:
an underground storage tank with 185t liquefied gas
a pump and compressor room
two road tanker filling stations
a railway tanker filling station
a building with office and measuring station.

1) to 5) form a facility in accordance with the definition contained in Article 3 (5a) BImSchG (German Pollution Control Act) and are at the same time a facility requiring official approval in accordance with Article 4 BImSchG in combination with No. 9.1 Column 1 of the Annex to 4. BImSchV.

Liquefied gas is the only relevant hazardous substance listed in the StörfallV which is present in the facility described here (No. 11 Annex I StörfallV). The relevant data regarding safety and reactions of the substance are contained in the safety data sheet which is available for viewing at the facility together with the BImSchG approval documentation.

The total volume of liquefied gas which is present in the facility (in storage tanks or in railway or road tankers) exceeds the limit given in Column 4 to No.11 of Annex I of the StörfallV (50 t), but however does not reach the limit from Column 5 (200 t)10.

This means that the facility is subject to the basic obligations described in StörfallV, but not the extended obligations of Articles 9 - 12 of the same ordinance.

1.2.2 Location and environment

The facility is located in the industrial trading estate in the south of the district of A-dorf on the Industriestraße road.
The surrounding area of the facility including the shortest distances from the severable connections to the nearest objects not belonging to the facility can be read in the approval application.

1.2.3 Hazard potential of the facility

The hazards connected with the facility result from the inflammability and explosion characteristics of the liquefied gas.

[10] The limit of 200 t is also not exceeded during deliveries with railway tankers, as delivery only takes place when the storage tank at the facility is empty enough to accept the contents of the railway tanker.

2 Prevention of hazardous incidents and limitation of their effects

The following text describes the basic principles of the procedures of Flüssiggas AG (Subsection "Company procedure") as well as their concrete implementation at Depot A (Subsections "Implementation/implemented measures") for the prevention of hazardous incidents and the limitation of their effects.
The structure of the text is orientated towards the life phases of the installations within a facility, from the planning phase down to decommissioning.

2.1 Company policy

Company procedure:
The basic principles (maxims for action) are laid down by the top management in the form of company policy which is followed by the company with reference to plant safety, safety and health and hazard prevention management. The company policy is made known to all the members of the workforce.

Implementation/implemented measures at Depot A:
The company policy of Flüssiggas AG is formulated in the "Health, Safety and Environmental Policy" in X basic principles (see Annex 1 - not included in this sample plan). Prevention of hazardous incidents is laid down in the company policy as a high level maxim on which actions are based.

This company policy is made known to all members of the workforce by means of training measures as well as circulars and notices displayed within the company.

2.2 Organisation and personnel

Company procedure:
The areas of responsibility for the persons responsible for the fulfilment of the requirements of the official legal and technical rules and for those members of the workforce involved in the prevention of hazardous incidents and the limitation of their effects at all levels within the organisation are clearly laid down within the framework of staff planning.
In so far as a hazardous incidents representative is required by law for the Flüssiggas AG facility (Article 58a BImSchG in conjunction with Article 1 Abs. 2 of 5. BImSchV), the representative is elected in writing.
A requirement profile which lays down the individual qualifications which are necessary is laid down for all members of staff (management, representatives and plant personnel). Relevant training measures for the achievement of these qualifications as well as their ongoing maintenance are systematically planned.

Implementation/implemented measures at Depot A:
The safety structure and organisation of Flüssiggas AG is integrated into the operating structure and organisation, and is described in the memo regarding company organisation in accordance with Article 52a BImSchG, giving the different functions and authorities within the safety structure and organisation (see Annex 2 – not included in this sample plan).
It is not necessary to elect a hazardous incident representative for Depot A.

The responsibilities of the members of the operational management and those delegated to carry out the various tasks are formulated in the form of:
- written job descriptions or
- separate written delegations of responsibility.

Substitution for the members of management is regulated by a deputation plan.

Clear formulation of responsibilities ensures that the actions which are necessary to achieve the targets which have been set are actually implemented in practice. Implementation of the actions is checked by the relevant supervisor on a random sample basis.

2.3 Determination of hazards and specification of basic actions for prevention of hazardous incidents and limitation of their effects

2.3.1 Planning phase (planning of new facilities or changes to existing facilities)

Company procedure:
The safety plan for all phases in the lifetime of a facility is laid down within the framework of new planning of an installation or a process or within the framework of planning of changes to existing plant or processes.
The basis of the safety plan of Flüssiggas AG is the observation of the extremely concrete and comprehensive technical rules which govern liquefied gas installations.

Firms which can demonstrate their suitability for planning and construction of similar plant are entrusted with the planning and implementation of new Flüssiggas AG plant or changes to existing plant.
During the planning of new plant or of changes to existing plant or processes potential causes of hazardous incidents are determined within the framework of a preliminary assessment of the site in question. The company entrusted with the planning of the new plant or changes carries out a risk analysis in collaboration with Flüssiggas AG. Sources of risk which are a result of the environment and conditions within the environment are taken into consideration in this analysis.

Based on the results of the analysis, the basic principles for the organisational and technical measures to be taken are laid down as well as actual concrete measures both for normal use of the Depot And for disturbances and hazardous incidents (alarm and hazard defence planning) basic safety-relevant operating instructions are drafted by the company entrusted with the planning, taking into consideration the rules given by the manufacturers of the individual and plant components.

The planning documents are reviewed by the technical management and the hazardous incident representative of Flüssiggas AG, paying particular attention to the fulfilment of the requirements of the technical rules. Regular project meetings take place for this purpose.
In addition, already at the planning phase discussions take place between Flüssiggas AG, the planning company, approval and monitoring bodies and organisations of independent experts, where the necessary technical and organisational measures are agreed. Within the framework of the approval procedure, the planning documents are additionally assessed by external independent experts.

Knowledge of the present state of safety technology and current rules and regulations is ensured by means of regular communication within the DVFG (Deutscher Verband Flüssiggas - German Liquefied Gas Association) and information which is received on a regular basis by Flüssiggas AG as a member of DVFG.

Implantation/implemented measures at Depot A:
The procedure described above is fixed practice for all planning procedures for new plant or changes to existing plant. Planning procedures are implemented or instigated exclusively by the head office of the company.
Depot A was planned in accordance with this procedure.
The technical documentation of the facility is a component part of the BImSchG approval documentation and can also be viewed on site and at the head office of the company.

2.3.2 Implementation phase

Company procedure:
The necessary quality assurance during this phase is carried out through selection of suitable companies for plant manufacture and erection, implementation of the legally specified inspections in accordance with the relevant regulations, review of the EC Declarations of Conformity and type approval certificates.
All the inspections and checks (with regard to implementation of the planning rules) which are carried out during the implementation phase are laid down by the planning company within the framework of the planning phase.
An organisation of independent experts is commissioned with monitoring the construction work during the entire implementation phase.
The technical management of Flüssiggas AG for itself makes sure that the planning company and organisation of independent experts is implementing the necessary measures by carrying out checks on a random basis.
The safety-relevant operating instructions which are drafted in the planning phase are completed and made more concrete as necessary by the technical department responsible for the storage and filling areas of the depot.

Implementation/implemented measures at Depot A:
The procedure described above is fixed operational practice at Flüssiggas AG for all procedures within the framework of the implementation phase (plant manufacture, erection, construction and assembly, commissioning).
The original certificates regarding the implementation of the tests and inspections described above are filed by the technical director of the company at company headquarters. Copies of the certificates can be seen in the inspection file on site at Depot A.

2.3.3 Operational phase

2.3.3.1 Monitoring of normal use

Company Procedure:
The operating personnel receives operating instructions for the safety-relevant activities which lay down the work steps to be followed for operation of the plant and equipment in normal use as well as the actions which must be taken in the case of operation which is not in accordance with normal use. Regular inspections are made of safety equipment in order to ensure that its condition is in accordance with the regulations. Deviations are documented and analysed.

Implementation/implemented measures at Depot A:
The storage plant is monitored continuously by a storage manager during operation. During the filling process the storage plant is manned by two persons. Filling of the road tankers is carried out by the tanker drivers after they have been instructed in the special features of the plant by the storage manager. The plant is fenced in and locked when it is not in operation.

The individual work steps for all safety-relevant activities (commissioning, decommissioning, filling, emptying) are laid down by the planning company in the operating manual. The operating manual can be viewed on site at the plant and is the basis of all the activities to be carried out as well as the subject of training courses.

A daily inspection round with a list of the parameters to be checked is also described in the manual.

A safety check is carried out by specialists from the head office of Flüssiggas AG (hazardous substances representative, work safety specialist) at regular intervals (i.e. at least once a year) using a checklist. The checklists are filed in the operating manual.

2.3.3.2 Procedure in the case of disturbances to normal operation

Company Procedure:
Systematic determination of possible deviations from normal operation and disturbances to normal operation as well as systematic specification of all the actions which are necessary in order to return the plant and equipment to normal operation and for the limitation of the effects of disturbances/hazardous

incidents is carried out during the planning phase within the framework of the risk analysis (see No. 2.3.1). Necessary actions in the case of disturbances to normal operation and hazardous incidents are laid down in the alarm and hazard defence plan.
These actions are the subject of regular instruction and drills.
If disturbance to normal operation or a hazardous incident occurs, these specifications act as a guideline.

Implementation/implemented measures at Depot A:
There is an alarm and hazard defence plan for Depot A where the locations (internal and external) where the alarm has to be received and the actions to be implemented by the workforce in the case of events which comprise a dangerous situation (alarm events) are laid down. The alarm and hazard defence plan have been agreed with the fire service in A-dorf.

The alarm events are divided into two categories, depending on the effects to be expected:
Category 1: Events which can be combated by members of the company workforce,
Category 2: Events which require the use of external hazard defence forces.

Responsibilities and authorities are laid down for each category.

After a disturbance which comprises an alarm event or a hazardous incident is identified, the service technical supervisor and the fire service if necessary are informed in accordance with the rules laid down in the alarm plan. The alarm plan also lays down the further internal and external locations which have to be informed.

If it is necessary to involve external forces, these are informed and advised by the safety staff in accordance with the alarm and hazard defence plan.

The alarm and hazard defence plan is checked to make sure that it is fully up-to-date by the technical department responsible for the storage and filling areas if the storage installation is changed, but at any rate once a year. This is laid down in the alarm and hazard defence plan.

2.3.3.3 Service and maintenance plan

Company Procedure:
The inspections to be carried out result both from the relevant rules and regulations (in accordance with the work safety law applying to plant components subject to mandatory inspection) and also from the laying down of safety-relevant plant components and installations within the framework of the risk analysis. The plant components which have to be inspected at regular intervals are described in an overview (inspection and test file).

