TAA

TECHNICAL COMMITTEE ON PLANT SAFETY

at the
Federal Ministry for
the Environment, Nature Conservation and Nuclear Safety

Final report of the
Working Group on
Inspection and Auditing of Installations

Integrated Inspection and Auditing of Installations

TAA-GS-29

Working Group on
Inspection and Auditing of Installations

of the Technical Committee on

Plant Safety (TAA)

Final report

Integrated Inspection and Auditing of Installations

adopted at the 28th meeting of the TAA on 19 February 2003

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The Technical Committee on Plant Safety (German acronym: TAA) was set up in accordance with the provisions of Art. 31a of the Federal Pollution Control Act at the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. Its office is at the GFI Umwelt (Gesellschaft für Infrastruktur und Umwelt mbH) in Bonn.

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Foreword to the English Translation

This report was originally drawn up to document the integrated inspection and auditing of installations as parts of establishments as currently practiced in Germany. The implementation of the Seveso II Directive requires under Article 18, that the responsible authorities set up a system of inspections covering all establishments under the legislation.

There is a long history of inspection and auditing systems in Germany. These systems can be basically divided into three types: those carried out by public authorities, those carried out by the operator and those carried out by third party inspectors as authorized by the state.

The public authorities carry out inspections under environmental legislation and under occupational health and safety legislation depending on the executive authority structure in the "Land". This may be one authority or two or more authorities. At federal (national) level there are no inspection authorities.

Third party inspections have in the past generally covered technical equipment such as pressure vessels, flammable liquids, explosive hazards, etc. Historically these third parties were known as Technical Inspection Bodies (Technische Überwachungs-Vereine – TÜV). With deregulation within Europe other organisations are now being recognised too (beginning in the year 2005).

In an attempt to distinguish between these inspection and auditing activities carried out by operators and those carried out under legal obligations, the terminology adopted at the OECD Workshop on Audits and Inspections related to Chemical Accident Prevention, Preparedness and Response, Madrid, 6-9 March 2001, has been used as far as possible. Thus an audit is the control measures carried out by or on behalf of an operator and inspection the control measures carried out by public authorities or third parties authorized by the state under specific legislation.

Preface

The Working Group on Inspection and Auditing of Installations was set up by the Technical Committee on Plant Safety (German acronym: TAA) at its third meeting on 19.12.1992 and mandated to prepare proposals for an integrated system for Inspection and Auditing of Installations as required under Art. 7 para. 1 no. 4 of the Federal Pollution Control Act (BImSchG). The Working Group's final report, which addressed the brief on the basis of the mandate given and the legal basis cited, was published in January 1996 as" TAA-Bericht TAA-GS-11 - Ganzheitliche Anlagenüberwachung" (TAA-Report: TAA-GS-11 – Integrated Inspection and Auditing of Installations).

With the publication of the Seveso II Directive in 1996 and its transposition into German law by the revised version of the 12th BImSchV (Major Accidents Ordinance) in 2000, the obligations and requirements concerning the inspection of establishments and installations by the competent authorities were redefined. Art. 16 of the Major Accidents Ordinance of 26.04.2000 (StörfallV), which implements the provisions of Art. 18 of the Seveso II Directive, contains more precise stipulations regarding the inspection system that the competent authorities are required to set up in order to assure the regular and systematic inspection of the technical, organisational and management-related systems of the establishments that come under their jurisdiction.

These new provisions and two documents now available that set out more precise details:

- Guidance on Inspections as Required by Article 18 of Council Directive 96/82/EC (Seveso II) published by the Institute for Systems Informatics and Safety
- Guidance document on the inspection system required by Art. 16 of the Major Accidents Ordinance, jointly adopted by the *Länderausschuss für Immissionsschutz* - LAI (*Länder* committee on pollution control) and the Länderausschuss für Arbeitsschutz und Sicherheitstechnik – LASI (*Länder committee on occupational safety and safety technology*)

have made it necessary to revisit the topic of inspection and auditing of installations and, taking into account Art. 16 of the Major Accidents Ordinance, to deal in particular with the subject of inspection systems. At its 21st meeting on 26.04.2000, the Technical Committee on Plant Safety issued a corresponding mandate to its Working Group on Inspection and Auditing of Installations .

Inspection by the authorities of process installations includes not only the inspection of installations that are already operational, but begins during the licensing procedure with the preliminary discussions that normally take place before the planning phase is completed.

The official licensing procedure and the inspections and evaluations it includes give the competent authorities an important instrument with which they can fulfil initial assessment obligations at an early stage for projects that impact on the environment and safety.

Council Directive 96/61/EC (1996) on Integrated Pollution Prevention and Control (IPPC Directive) requires Member States to take appropriate measures to enable the competent authorities to satisfy themselves that the necessary measures have been put in place to prevent accidents and limit their consequences during the operation of installations for defined industrial activities. An important new aspect here is that an integrative approach is set out, which views the environment as a cohesive system and incorporates a standardized licensing process for industrial activities and installations involving cross-media and cross-sector inspections and decisions.

In view of the legal background described, this report also takes an essentially cross-media approach, while focussing on the area of installations safety.

The Working Group on Inspection and Auditing of Installations believes that for the safe operation of process installations it remains essential that their monitoring be assured through a range of different assessment and inspection activities carried out by different institutions. This approach is not new. Based on the relevant areas of the law, there is a tried and tested range of instruments for the inspection and auditing of installations, which involves the operators, official experts, authorities and approved bodies and covers all the stages in the life of an installation from the planning phase (including licensing) through construction and operation to shutdown, decommissioning and demolition.

As well as looking at the components and individual parts of an installation, an integrated view also has to look at the installation as a whole, i.e. its inventory of dangerous substances and their hazard potential, processes used, the technical design and the organisational procedures required.

Integrated inspection and auditing of installations is made up of many different aspects, which, when seen in their entirety, characterise the system of assessment and control:

- A view of the installation as a whole, including the substances it uses, processes employed and the interaction of components and equipment
- Organisational arrangements concerning the interaction of people and technology designed to ensure adequate protection of the workforce, people living in the vicinity and the environment
- A view of all the phases in the life cycle of the installation (beginning with the planning phase)
- Licensing including secondary provisions and fulfilment of the applicable legislation and regulations
- Safety assessments to facilitate the drawing up of a mayor accident prevention policy and to serve as a basis for subsequent assessments
- Technical tests and assessments of the installation and parts of the installation and their safe functioning
- The influence of external safety-critical factors
- The participation of different institutions based on the scope of their jurisdiction and responsibility (authorities, operators, official experts and approved bodies)

This integrated approach to inspection and auditing installations means that all inspections will be included that arise from the requirements of different areas of legislation, such as pollution control, occupational health and safety, including safety of equipment and appliances, water protection, soil protection, the relevant regulations in force at the time and provisions imposed as part of the operating licence. The fundamental control, auditing and consultation responsibilities are carried out for the operator by those whom he must by law appoint, in particular the Major Accident Representative. The other miscellaneous inspections and reviews, which the operator carries out above and beyond those required to fulfil his duties as prescribed by the primary and secondary legislation and which serve to meet the operating standards he has set himself, should also be seen as being of key importance in this context.

Seen in this way, integrated inspection and auditing of installations is an ongoing process that covers the entire life cycle of process installations and is made up of numerous individual inspection activities that are carried out by the operators, authorities, official experts and approved bodies.

1 Objective

Against the background of the Seveso II Directive and the Directive concerning Integrated Pollution