Intervals for inspection and maintenance work are laid down for all plant components, as well as the descriptions of the items to be tested and the test methods.

Responsibilities are laid down for the specification of the plant components to be maintained / inspected and for the instigation and implementation of the inspection and maintenance work.

Maintenance work which involves particular risks and dangers (e.g. working where there is ignition hazard) are regulated by means of a release procedure.

Implementation/implemented measures at Depot A:
The rules for carrying out inspection and maintenance work for the storage and filling areas are laid down in the inspection and test file by the technical department responsible for the storage and filling areas in accordance with the rules laid down by the planning company or the manufacturer.
As far as possible the companies that implemented planning and erection of the plant are commissioned with the inspection and maintenance work. Otherwise recognised specialist companies are used.
Implementation of the inspection and maintenance work is documented in the inspection and test file.
Implementation of inspections for plant components which are subject to mandatory monitoring is also documented in the inspection and test file.
In the final documentation "Pipelines and fittings", it is demonstrated that pipelines and fittings have been tested.

The approval certificates are retained and filed.

2.3.3.4 Training and instruction

Company Procedure:
All members of the workforce are first trained and instructed in safety-relevant matters before taking up their positions within the company, and undergo further training and instruction thereafter at regular intervals and when basic changes are made to the plant and equipment. In addition the public hazard defence services are given initial and further regular instruction as regards the specific features of the Flüssiggas AG plant.

Members of the workforce who are unable to participate in the intended training courses receive the training at a later date.

Personnel engaged from outside the company are instructed with regard to the particular hazards associated with the plant and the safety measures which have to be taken before starting work.

Implementation/implemented measures at Depot A:
The rules regarding the annual instruction of the plant workforce including specification of the minimum material to be covered by the instruction are contained in the operating manual.

Regular training of the storage area manager of Depot A is carried out within the framework of the annual viewing of the plant by specialists from the headquarters of the company.

The hazard defence forces are trained in stages. Before first commissioning of the facility as well as after any basic changes to the plant a theoretical training evening is carried out at the premises of relevant fire service. After this the leaders of the fire service are given instruction on site at the plant. Annual drills are carried out in agreement with the disposition department and the storage area administration. A written record of the drill is made and retained in the facility.

Road tanker drivers are given two-stage training. Theoretical training is given by the hazardous substances representatives. Practical handling of the vehicle, the storage containers and the filling stations is trained on site in the relevant areas.
Training of each tanker driver is carried out initially before work is started, at regular intervals and after any basic changes to the equipment.
Training measures are documented and a list is maintained at the headquarters of the company in order to ensure that the training intervals that have been laid down are adhered to.

2.3.3.5 Monitoring of effectiveness of specified measures

Company Procedure:
The effectiveness of the measures that have been taken is investigated by means of a systematic assessment of events subject to mandatory reporting in the sense of Article 19 StörfallV as well as other events which are relevant as regards hazardous incidents.
Not only disturbances at Flüssiggas AG but also in comparable companies and within comparable processes are taken into consideration (analysis of literature and communication within specialist circles).

Implementation/implemented measures in Plant A:
Systematic determination of accidents at work and near-accidents is carried out by means of the annual statistics presented by the specialist for occupational safety and health.
Determination of disturbances to normal operation which could lead to danger for the general public and the neighbourhood or from which information can be gathered with regard to possible improvement to the operation of the plant is carried out at the headquarters of the company. Rules with regard to the disturbances that have to be reported are laid down in an internal company instruction. These disturbances are analysed by the disturbance representative.
In addition an assessment of events with are relevant for hazardous incidents for comparable plant is carried out by the DVFG.

2.3.4 Decommissioning

Company Procedure:
In the planning phase all the measures which have to be taken in the event that plant components or the entire plant is decommissioned are laid down in order to ensure that there is no risk during the decommissioning work and that no risk emanates from the plant or equipment which is not in operation.

Implementation/implemented measures in Plant A:
If pipelines and/or the tank are decommissioned, the measures laid down in the operating manual in accordance with the technical rules and regulations are implemented under the supervision of the storage area management and the technical management of the headquarters of the company. Implementation of the measures is documented at the headquarters of the company (rinsing certificates).

Annex 4

Plan for preventing hazardous incidents according to Article 8, StörfallV (Hazardous Incidents Ordinance)

for Plant A "Plant for the manufacture of polyurethane foam parts "

of Company B

The concept for prevention of hazardous incidents presented here is an anonymous example of written documentation in accordance with Article 8 of the StörfallV (Hazardous Incidents Ordinance) for an existing operating area. This concept particularly serves as an example as regards structure and depth of presentation and cannot be taken as a general rule as far as content is concerned. Please note that with increasing experience in the creation and review of concepts for the prevention of hazardous incidents, further adaptation / optimisation of this concept cannot be excluded.

Contents:

1 Short description of the company and the facility

1.1 Technical goal of facility

Works A of Company B is a plant for the manufacture of moulded parts of polyurethane foam for the furniture industry. Manufacture is largely automated and is by means of the polymerisation of isocyanates (TDI) with different polyols using various additives (catalysts, stabilisers, substances for flame protection). The reaction for each moulded part is carried out in the relevant mould.

1.2 Location and environment

The production facilities of Company B, Works A are located in the northern section of the ZZ AG site in town X on the south side of the river.
The immediate environment of the company consists of the production facilities of ZZ AG .
The distance to the borders of the ZZ AG site are as follows:

- approx. 150 m to the centre of the river in the north
- approx. 450 - 500 m to a residential area in the east
- approx. 330 m to the road in the south
- approx. 350 m to a green area in the west.

There are no objects which must have special protection on the ZZ AG site (children's nurseries, schools, hospitals etc.), which means that there are no such objects within at least 330 m of the plant.

There are neither officially protected parks nor green areas or water conservation areas nor are there any other plant which are subject to StörfallV. This means that the area round the works is not used in a way which could give rise to particular risks.

There are no objects near to the plant which could be affected by disturbance to normal operation of the plant in such a way that effects which could give rise to a serious risk in the sense of StörfallV must be considered.

1.3 Substances

The following hazardous substances are to be found in the plant. (More detailed information on the substances can be found in the safety data sheets in the approval application or on site at the works).

Name of substance	No. acc. Annex I of StörfallV	Hazard characteristic	Maximum amount in the facility	Remarks
separating agent	7b	highly inflammable liquid	4500 kg	for the most part stored unpressurised at room temperature
natural gas	8	combustible gas, highly inflammable	only a few kg in the pipelines	connection to the public gas supply
toluylene di-iso-cyanate	37	extremely poisonous	48280 kg	for the most part stored unpressurised at room temperature

1.4 Hazard potential at the facility

The hazard potential of the facility lies

- in the potential for release of poisonous substances (TDI),
- in the possibility that explosions may occur (explosive vapour/air mixtures of the separating agents)
- in the possibility of fire (foam parts, TDI, separating agents) and the spread of poisonous by-products (nitrous oxides).

2 Prevention of hazardous incidents and limitation of their effects

2.1 Company policy

Procedure:

The basic principles (maxims for action) are laid down by the top management in the form of company policy which is followed by the company with reference to plant safety, safety and health and hazard prevention management. The company policy is made known to all the members of the workforce.

Implementation/implemented measures:

The company policy of Flüssiggas AG is formulated in the "Health, Safety and Environmental Policy" in 3 basic principles. Prevention of hazardous incidents is laid down in this company policy as a high-level maxim. This maxim is embodied in a concrete way in procedures for all safety-relevant activities.

The company policy is contained in the "Occupational safety and health and environmental protection " manual and displayed at a suitable location in Works A so that all members of staff are aware of the basic principles of the policy.

Implementation of the " Health, Safety and Environmental Policy" in actual practice is achieved within the framework of the 20 elements of the management system. In this system, the measures for implementation of the policy are embodied in concrete form in Procedures as well as through the requirements of the audits which apply to the relevant element.

2.2 Organisation and Personnel

Procedure:

The areas of responsibility for the persons responsible for the fulfilment of the requirements of the official legal and technical rules and for those members of the workforce involved in the prevention of hazardous incidents and the limitation of their effects at all levels within the organisation are clearly laid down within the framework of staff planning.
The representatives which are required by law are elected in writing.
A requirement profile which lays down the individual qualifications which are necessary is laid down for all members of staff (management, representatives and plant personnel).
Relevant training measures for the achievement of these qualifications as well as their ongoing maintenance are systematically planned.

Implementation/implemented measures:

The safety structure and organisation of Company B is integrated into the operating structure and organisation, and is described in the organisation plan in accordance with Article 52a BImSchG (German Pollution Control Act), giving the different functions, the staff in the organisation units and the reporting structures.

The responsibilities of the members of the operational management and those delegated to carry out the various tasks are formulated in the form of:

- written job descriptions or
- separate written delegations of responsibility.

Substitution for the members of management is regulated by a deputation plan.

Managers are elected in writing for the 20 elements for implementation of the "Health, Safety and Environmental Policy" and the corresponding tasks of the managers are laid down in the job descriptions and the Procedures for the 20 elements.
The work of the managers in the areas of health, safety and the environment are taken into consideration by the top management of the company when assessing the managers' overall performance.

2.3 Determination of hazards and laying down of basic actions for the prevention of hazardous incidents and limitation of their effects

2.3.1 Planning/alteration phase

Procedure:

The safety concept for all phases in the lifetime of a facility is laid down within the framework of new planning of an installation or a process or within the framework of planning of changes to existing plant or processes.
The basis for the safety plan of Company B, Works A, is the determination of potential hazards which can result from activities carried out at the company and from the materials that are used. Circumstances in the environment which increase risks as well as hazards caused by the environment are taken into consideration. In order to achieve this, there is regular communication with the neighbouring companies and the responsible authorities.

During the planning of new plant or of changes to existing plant or processes, potential causes of hazardous incidents are determined within the framework of a preliminary assessment. In

this preliminary assessment it is decided what sections of the plant require a deeper and more detailed risk assessment.

Based on the results of the preliminary risk assessment, the basic principles of the organisational and technical measures are laid down for all phases of operation (erection, operation, decommissioning), both for normal operation and also for disturbances and hazardous incidents (alarm and hazard defence planning).
The measures that are taken must be in proportion to the effects of a potential hazardous incident. This proportion is established by means of the current state of safety technology.
The relevant rules and regulations and also the state of safety technology are systematically determined for new planning and planned alterations as well as for the current operation.
Determination of the rules and regulations which have to be observed also includes determination of other obligations arising from viewings of the site, test reports etc.

Implementation/implemented measures:
The procedure for the determination of potential hazards within the framework of the planning or alteration phase is laid down in Procedure A/HS&E 03.01.

Responsibility for the determination of the rules and regulations which apply to Works A as well as the internal communication paths for transferring on information with regard to corresponding requirements from the rules and regulations are laid down in Procedure A/HS&E 03.01.

The rules and regulations applying to Works A with regard to immission (received concentration) control are listed in Annex 1 of this Procedure and are kept up to date by the manager responsible for this element.
The other rules and regulations which are relevant for Works A are listed in the "Other Relevant Documents" sections of the Procedures for each element.

2.3.2 Implementation phase (erection, construction and assembly, commissioning)

Procedure:

The necessary quality assurance during this phase is carried out through selection of suitable companies for plant manufacture and erection, implementation of the legally specified inspections in accordance with the relevant regulations, review of the EC Declarations of Conformity and certificates with regard to type approval..

Inspections and checks are laid down to ensure that the plant is erected in accordance with the plans.

All plant components are checked for correct functioning before commissioning.

Implementation/implemented measures:

Responsibilities and the procedure for the inspection measures to be carried out during the erection phase are laid down on a project-to-project basis by the project manager.

The inspections to be carried out within the framework of the implementation phase are laid down in Procedure A/HS&E 06.00.

Proof that the necessary inspections have been carried out on safety-relevant plant components can be seen in the inspection and test books of the individual items of equipment.

The design of the plant can be seen in the technical plant documentation (flowchart, erection plans, technical data sheets of the plant components).

The areas where there may be an atmosphere capable of explosion are shown in a zone plan.

2.3.3 Operation phase

Safe process management

Procedure:

Operating instructions for the safety-relevant activities are created by the responsible head of department. These lay down the work steps in normal operation as well as the actions which are to be carried out in the case of deviation from normal operation or in order to avoid impermissible error range.

Determination of the safety-relevant activities is carried out within the framework of risk analysis or within the framework of assessment of relevant rules and regulations.

New operating rules or changes to existing rules are made known to all members of the workforce by means of training and instruction.

Implementation/implemented measures:
Operating instructions are available for all safety-relevant activities. The operating instructions are known to the staff and can be read at all times.

Monitoring of operation

Procedure:
Continuous measurements and regular checks are carried out to ensure that the plant is operating normally. Deviations from normal operation are documented and assessed.
Meetings where current safety questions are discussed take place at regular intervals.

Implementation/implemented measures:
The operating data shown in the central control room are used to monitor normal operation of the plant. Any deviations from the specified set condition are documented in the control room and discussed in the daily meetings.
The ambient air in the works is checked with portable TDI monitors, which give an alarm if a concentration of 5 ppp isocyanate is exceeded.
The actions to be taken by the plant workforce if the alarm is given are laid down in Procedure A/HS&E 14.00.

Daily meetings take place which have to be attended by every manager. In addition to the general discussion points, matters related to occupational safety and health and environmental safety are always considered.
This is laid down in Procedure A/WL VA 001.

Procedure when normal operation is disturbed

Procedure:
The systematic determination of deviations from normal operation and disturbances to normal operation as well as systematic laying down of all necessary measures for returning the plant to normal operation and for limiting the effects of disturbances/hazardous events is carried out in the planning phase within the framework of the risk analysis (see No. 2.3.1). The necessary measures in the case of disturbance to normal operation and hazardous events are laid down in the alarm and hazard defence plan, checked at regular intervals and if necessary updated.
The measures which have been laid down are the subject of regular instruction and drills.
If a disturbance to normal operation / a hazardous incident actually occurs, these specifications act as a guideline.

Implementation/implemented measures:
There is an alarm and hazard defence plan for Works A where the locations (internal and external) where the alarm has to be received and the actions to be implemented by the

workforce in the case of events which comprise a dangerous situation (alarm events) are laid down. The alarm and hazard defence plan has been agreed with the ZZ AG works fire service.

The alarm and hazard defence plan is reviewed if changes are made to a plant or a process, but in any case annually. This is laid down in the alarm and hazard defence plan itself.

Maintenance plan

Procedure:

The inspections to be carried out result both from the relevant rules and regulations (in accordance with the work safety law applying to plant components subject to mandatory inspection) and also from the laying down of safety-relevant plant components and installations within the framework of the risk analysis. The plant components which have to be inspected at regular intervals are described in an overview.

Intervals for inspection and maintenance work are laid down for all plant components.

Responsibilities are laid down for the specification of the plant components to be maintained / inspected and for the instigation and implementation of the inspection and maintenance work..

Maintenance work which involves particular risks and dangers (e.g. working where there is risk of fire or explosion**)** are regulated by means of a release procedure.

If maintenance work is carried out using external providers, safety measures are laid down and the workforce of the external providers are instructed in the safety measures before beginning the work.

Implementation/implemented measures:

The procedure for implementation of maintenance and repair work using external providers is regulated in Procedure A/HS&E 05/1.00.

Implementation of the inspection and maintenance work is documented in maintenance journals.
Tests on plant components subject to mandatory inspection are documented in the corresponding test journals.
There is separate documentation for the pipelines which have to be tested.
The approval certificates are retained and filed by the head of the maintenance department.

Training and instruction

Procedure:
All members of the workforce are first trained and instructed in safety-relevant matters before taking up their positions within the company, and undergo further training and instruction thereafter at regular intervals and when basic changes are made to the plant and equipment.

Each year the head of the personnel department determines the training requirement and lays down relevant material to be the subject of instruction in collaboration with the safety engineer. Using this requirement analysis a training plan is created each year by the head of personnel. Members of the workforce who are unable to participate in the intended training courses receive the training at a later date. The subjects that are covered and attendance at the training courses is recorded. External training courses are documented by means of certificates.

Implementation/implemented measures:
The rules with regard to training and instruction of personnel are contained in Procedure A/HS&E 08.00.
Documentation regarding training is created and administered by the personnel department.

Review of effectiveness of specified measures

Procedure:
The effectiveness of the measures which have been taken is reviewed by means of systematic assessment of

- disturbances to normal operation
- accidents and near accidents at work
- test results and
- working meetings.

Not only disturbances at Company B, but also in comparable companies and within comparable processes (analysis of literature and communication within specialist circles) are taken into consideration.

Implementation/implemented measures:
Rules regarding the determination, recording and analysis of disturbances to normal use are contained in Procedure A/HS&E 02.00.

A monthly set of statistics is created with regard to accidents/hazardous events (accidents, damage to plant components, release of hazardous substances). These statistics are viewed by each manager, signed and filed in a central register.
These reports are discussed in the monthly meetings of the occupational safety and health committee.

2.3.4 Decommissioning phase

Procedure:

In the planning phase all the measures which have to be taken in the event that plant components or the entire plant is decommissioned are laid down in order to ensure that there is no risk during the decommissioning work and that no risk emanates from the plant or equipment which is not in operation.

Implementation/implemented measures:

The measures to be taken for Works A in the case of decommissioning are described in Chapter 21 of the approval application.
Shutdown of production is carried out in accordance with Procedure A/HS&E 02.00.
Rules for waste disposal are described in Procedure A/HS&E 10.00.
Proper implementation of the measures which have been laid down is monitored and checked by the head of the maintenance department in accordance with Procedure A/HS&E 4.00.

2.4 Review of the effectiveness of the plan

Procedure:

Systematic assessment of the plan for prevention of hazardous incidents is carried out within the framework of an audit system which contains all 20 elements for the implementation of the "Health, Safety and Environmental Policy". In the course of this, conformity or nonconformity of the actions which have been carried out with the specified rules of the 20 system elements is checked in each works by means of standardised auditing procedures.

Implementation/implemented measures:

The audits for Works A are carried out at 18-month intervals.
The audit reports are laid before the top management of the company.

3. Summary

The plan described here for the prevention of hazardous incidents ensures safe operation of the plant at Works A.

4 List of documents for implementation of plan

Not included with the present document.

Annex 5

Plan for preventing hazardous incidents according to Article 8, StörfallV (Hazardous Incidents Ordinance)

for hazardous substances depot A

of LAGER AG

The concept for prevention of hazardous incidents presented here is an anonymous example of written documentation in accordance with Article 8 of the StörfallV (Hazardous Incidents Ordinance) for an existing operating area. This concept particularly serves as an example as regards structure and depth of presentation and cannot be taken as a general rule as far as content is concerned. Please note that with increasing experience in the creation and review of concepts for the prevention of hazardous incidents, further adaptation / optimisation of this concept cannot be excluded.

Contents:

1 Short description of the facility

1.1 Technical goal of the facility

Hazardous substances Depot A of LAGER AG serves for the storage and unloading and reloading of hazardous substances.
The products are stored in tanks above ground outside as well as in drums in indoor storage areas. Delivery and despatch is by means of road and rail tankers and vessels or in drums on trucks.

The following installations exist at the depot:

1) above-ground storage tanks for organic solvents
2) storage room for highly toxic and toxic substances
3) storage room for inflammable substances
4) drum filling station
5) road tanker loading and unloading station
6) rail vessel waggon unloading station
7) unloading and loading bay for unit loads
8) building with office and measuring station.

1) to 8) form a facility in accordance with Article 3 (5a) BImSchG (German Pollution Control Act) and are at the same time plant subject to mandatory approval in accordance with Article 4 BImSchG in conjunction with 4. BImSchV.

1.2 Location and environment

The facility is located within an industrial trading estate.
The surroundings of the facility, including the shortest distances to the nearest objects which do not belong to the facility, can be seen in the approval applications.
There are no objects which must have special protection (children's nurseries, schools, hospitals etc.) within a surrounding area of 500 m, nor are there any official conservation areas.

1.3 Substances

The relevant hazardous substances in accordance with StörfallV which are located within the facility are listed in the following text. The individual specifications and quantities of the substances and the relevant safety and reaction data can be read in the list of hazardous substances/storage list and in the safety data sheets which are available on site.

Category/ No. acc. Annex I of StörfallV	Designation	Maximum quantity in the facility	Physical Form
1 highly toxic	Chemicals with R phrases 26-28	8 000 kg	solid, liquid
2 toxic	Chemicals with R phrase 23-25	100 000 kg	solid, liquid
7 b highly-inflammable liquids	highly-inflammable liquids with R phrase 11	1 000 000 kg	liquid

The thresholds for quantities from Column 4 of Annex 1 StörfallV is exceeded for highly toxic (5 t) and toxic substances (50t). The corresponding thresholds from Column 5 (20t or 200 t) are not exceeded. This means that the facility is subject to the basic obligations of StörfallV, but not of the extended obligations of Articles 9 - 12 StörfallV.

1.4 Hazard potential of the facility

The hazard potential of the facility lies

- in the potential for release of highly-toxic and toxic substances
- the possibility of explosion
  (explosive vapour/air mixtures of the highly-inflammable substances) and
- in the possibility of fire and the spread of toxic by-products of combustion.

2 Prevention of hazardous incidents and limitation of their effects

The general principles of the procedures followed by LAGER AG for the prevention of hazardous incidents and limitation of their effects as well as their concrete implementation in the facility are described in the following text.
The structure is based on Annex III of StörfallV "Basic principles for the plan for prevention of hazardous incidents and the safety management system".

2.1 Overall goals and general principles

The basic principles (maxims for action) are laid down by the top management of LAGER AG in the form of company policy which is followed by the company with reference to plant safety, safety and health and hazard prevention management.
The company policy is formulated through 10 basic principles (see Annex 1 - *not included in this plan*) Prevention of hazardous incidents is laid down in this company policy as a high-level maxim for action.

This company policy is made known to all members of the workforce by means of training measures and well as in circulars and notices displayed within the company.

2.2 Organisation and Personnel

The areas of responsibility for the persons responsible for the fulfilment of the requirements of the official legal and technical rules and for those members of the workforce involved in the prevention of hazardous incidents and the limitation of their effects at all levels within the organisation are clearly laid down within the framework of staff planning.
The safety structure and organisation of LAGER AG is integrated into the operating structure and organisation, and is described in organigrams giving the different functions and authorities within the safety structure and organisation (see Annex 2 – *not included in this plan).*
The representatives which are required by law are elected in writing.
A requirement profile which lays down the individual qualifications which are necessary is laid down for all members of staff (management, representatives and plant personnel).
The responsibilities of the operative managers and the representatives are formulated in the form of written job descriptions or separate written delegations of authority.
Substitution for the members of management is regulated by a deputation plan

Clear definition of the responsibilities ensures that the necessary actions for achievement of the set objectives are implemented in practice. Implementation of the measures is checked by the relevant supervisor on a random basis.

Qualification and Training

Relevant training measures for the achievement of the necessary qualifications as well as for their ongoing maintenance are systematically planned.
Training and instruction in safety-relevant matters is carried out for all members of the workforce initially before employment is taken up and then at regular intervals and if there are basic changes to the plant or equipment. The rules regarding annual instruction of the plant personnel including specification of the minimum material to be covered are contained in a training plan.
Members of the workforce who do not attend the training courses when they first take place are given training at a later date. Implementation of the training courses is documented and adherence to the set intervals is demonstrated by means of a list. External training courses are documented by means of certificates of attendance.

The hazard defence forces are trained in collaboration with the responsible fire service. Written records are kept in the facility with regard to the drills which are carried out.

On arrival, staff from external providers are provided with a printed description of the most important in-house safety regulations and the working regulations in the operating area. Before starting work the hired-in staff are instructed of the particular hazards and the safety measures to be taken in the different areas of the depot. This instruction is carried out by operative managers from LAGER AG.
Before beginning their work the hired-in staff have to acknowledge by means of signature that they know the safety regulations and working regulations.

2.3 Determination and assessment of the dangers of hazardous incidents

The safety plan for the facility is laid down for all life phases of the plant within the framework of planning of new plant or new processes or of planning changes to existing plant or equipment or processes.
The safety plan of LAGER AG consists of the observation of the very concrete rules and regulations which exists for depots of hazardous substances (e.g. VbF/ TRbF, WHG/ VAwS, GefstoffV(Hazardous Substances Ordinance)/ TRGS).

Planning is exclusively instigated by those carrying technical responsibility at LAGER AG and is implemented with the help of external providers.

Only firms which can demonstrate their suitability for planning and construction of similar plant are entrusted with the planning and implementation of new plant or changes to existing plant.
During the planning of new plant or of changes to existing plant or processes potential causes of hazardous incidents are determined within the framework of a preliminary assessment of the site in question. Based on the results of this preliminary assessment it is determined what areas of the plant require a deeper and more detailed analysis, if any.

Within the framework of the risk analysis, the basis principles for the organisational and technical measures to be taken are laid down as well as actual concrete measures both for normal use of the Depot and for disturbances and hazardous incidents (alarm and hazard defence planning). Sources of risk resulting from the environment and circumstances within the environment which increase risks are taken into consideration.

The basic safety-relevant operating instructions are created within the framework of the planning, taking into consideration the rules and regulations specified by the manufacturers of the parts and plant components.
The planning documents are reviewed by the technical management of the company and the occupational safety and health and environmental protection department at LAGER AG. During this process, particular attention is paid to fulfilment of the requirements of the technical rules and regulations. Regular project meetings are held for this purpose.
In addition, already at the planning phase discussions take place between LAGER AG, the planning company, approval and monitoring bodies and organisations of independent experts, where the necessary technical and organisational measures are agreed. Within the framework of the approval procedure, the planning documents are additionally assessed by external independent experts.
The relevant rules and regulations and the documents representing the state of safety technology as well as documents regarding special safety measures and requirements of public authorities are administered and constantly updated by the occupational safety and health and environmental protection department.

The technical documentation regarding the facility is available in the technology department.

2.4 Monitoring of the facility

Monitoring of normal use

Overall responsibility for monitoring and safe operation of the depot lies with the top management at the facility, including those directly responsible for the depot and storage facilities themselves.

The individual work steps that have to be carried out for all safety-relevant activities (commissioning, decommissioning / shutdown, filling processes, emptying processes) are laid down in operating instructions. In addition, safety instructions for the prevention of accidents and information regarding measures to be taken in the event of deviation from normal operation are contained in the operating manual.
The operating instructions are available at the individual installations and also centrally in the site office. At the unloading and loadings stations the operating instructions are displayed so as to be resistant to the weather and are available in several languages if appropriate (for foreign tanker drivers).
The workforce is instructed with regard to contents of the operating instructions within the framework of the training courses. Those participating in courses confirm their attendance by means of signature.

Normal plant conditions are monitored by means of regular checking of the safety equipment. Deviations from the normal condition are documented and assessed.
Staff are only present to monitor the plant when operations are actually in progress. The operations are carried out by trained personnel. The relevant supervisor is responsible for all unloading and loading operations, and is also responsible for checking that the equipment is in perfectly satisfactory condition and that the quantities given for the substances are accurate. He must also check that the substances are correctly identified and that storage is carried out in the proper manner, taking into consideration the storage classes.

In addition, daily inspection rounds are carried out as a matter of routine by the supervisor responsible for the storage area. The items to be inspected are laid down in the operating instructions. All inspection rounds are documented. The storage area supervisor carries out a visual inspection of the storage area and its safety-relevant equipment on a daily basis. Rules for the daily inspection round with a list of the parameters to be checked are also contained in the operating manual.

It is not necessary that the plant be continuously manned even when not in operation, as normally no processes take place which involve a change in physical conditions. Important alarms which indicate hazard conditions (gas warning via gas sensor installed in the storage area, fire or smoke alarm) are given as a collective alarm in the site watchman's cabin, which is continually manned.

The facility is fenced in and locked when the plant is not in operation. Rights of access are checked at the entrance to the depot by inspection of the company identity card or a visitor's pass. Entrance of vehicles is checked by the watchman.

Only authorised persons are allowed to enter the storage areas.

A safety check is carried out by the occupational safety and health and environmental protection department at regular intervals (i.e. at least once a year) using a checklist. The checklists are filed in the site manual.

Maintenance plan

The inspections to be carried out result both from the relevant rules and regulations (plant components subject to mandatory inspection in accordance with occupational safety and health law) and from the determination of safety-relevant plant components and equipment as laid down in the risk analysis. Plant components which have to be inspected at regular intervals are laid down in an overview (inspection and test file).

The rules and regulations for carrying out the inspection and maintenance work are laid down in the inspection and test file by the relevant technical department in accordance with the rules laid down by the planning company and/or the manufacturers or the plant and equipment. Experience gathered over years of working with the plant and equipment is also taken into consideration when formulating the rules.

As far as possible the companies that implemented planning and erection of the plant are commissioned with the inspection and maintenance work. Otherwise recognised specialist companies are used.

Implementation of the inspection and maintenance work is documented in the inspection and test file. Tests on plant components subject to mandatory inspection are recorded in the test journals.

Maintenance work associated with particular hazards (e.g. work involving risk or fire or explosion) is subject to a release procedure.

The release forms are retained and filed.

2.5 Safe implementation of changes

Planning of changes to existing installations or the design of new plant is carried out in accordance with the processes and regulations laid down in Section 2.3.

All the tests which have to be carried out during the implementation of the planned project (in accordance with the technical rules and regulations) and all the necessary checks (to ensure that the plans are correctly implemented) are laid down within the framework of the planning.

The necessary quality assurance during the erection, construction and assembly as well as during plant commissioning is carried out through the selection of suitable companies for the manufacture and erection of the plant, implementation of the inspections which are prescribed by law in accordance with the relevant rules and regulations and also through checking of the EC Declarations of Conformity and the type approval test certificates.

An organisation of independent experts is commissioned with ongoing inspections during the entire implementation phase. For its part the technical management of LAGER AG checks on

a random basis that the measures laid down within the framework of the planning phase are being carried out and that the organisation of independent experts is carrying out its tasks according to plan.

The design of the plant can be seen in from the technical plant documentation (flowcharts, erection plans, data sheets and specification).
Proof that inspections have been carried out on safety-relevant plant components before commissioning can be seen in the test journals of the individual items of equipment.
The safety-relevant operating instructions drafted during the planning phase are supplemented and made more concrete by the occupational safety and health and environmental protection department as necessary.

2.6 Planning for emergencies

Systematic determination of possible deviations from normal operation and disturbances to normal operation as well as systematic determination of all actions which are necessary to return the plant to normal operation and to limit the effects of disturbances/hazardous incidents is carried out in the planning phase within the framework of the risk analysis (see No. 2.3).
The actions which are necessary in the case of disturbance to normal operation are laid down in the alarm and hazard defence plan. In the plan events which represent a hazardous situation (alarm events), the locations (internal and external) where the alarm has to be given and the actions to be taken by the workforce are laid down. The alarm and hazard defence plan is agreed with all the relevant authorities.

The alarm events are divided into two categories, depending on the effects to be expected:
Category 1: Events which can be combated by members of the company workforce,
Category 2: Events which require the use of external hazard defence forces.

Responsibilities and authorities are laid down for each category

After a disturbance which comprises an alarm event or a hazardous incident is identified, the service technical supervisor and if necessary the fire service are informed in accordance with the rules laid down in the alarm plan. The alarm plan also lays down the further internal and external locations which have to be informed.
If it is necessary to involve external forces, these are informed and advised by the safety staff in accordance with the alarm and hazard defence plan.

The alarm and hazard defence plan is checked by the technical department responsible for the storage and filling areas to make sure that it is fully up-to-date if the storage plant is changed, but at any rate once a year. This is laid down in the alarm and hazard defence plan

These measures are the subject of regular instruction and drills.
If a disturbance to normal operation of the facility or a hazardous incident actually occurs, these specifications serve as a guideline.

2.7 Monitoring of the effectiveness of the safety management system

The effectiveness of the measures is checked by means of systematic assessment of events subject to mandatory reporting in the sense of Article 19 StörfallV as well as of other events relevant to hazardous incidents.
Not only disturbances at Depot A, but also in comparable companies and within comparable processes (analysis of literature and communication within specialist circles) are taken into consideration.

Systematic determination of accidents and near-accidents at work is by means of the yearly statistics compiled by the occupational safety professional within the company.
Determination of disturbances to normal operation which can lead to hazards for the general public and the neighbourhood or where the knowledge gained can help to improve the safety of the plant is carried out in the occupational safety and health and environmental protection department. Regulations regarding the disturbances subject to mandatory reporting are laid down in relevant instructions.
Analysis of these disturbances including decisions regarding suitable corrective actions is carried out by the occupational safety and health and environmental protection department in conjunction with the technical managers.

2.8 Systematic review and assessment

Systematic assessment of the plan for the prevention of hazardous incidents takes place within the framework of an auditing system. Conformity or nonconformity of the actions which have been carried out with the specified rules and regulations are assessed by means of a checklist.

Audits are carried out at 18-month intervals.
The audit reports are available for viewing at the works.

3. Summary

The plan described here for the prevention of hazardous incidents ensures safe operation of the depot for hazardous substances.

Annex 6

Plan for preventing hazardous incidents according to Article 8, StörfallV (Hazardous Incidents Ordinance)

for the facility of

Mustermann GmbH

The concept for prevention of hazardous incidents presented here is an anonymous example of written documentation in accordance with Article 8 of the StörfallV (Hazardous Incidents Ordinance) for an existing operating area. This concept particularly serves as an example as regards structure and depth of presentation and cannot be taken as a general rule as far as content is concerned. Please note that with increasing experience in the creation and review of concepts for the prevention of hazardous incidents, further adaptation / optimisation of this concept cannot be excluded.

Preliminary remarks:

The facility of Mustermann GmbH is subject to the extended obligations of StörfallV.
This means that, according to Article 9 StörfallV, a safety report has to be written for the entire facility which has to describe how the plan for prevention of hazardous incidents has been implemented in accordance with Article 9 (1) No. 1.
The following text presents the corresponding chapter in accordance with Annex II "Minimum information to be contained in the safety report".

I. Information on the management system and the organisation of the facility with regard to prevention of hazardous incidents

Mustermann GmbH has installed a safety management system (SMS) for its facility in order to fulfil the organisational safety obligations of the Hazardous Incidents Ordinance. The documentation regarding the safety management system is implemented in accordance with the provisions of a safety management manual (SMM) and also the relevant guidelines, Procedures and work instructions.
The SMM describes the basic principles and goals of the safety management system, the responsibilities and also the mutual interaction of staff in executive, operative, control and advisory positions which are relevant to safety. It also contains basic rules on procedures to be followed when carrying out safety-relevant activities within the framework of planning, erection, commissioning, operation, decommissioning and disposal.
The SMM also contains rules as regards the control, assessment and updating of the SMS and makes reference to guidelines and Procedures/work instructions and other important system documents. The guidelines and Procedures/work instructions lay down in detail the safety-relevant processes which require controlled organisation of processes and procedures.
The SMM as well as the other relevant documents can be seen in the installations of the facility and has been made known to all members of the workforce.

Allocation of the items which have to be taken into consideration in accordance with Annex III of the Hazardous Incidents Ordinance to the individual chapters in the safety management manual can be seen in the following table:

Requirements of Annex III		Chapter in safety management manual
1.	**Overall goals and general principles of the plant operator with regard to limitation of the dangers arising from hazardous incidents**	**Chapter 1.2** Safety principles and goals, safety program
3 a)	**Organisation and Personnel** Specification of tasks and areas of responsibility of the personnel involved in the prevention of hazardous incidents and the limitation of their effects Determination of the corresponding training and further training requirement and implementation of the necessary training courses. Training of in-company staff and/or subcontractors' staff.	**Chapter 1** 1.1 Overall responsibility of top company management 1.3 Safety organisation 1.4 Representatives **Chapter 18** Training, qualification and development of awareness **Chapter 7** Safety requirements for external suppliers and subcontractors
3 b)	**Determination and assessment of dangers emanating from hazardous incidents** Specification and application of processes and procedures for the systematic determination of the dangers emanating from hazardous incidents in normal operation and in the case of deviations from normal operation as well as estimation of the probability and seriousness of such hazardous incidents.	**Chapter 4** Safety requirements for development, planning, erection and assembly
3 c)	**Monitoring of operation** Specification and application of processes and instructions for safe operation, including maintenance of the plant, for processes, equipment and temporary interruptions.	**Chapter 9** Normal operation **Chapter 10.3.4/ 10.4.2.3-7** Responsibilities and authority / procedures for monitoring normal operation, operation during pauses in production, plant or plant components that have been decommissioned or shutdown, regular inspections. **Chapter 15** Storage and transport
3 d)	**Safe implementation of changes** Specification and application of processes for the planning of changes to existing plant or processes or for the design of new plant or new processes.	**Chapter 4** Safety requirements for development, planning, erection and assembly. **Chapter 6** Safety requirements for procurement **Chapter 9** 9.3/ 9.4 Responsibilities and authority/procedures during commissioning and trial operation **Chapter 10** 10.3/ 10.4 Responsibilities, authority/procedures for test planning, inspections within the framework of assembly, inspections and commissioning

Requirements of Annex III		Chapter in safety management manual
3 e)	**Planning for emergencies** Specification and application of processes for determining predictable emergencies based on systematic analysis and for the creation, trial and review of alarm and hazard defence plans in order to be able to react appropriately in case of emergency.	**Chapter 13** Deviations from normal operation and hazard defence
3 f)	**Monitoring the effectiveness of the safety management system** Specification and application of processes and procedures for continuous assessment of the extent to which the goals laid down by the plant operator within the framework of the plan for preventing hazardous incidents and the safety management system are achieved, as well as installation of mechanisms for investigation and correction if the goals are not achieved. The processes and procedures include the system for reporting hazardous incidents and near-incidents, in particular when safety measures fail, as well as corresponding investigations and subsequent actions, based on relevant experience.	**Chapter 20** Statistical methods **Chapter 14** Corrective and preventive actions
3 g)	**Systematic review and assessment** Specification and use of processes and procedures for the regular systematic assessment of the plan for preventing hazardous incidents and the effectiveness and suitability of the safety management system. Review of the effectiveness of the current plan and the safety management system by the top management of the facility, correspondingly documented, and also updating of the plan and the system.	**Chapter 1.5** Assessment of system by top management **Chapter 17** Safety audits

Annex: Table of Contents of Safety Management Manual of Mustermann GmbH
not included with this exemplary plan (Chapter I of the Safety Report)

Annex 7

Plan for preventing hazardous incidents according to Article 8, StörfallV (Hazardous Incidents Ordinance)

of the research plant ("Technikum")

of TECHNIK AG

The concept for prevention of hazardous incidents presented here is an anonymous example of written documentation in accordance with Article 8 of the StörfallV (Hazardous Incidents Ordinance) for an existing operating area. This concept particularly serves as an example as regards structure and depth of presentation and cannot be taken as a general rule as far as content is concerned. Please note that with increasing experience in the creation and review of concepts for the prevention of hazardous incidents, further adaptation / optimisation of this concept cannot be excluded.

Contents:

1 Short description of the facility

1.1 Technical goal of the facility

TECHNIK AG operates factories for the manufacture of fine chemicals at several locations in Germany.
At location Z, TECHNIK AG operates a research plant ("Technikum") for these factories. The task of the research plant is to develop and optimise processes for the manufacture of new products, to produce new products in the amounts necessary for trials of their properties by third parties before their introduction to the market and to create and test safety concepts for dealing with the hazardous substances.
For this purpose, 10 test rigs are operated at the research plant. The most important equipment consists of mixing vessels with heating/cooling circuits including peripheral equipment (e.g. head columns, condensers, distillation receivers), exhaust gas cleaning equipment (washers, adsorption columns) as well as evaporating equipment, drying equipment and centrifuge. In addition there are storage facilities for drums, solid substances and compressed gas bottles, where the substances handled during the tests are stored.

1.2 Location and environment

The Technikum of TECHNIK AG is located in the northern sector of an industrial trading estate.
The immediate surroundings of the facility consist of production facilities belonging to CHEMIE GmbH. The distances of the Technikum to the works borders of the industrial trading estate are 220 m to the north, approx. 350 m to the east and west and approx. 480 m to the south.

There are no objects which must have special protection within the closed site of the industrial trading estate (children's nurseries, schools, hospitals etc.), which means that there are no such objects within a surrounding area of at least 220 m of the facility.
There are safety reports in accordance with StörfallV referring specifically to the surrounding production facilities of CHEMIE GmbH which demonstrate that no danger need be feared for the neighbouring research plant.

1.3 Materials

A characteristic of a research plant facility is the use of numerous process steps with frequently-changing process conditions and the use of a large number of different substances and chemicals in relatively small amounts.

The hazardous substances in the facility in question which are relevant in the sense of StörfallV are listed in the following table:

Category/ No. acc. Annex I of StörfallV	Designation	Maximum quantity in the facility	Physical Form
1 highly toxic	Chemicals with R-phrases 26-28	4 000 kg	solid, liquid, gas
2 toxic	Chemicals with R-phrases 23-25	15 000 kg	solid, liquid, gas
7 b highly-inflammable liquids	highly-inflammable liquids with R-phrase 11	10 000 kg	liquid
8 highly inflammable	inflammable gases and vol. highly-inflammable substances/preparations above the temperature of their respective boiling points	8 000 kg	liquid, gaseous
20 chlorine	toxic gas, dangerous to the environment	1 000 kg	liquid, gas
21 hydrochloric gas	toxic gas	2 000 kg	liquefied gas

The threshold quantity from Column 4 of Annex 1 StörfallV is not exceeded for any individual substance. If the addition rule is applied for Categories 1 and 2, also taking into consideration individual substances from Annex 1 Nos. 20/ 21, the sum of the quotients related to the quantity thresholds from Column 4 is greater than 1. This means that the facility it subject to the basic obligations of StörfallV.

1.4 Hazard potential of the facility

The hazard potential of the facility lies

- in the potential for release of toxic and highly-toxic substances
- in the possibility of explosion (explosive vapour/air mixtures of the highly-inflammable substances) and
- in the possibility of fire and the spread of toxic combustion by-products.

2 Prevention of hazardous incidents and limitation of their effects

Mustermann GmbH has installed a safety management system (SMS) for its facility which includes the research plant in order to fulfil the organisational safety obligations of the Hazardous Incidents Ordinance. The documentation regarding the safety management system is implemented in accordance with the provisions of a safety management manual (SMM) and also the relevant guidelines, procedures and work instructions.
The SMM describes the basic principles and goals of the safety management, the responsibilities as well as the authorities and also the relationships between staff who carry out executive, operative, control and advisory functions with regard to safety-relevant activities. It also contains basic principles as regards procedures for implementing safety-relevant activities within the framework of planning, erection, commissioning, operation, decommissioning, shutdown and disposal.
The SMM also contains regulations as regards control, assessment and updating of the SMS. and makes reference to guidelines and procedures/work instructions and other important system documents. The guidelines and procedures/work instructions lay down in detail the safety-relevant processes which require controlled organisation of processes and procedures.
The SMM as well as the other relevant documents can be seen at the research plant and has been made known to all members of the workforce.

2.1 Company policy

The company policy followed by TECHNIK AG with regard to plant safety, occupational safety and hazard defence management is described in Chapter 1 of the SMM. In this chapter, (1.2.1), 10 basic principles are laid down.
Prevention of hazardous incidents is laid down in this company policy as a high-level maxim for action.
This basis for action is made more concrete in procedures which describe all safety-relevant activities.
Translation of the safety principles, goals and programs into operational practice is carried out within the framework of the 20 elements of the management system, in which the measures for implementation of the company policy are made more concrete by means of procedures as well as through the requirements of the audits for the respective elements.

2.3 Organisation and Personnel

The safety organisation, including areas of responsibility for members of staff involved in the prevention of hazardous incidents and the limitations of their effects at all levels within the organisation is described in Chapters 1.1 (Overall responsibility of top company management), 1.3 (Safety organisation) and 1.4 (Representatives) of the SMM. A requirement profile which lays down the individual qualifications which are necessary is laid down for all members of staff (management, representatives and plant personnel).
Implementation of relevant training measures for the achievement of these qualifications as well as for maintaining the qualifications is regulated in Chapter 18 of the SMM (training, qualification and development of awareness).
Regulations regarding selection of suitable external providers are contained in Chapter 7 of the SMM.

2.3 Determination of hazards and specification of basic measures for preventing hazardous incidents and limiting their effects

2.3.1 Planning/change phase

In Chapter 4 of the SMM are documented the responsibilities as well as the procedures for determining safety requirements during development, planning, erection and assembly of new test rigs or procedures to be carried out during changes to existing test rigs or processes.
Chapter 4 contains among others

- Rules for the management of regulations as well as for the determination of basic principles which are relevant to safety
- Information on procedures when creating the safety plan and when implementing a systematic safety analysis
- Information for the implementation of safety acceptance procedures
- Principles of approval management

Within the framework of the systematic safety analysis, the potential sources of hazards and their effects for all the operating phases (erection, operation, shutdown) both for normal operation and for disturbances (alarm and hazard defence planning) are systematically allocated to the relevant measures for preventing and limiting hazardous incidents. The results of this process are then compared with the requirements according to the current state of safety technology. By means of this comparison, the quality of the safety plan for the planned trial plant is assessed and improved if necessary.

2.3.2 Implementation phase (erection, construction and assembly, commissioning)

The necessary quality assurance during this phase is implemented by means of selection of suitable companies for the manufacture and erection of the plant, by the implementation of the legally required inspections and tests in accordance with the relevant regulations and by checking the EC Declarations of Conformity and the type approval test documents.
The following rules are contained in the SMM in this regard:

- Chapter 6: Procurement
  Contains rules which already during the contract phase ensure the observance of the state of safety technology when purchasing safety-relevant plant and equipment and also plant components and materials by laying down delivery and procurement specifications. The rules also influence the selection of suitable suppliers.

- Chapter 7: Safety requirements with regard to external suppliers
  Contains rules with regard to the selection of suitable service providers. It is ensured that when safety-relevant services are outsourced (e.g. engineering services within the framework of this phase), only companies which have the necessary qualifications for fulfilling the tasks according to the requirements are approached.

- Chapter 9: Normal operation
  Contains rules which define procedures during commissioning and trial operation so that no damaging environmental effects or other serious hazards occur and that there are no considerable disadvantages nor burdens for the staff, the general public or the neighbourhood.

- Chapter 10: Tests and monitoring
  Contains rules with regard to test planning, test implementation and test documentation.

2.3.3 Operating phase

It must be ensured that the test equipment including subsidiary equipment is operated in such a way that no damaging environmental effects or other serious hazards occur and that there are no considerable disadvantages nor burdens for the staff, the general public or the neighbourhood.
Within the facility, rules are laid down for ensuring organised work procedures, monitoring and inspection and test measures and also provisions for maintenance.

Safe process management

For each set of trials and higher-level safety-relevant activities, work instructions are created by the plant manager which contain the necessary information as regards the reactions, the substances which are being handled and the work processes which have to be carried out. In

addition, the actions which have to be implemented if there are deviations from normal operation or in order to avoid deviations from normal operation have to be laid down.

Corresponding rules for the organisation of procedures and creation of operating instructions are laid down in Chapters 9 (Normal operations) and 15 (Storage) of the SMM.

Monitoring of operation

Monitoring of normal trial procedures is carried out by means of continuous measurement and checks on site at the central control point by the personnel responsible for implementation of the trials.
The additional equipment is monitored by means of regular inspection tours by a responsible member of staff.
Corresponding rules are contained in Chapter 10 (Tests and monitoring) of the SMM.

Procedure in the case of disturbance to normal operation

Return to normal operation or limitation of the effects of disturbances/hazardous incidents is ensured by means of systematic determination of possible deviations from normal operation and disturbances to normal operation, systematic determination of all necessary measures as well as provision of the necessary forces and materials for hazard defence, so that no further damage /hazards occur inside or outside the plant.

Corresponding regulations with regard to alarm and hazard defence planning as well as procedures in the case of deviations /disturbances to normal operation (no alarm events) are regulated in Chapter 13 of the SMM.

Maintenance concept

The elementary goals of ensuring plant safety, in addition to commercial goals, e.g. optimisation of plant availability, are implemented by means of planned and organised maintenance.

Rules for the repair and maintenance and inspection of equipment are laid down in Chapter 9 (normal operation).
Directions are contained in Chapter 10 (testing and monitoring) of the SMM in order to ensure that regular inspections are carried out in accordance with the official rules and regulations.

Training and instruction

By means of training and instruction which deal with the safety of plant operation and general safety awareness, it is ensured that all members of the workforce are suitably qualified to carry out the tasks with which they are entrusted.

By means of regular instruction it is ensured in particular that all members of staff know the dangers which occur within their sphere of operation and that they know all the actions and rules of behaviour which are to be employed in the case of disturbances or hazardous events. Corresponding rules are contained in Chapter 18 of the SMM (training, qualification and development of awareness.

Checking the effectiveness of specified measures

The effectiveness of the specified measures is systematically reviewed by means of statistics regarding disturbances to normal operation and systematic determination of correction actions. Weaknesses within the safety plan for the plant are recognised and corrected.
Implementation of this review is regulated in Chapters 20 (statistical methods) and 14 (Preventive and corrective actions) of the SMM.

2.3.4 Shutdown phase

In the planning phase (Chapter 4 of the SMM), all measures which are necessary during shutdown of plant components or the entire plant are laid down in order to ensure that danger does not occur during the work associated with the shutdown or in association with the plant which is not in operation.
The procedure during decommissioning or shutdown is in accordance with the specifications in Chapter 9 (Normal operation) of the SMM.

2.4 Review of the effectiveness of the plan

Systematic assessment of the plan for prevention of hazardous incidents is carried out within the framework of the SMM audit system. Rules for the implementation of internal and external audits are contained in Chapter 17 of the SMM. In the audits the SMM is periodically reviewed for application, effectiveness and usefulness in achieving the relevant goals with the aim of discovering weaknesses and instigating improvement and corrective actions.

3. Summary

Safe operation of the plant of the research plant is ensured by means of the plan for prevention of hazardous incidents described here.

Annex 8

Technical Documentation (from /12/)

The technical documentation encompasses all written and graphic documents which – independently of the project handling – relate to the technical structure and mode of action of the individual pieces of equipment and of the installation as a whole, the process engineering links between the individual parts, the design data, the raw material and consumption rates for consumables, as well as the qualities and production figures for the finished products.

The technical documentation includes the following items:

Process Engineering Documents

- flow charts and apparatus characteristics
- sequence plans
- material balance sheets, material flow charts
- energy balance sheets, energy flow charts
- equipment lists
- data sheets
- apparatus sketches
- layout plans
- erection plans
- hazard zone plans
- measuring, sampling and analysis regulations
- surveys of design data and of consumption and production figures

Documents for Machinery and Apparatus

- design drawings (assembly, detailed and installation drawings) including details regarding insulation and coating
- parts lists and material extracts
- foundation loading plans
- static and strength verifications (for the licensing authority)
- technical acceptance and testing regulations, acceptance documents (material certificates etc.)

Documents for Piping

- general plans with main pipe bridges, collective ducts, main cable routes – piping and cable plans, isometric drawings – lists of piping systems, pipe parts and pipe classes with material extracts
- strength verifications
- technical acceptance and testing regulations, acceptance documents
- insulation and coating specifications

Documents for the Electrical System

- electric circuit diagrams and descriptions
- erection plans and design drawings for electrical installations and equipment
- lighting plans
- cable plans
- earthing plans, including lightning protection
- lists of consumers, motors, cables, installation material
- material extracts
- data sheets

Documents for I&C

- circuit diagrams with descriptions
- function plans for controls and interlocks
- erection plans and design drawings for measuring panels, signalling installations, I&C power supply
- cable plans
- data sheets
- I&C equipment lists
- signal lists
- cable lists with material extracts

Documents for the Construction Department, including Steel Construction

- general plans for buildings, structures, steel scaffolding etc.
- detailed drawings for scaffolding parts, platforms, staircases, ladders etc.
- foundation plans
- formwork and reinforcement plans for concrete structures and foundations
- static and strength verifications
- acceptance documents
- plans for roads, rail installations, bridges, subways etc.
- material and mass extracts
- sewer and drainage plans
- excavation plans (earthworks)

Technical Documents for Plant Engineering, General

- drawing lists
- spare parts lists
- technical acceptance and testing regulations, acceptance documents
- plant models

Annex 9

Checklist for review of the plan for preventing hazardous incidents in accordance with

Article 8 StörfallV (Hazardous Incidents Ordinance)

The review of the plan includes review of suitability of the plant itself and review of the implementation of the plan. The review is carried out using the written draft of the plan and the plant documents to which reference is made as well as by means of interviews of members of the workforce. It is generally only possible to carry out a review of the safety management system and the operating instructions by means of random sampling methods.

The following checklist for review of the plan for preventing hazardous incidents is, like Annex III "Basic principles for the plan for preventing hazardous incidents and for the safety management system" - divided into 8 sections (see Column 1).
The individual questions (Column 2) correspond to the core requirements of Annex II of the Hazardous Incidents Ordinance with regard to safety management which have to be fulfilled within the safety management system and demonstrably regulated by the documentation i.e. for example in the Safety Management Manual and in the other relevant documents such as Procedures, guidelines etc., as well as in the other plant and technical documentation.
Column 3 of the checklist ("Implemented by") serves to prove the implementation of the corresponding requirements in the documentation of the facility, e.g. instructions, official forms, etc. The following checklist contains examples of documents in Column 3 where the corresponding requirements can be implemented; the examples given therefore also service as indications of a possible subject for testing.

Column 4 ("Assessment/Remarks/Other") serves to assess the degree to which the relevant requirements have been implemented, or lists measures for fulfilling the requirements. In addition, the sample which has been inspected, e.g. when checking the implementation of the plant on site, should be documented here.

For the user, the checklist serves the following purposes:
- self-assessment when drafting a plan for preventing hazardous incidents and also when creating a safety management system
- as a basis for (external) inspection of the implementation of the requirements of Annex III of the Hazardous Incidents Ordinance after creation of the plan and installation of the system.

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
1. Company policy		
1.1 Is prevention of hazardous incidents defined as a primary goal of the company (company policy)?	- *company policy*	
1.1.1 Have the company goals been made known to all members of the workforce?	- *circular letter* - *Intranet* - *displayed notice* - *informative events / training*	
1.2 Are the basic principles for achievement of the safety goals formulated in a concrete form, if necessary in separate guidelines?	- *company guidelines and principles*	
1.3 Is the company policy reviewed at regular intervals and adapted if necessary?		
2 Organisation and Personnel		
2.1 Are the obligations of the plant operator with regard to all plant subject to approval officially transferred to a member of an organ or a partner or shareholder?	- *Notice in accordance with Article 52a BImSchG (German Pollution Control Act*	
2.2 Are the tasks and areas of responsibility including the authority to give binding instructions laid down for all hierarchical levels within the organisation?	- *Guideline for the delegation of company responsibility* - *Organigrams* - *Tasks / job descriptions*	

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
2.3 Are the representatives required by law elected in writing, e.g. (of these the representatives whose tasks at least in the widest sense serve the prevention of hazardous incidents are especially relevant): - Waste representative in accordance with Article 54 and Article 1 Company Representative Ordinance - Water conservation representative Article 21a Water Conservation Law - Immission protection representative in accordance with Article 53 German Pollution Control Act - Hazardous incident representative in accordance with Section 58a German Pollution Control Act - Safety representative in accordance with Articles 22 SGB VII and § 9 VBG 1 - Specialists for occupational safety and health in accordance with Article 5 ASiG (Occupational Safety Act) - Company doctors in accordance with Article 2 ASiG - First aid assistants in accordance with Article 10 ArbSchG (Occupational Safety and Health Act) and VBG 109 - Radiation representatives and authorised radiation officers in accordance with Articles 29 - 31 Radiation Protection Ordinance - Hazardous substance representative or elected representatives in accordance with Article 1 or 5 Hazardous Substances Representative Ordinance	*Written delegation of authority*	

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
2.4 Is a specific person entrusted with the limitation of the effects of hazardous incidents and is this person known to the relevant authorities?	- **Notice in accordance with Article 52a BImSchG (German Pollution Control Act)**	
2.5 Have committees been formed in which top management participates? *If there are several legally required representatives such as for example immission protection representative, hazardous incident representative, co-ordination of the representatives must be ensured, particularly by means of an environment committee (Article 55 BImSchG- Pollution –Control Act; Article 21c WHG – Water Resources Management Act)*	- *Interview*	
2.6 Are rules laid down for - frequency of meetings and - - constitution of the committees?	- *Minutes of meetings*	
2.7 Are there rules as to the number of staff who have to man the plant at any given time in order to ensure safe plant operation at all times?	- *Procedure, Interview*	
2.8 Do the rules regarding manning include - relevant responsibilities for determination of the necessary manning of the plant (facilities) or shifts - criteria for determination and specification of the personnel - criteria for determining and specifying the	- *Procedure, Interview*	

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
manning of the plant (facilities) or shifts, including the specification of minimum manning levels *e.g. on the basis of determination of work process times* - specification of the procedures to be followed if minimum manning levels are not achieved?		
2.9 Is the qualification which is necessary for all positions within the line organisation as well as the knowledge necessary for the representatives specifically laid down?	- *Requirement profiles, function or job descriptions*	
2.10 Is there a specified procedure for regular determination of the requirement for training and further training for members of the line organisation?	- *Procedure, Interview*	
2.11 Are there rules with regard to the - drafting, - review and - further development - of training plans?	- *Procedure, Interview*	
2.12 Are there rules for instruction of members of staff - initially before starting work, - at regular intervals, - when working materials, processes or equipment are fundamentally changed, - if particular types of work have to be carried out and - if exceptional events have occurred?	- *Procedure, Instruction plans*	

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
2.13 Do the rules regarding instruction include - allocation of responsibilities for implementation - definition of those to receive instruction - minimum material to be covered - documentation *Minimum requirements result on the one hand from the relevant rules regarding instruction contained in the legal and technical regulations; in addition the material covered by the instruction should be centred on the fundamental content of the operating instructions, release and approval certificates as well as on the alarm and hazard defence plan.*	- *Procedure, Instruction plans*	
2.14 Are there rules as regards the systematic subsequent training of members of the workforce who could not attend initial training?	- *Procedure, Interview* - *Instruction reports*	
2.15 Are the rules that apply within the company taught to hired-in staff / supervisors?	- **Procedure, Interview** - **Notice on instruction of hired-in staff**	

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
2.16 Does the workstation-related/activity-related instruction follow a specified procedure as regards: - specification of responsibilities for the instruction? - specification of the minimum material to be covered, taking safety, environmental protection and occupational health and safety into consideration? - review during the activity? - acceptance on completion of the activity? - rules with regard to recording and documentation of the instruction?	- *Procedure, Interview* - *Work release / Work permission sheets*	

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
3. Determination and assessment of the dangers of hazardous incidents		
3.1 Are there fixed procedures in the company for systematic determination of the dangers associated with hazardous incidents during - planning of equipment or processes - changes to equipment of processes - erection - commissioning - normal operation - deviations from normal operation - decommissioning - shutdown?	- *Procedure*	
3.2 Are criteria laid down to determine for which processes / new investments the specified procedures must be observed? *In so far as in principle not all change /investment procedures are included in the specified ways of proceeding, such criteria can on the one hand be formulated as exclusion criteria (e.g. all investments, excluding where a plant component/material is replaced by a component/material which is identical in design or composition), or as positive criteria e.g. list of certain investment/planning procedures or investments). If appropriate it can be specified that an initial assessment of the danger potential be carried out in order to decide whether a detailed risk analysis is necessary.*	- *Procedure*	

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
3.3 Are the methods for systematic determination of the dangers of hazardous incidents specified? (z. B. PAAG procedure, failure effect analysis according to DIN 25 448) *Systematic risk analysis with regard to non-normal operation is required by both StörfallV and TRGS 300 (Section 4.1) so that independently of whether the plant of the company is considered a safety-relevant part of the facility, in any case the obligation to carry out systematic risk analyses exists when handling hazardous substances (the term "safety analysis" of TRGS 300 can be interpreted accordingly).*	- *Procedure, Interview*	
3.4 Do the Procedures contain rules for including sources of risk which depend on the environment?	- *Procedure*	
3.5 Do the Procedures contain rules as to, - what company functions are responsible for implementation of systematic risk analyses - what functions of the company have to be included and - what functions of the company have to be informed?	- *Procedure*	

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
3.6 Do the Procedures contain rules with regard to documentation of the systematic risk analyses?	- *Procedure* - *Documentation of risk analysis*	
3.7 Do the Procedures contain rules for determining necessary measures corresponding to the risk potential that has been established?	- *Procedure* - *Documentation of risk analysis*	

3.8 Are the rules sufficiently taken into consideration, particularly with regard to:
- the inherent safety of the processes
- sealed containment of hazardous substances
- protection against mechanical damage
- design of the plant components for the expected loads including for hazardous incidents whose possible occurrence cannot be excluded
- supply of the plant with sufficiently reliable I&C equipment and with sufficient warning, alarm and safety equipment
- the necessary alarm and hazard defence measures for all risks that are determined
- creation of systematic test concepts and plans for
  - pre-testing,
  - production monitoring,
  - construction and assembly monitoring,
  - function tests,
  - acceptances,
  - trial operation,
	- *Description of the hazard prevention and limitation measures in the risk analysis*
	- *Approval documentation*
	- *Technical documentation*
	- *Alarm and hazard defence plan*
	- *Test plans*	

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
- commissioning, - regular inspections? - drafting of operating rules for the new processes / plant components / operating materials? *In addition to the rules contained in legal and technical regulations with regard to drafting of operating instructions, in particular necessary instructions for operating personnel resulting from the risk analysis, e.g. with regard to personal safety equipment, safety-relevant control activities or series of activities for the avoidance of serious hazards e.g. after alarm systems have triggered must be taken into consideration.* - establishment of limit values for normal operation? (e.g. pressure, temperature and concentration ranges to be observed)	- *Operating instructions, regulations* - *Transfer report, operating instructions* - *Planning and design documents*	
3.9 Are there rules for controlling implementation of the measures laid down in the risk analysis along with specification of - responsibility for control - responsibility for implementing corrective actions - documentation?	- *Procedure*	

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
3.10 Have the measures laid down within the framework of the risk analysis been implemented?	- *Technical documentation* - *Plant implementation on site*	
3.11 Are there rules for continuing risk analysis and laying down of measures based on - knowledge gained from disturbances to normal operation /hazardous incidents - development of the state of safety technology?	- *Procedure*	

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
4. Monitoring of operation		
4.1 Are there work instructions for normal operation and in particular for - commissioning - start-up and shut-down - trial operation - normal operation - maintenance and cleaning work?	- *Procedure, Interview* - *Work and operating instructions*	
4.2 Are responsibilities for creation and continuation of work instructions laid down?	- *Procedure, Interview*	
4.3 Are the work instructions available on site?	- *On-site instruction*	
4.4 Are work instructions checked for their - effectiveness - correctness - clarity?	- *Procedure, Interview*	
4.5 Do the formal rules for drafting, checking, release, identification and distribution correspond to those laid down for system-related documents?	- *Procedure, Interview* - *Work and operating instructions*	
4.6 Are there rules for controlling observance of the measures laid down for ensuring normal operation e.g. inspection tours, rules regarding documentation of proof ?	- *Procedure, Interview* - *Checklist for site inspections*	
4.7 Are controls carried out in accordance with planned rules with regard to - control staff	- *Procedure, Interview* - *Checklists*	

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
- control times / intervals - objects to be controlled - type of controls - type of documentation - methods of recording unusual events - measures to be taken?		
4.8 Are there rules for the implementation of inspection and repair work?	- *Procedure, Interview*	
4.9 Are the - responsibilities - notes on implementation - maintenance intervals - reporting or wear criteria - maintenance documentation contained in the rules? *Operators of facilities subject to extended obligations have to provide documentation about the following and keep it for at least five years ready for inspection by the relevant authorities in accordance with Article 6 Paragraph 1 Nos. 1 and 2* .... *2. monitoring and regular maintenance of the plant with regard to safety,* *3. the safety-relevant maintenance and repair works* *4. function tests of the warning,*	- *Procedure, Interview* - *Maintenance plans*	

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
alarm and safety equipment.		
4.10 Are there rules on the inspection of technical plant and equipment?	- *Procedure, Interview*	
4.11 Do the rules on testing include - allocated responsibilities for determination of necessary tests on technical plant and equipment *In the case of larger companies with various types of technical plant and equipment which is subject to mandatory inspection, creation of a table which allows an overview of the inspections to be carried out is recommended.* - allocated responsibilities for implementation of the tests *The vital point here is that in particular when having tests carried out by various internal and/or external organisational units it is clearly laid down what organisations are responsible for testing what plant and equipment (e.g. inspection of pressure vessels by independent experts, inspection of other vessels or containers which are significant from a safety point of view by the plant operator, inspection of industrial trucks by Expert Body, inspection of ladders by Expert Body).* - specification of intervals for regular inspections - specifications of the items to be inspected and the tests to be applied, - reasons for testing, e.g. - testing before commissioning	- *Procedure, Interview*	

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
- testing after significant changes - allocated responsibilities for schedule control with regard to observation of test intervals - rules regarding test documentation?		
4.12 Is the work which may only be carried out after approval has been given in writing laid down by the plant management?	- *Procedure, Interview*	
4.13 Does the specified work at least include the following: - Work in tanks and vessels and limited spaces - Work involving risk of fire and explosion; welding, soldering and separation by milling or rotary disk cutter - Work on plant components or in locations where dangerous substances are or were handled	- *Procedure*	
4.14 Is the form of approval/permission documents laid down, along with the minimum information which they have to contain?	- *Procedure, Interview* - *Forms*	
4.15 Are there specifications with regard to the safety measures to be laid down in the approval/permission documents?	- *Procedure, Interview* - *Forms*	
4.16 Are the members of staff permitted to sign laid down for the approval/permission documents?	- *Procedure*	

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
5. Safe implementation of changes		
5.1 Are there rules or regulations in the company which contain procedures for the prevention of hazardous incidents with regard to - planning of new plant or processes and changes to existing plant or processes?	- *Procedure*	
5.2 Are criteria laid down as to what changes require deeper and more detailed risk analysis?	- *Procedure*	
5.3 Are internal and/or external expert bodies included in the procedures which can offer expert assessment /advice with regard to planned investments e.g. - Immission protection representative - Hazardous incident representative - Expert for occupational safety - Organisation of independent experts?	- *Procedure*	
5.4 Are the procedures which are laid down comprehensive enough to take the following matters into consideration when planning new equipment or planning changes to existing equipment:	- *Procedure*	
5.4.1 Checking the possibilities of replacing hazardous substances or decreasing their use to an absolutely necessary minimum		
5.4.2 Checking for relevance of the legal and technical regulations (systematic determination as to what legal and technical rules and regulations apply to the planned		

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
investment)		
5.4.3 Determination of the state of the art? (e.g. from specialist literature, standards, knowledge gained from literature, standards, knowledge gained from comparable plant and equipment inside and outside the company, manufacturers' information)		
5.4.4 Determination of whether the project is subject to reporting, approval or permission?		
5.4.5 Determination of hazard potential of the planned equipment or plant or the planned process by means of: - continuation/ creation of a hazardous substances directory? - if hazardous substances are used, checking whether use of substances which carry a lower health risk is possible? - implementation of systematic risk analyses with regard to non-normal operation in accordance with specified procedures? (e.g. PAAG procedure, failure effect analysis in accordance with DIN 25 448) - determination of hazards and of circumstances which increase the risk of hazards in the vicinity of the facility? - continuation/creation of risk assessment in accordance with Sections 5 and 6 of the occupational health and safety law?		

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
5.6 Are there rules for plant changes which do not require a detailed risk analysis with regard to - responsibilities for initiating the changes - responsibility for implementation - responsibility for checking - documentation?	- *Procedure, Interview*	
5.7 Are there planning rules with regard to - procedures - maintenance and repair activities - organisational measures - measures resulting from legal requirements, conditions and new legal regulations?	- *Procedure, Interview*	
5.8 Is there a regulated procedure for plant commissioning agreed between plant operator, involved expert bodies and official authorities which at least covers the following items:	- *Procedure, Interview*	
5.8.1 Specification of responsibilities and authorities for commissioning *The organisations responsible for the planning and those responsible for vital functions should be involved*		
5.8.2 Determination of documents to be supplied to the plant operator (e.g. flowcharts, design documents, operating instructions, test and maintenance plan, regulations regarding plant operation)		

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
5.8.3 Transfer meetings between the expert bodies involved and the plant operator		
5.8.4 Implementation of all necessary acceptance tests and checking of the functional capability of safety-relevant plant components		
5.8.5 Checking for observance of the measures laid down within the framework of the planning (see 5.6)		
6 Planning for emergencies		

6.1 Are there rules for the assessment and categorisation of
- deviations from normal operation (deviations / disturbances which effect only the availability of the plant or plant component or the product quality)
- disturbances to normal operation with potential influence on
  - life / health of the workforce
  - life / health of third parties
  - the environment
  - cultural items or real estate
- hazardous incidents
	- *Procedure*	

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
6.2 Are possible deviations from normal operation taken into consideration in the work instructions for the important operating procedures?	- *Operating instructions*	
6.3 Are there rules for determining alarm events for the plant?	- *Procedure*	
6.4 Are the locations where the alarm has to be given / which have to be informed determined for each alarm event - internally - externally?	- *Alarm and hazard defence plan*	
6.5 Is a continuously-manned on-site location named which is responsible for receiving internal alarms?	- *Alarm and hazard defence plan*	
6.6 Has a location or person been named who is responsible for advising external hazard defence forces or others involved from outside?	- *Alarm and hazard defence plan, interview*	
6.7 Is it ensured that at all times a person or location is available who is responsible for limitation of the effects of the hazardous incident?	- *Alarm and hazard defence plan, interview*	

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
6.8 Have responsibilities and authorities been laid down for each alarm event with regard to : - hazard defence measures where external forces are not involved - hazard defence measures where external forces are involved?	- *Alarm and hazard defence plan*	
6.9 Are the activities necessary for each alarm event laid down with regard to - warning the workforce - warning those in the neighbourhood - the immediate measures to be taken after the hazard has been identified - the measures to be taken for hazard defence / elimination of the disturbance?	- *Alarm and hazard defence plan*	
6.10 Are the - internal forces - external forces which are needed for each alarm event specified?	- *Alarm and hazard defence plan*	
6.11 Are the materials which are needed for each alarm event specified?	- *Alarm and hazard defence plan*	
6.12 Is the workforce instructed with regard to the rules of behaviour to be followed in the event of a hazardous event as follows: - initially - at regular intervals?	- *Instruction reports, interview*	

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
6.13 Are there rules with regard to the implementation of drills with regard to - intervals between drills - content of drills - participants?	- *Procedure, interview* - *Drill records*	

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
7. Monitoring the effectiveness of the SMS.		
7.1 Are there rules regarding - determination of disturbances to normal operation - assessment of these disturbances with reference to: - the causes - measures to be taken in future for the prevention of such disturbances and if appropriate continued development of the safety management system including development of its implementation?	- *Procedure, Interview*	
7.2 Are there instructions with regard to the determination and assessment of disturbances in comparable processes or plant in your own or other facilities?	- *Procedure, Interview*	
7.3 Are there instructions with regard to statistical evaluation of the disturbances in your own company for the purpose of control of the effectiveness of the plan and the SMS?	- *Procedure, Interview* - *Reports, disturbance statistics, accident statistics*	

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
8 Systematic review and assessment		
8.1 Are there rules with regard to responsibilities for the planning and implementation of safety audits?	- *Procedure, Interview*	
8.2 Is there an audit plan which forms the basis for implementing safety audits at regular intervals?	- *Audit plan*	
8.3 Are all elements of safety management checked for effectiveness?	- *Audit plan*	
8.4 Are the locations responsible for the safety audit independent of the areas to be audited?	- *Procedure, interview* - *Organigrams*	
8.5 Are the results of the safety audit documented?	- *Audit reports*	
8.6 Does this report contain - the necessary corrective actions (e.g. also changes to instructions), - the locations responsible for implementation and also - a schedule?	- *Audit reports*	
8.7 Is the report presented to top management?	- *Procedure, Interview*	

Checklist for review of plant for preventing hazardous incidents

Basic content of the plan	**Implemented by / means of inspection:** *[Examples]*	**Assessmtne/Remarks/Other** (informatin of smaple)
8.8 Are there rules for checking the effectiveness of corrective measures by means of follow-up audits?	- *Procedure, Interview*	
8.9 Are the results of the safety audit a component part of the review of the plan and the safety management system which is carried out by top company management?	- *Procedure, Interview* - *Review report*	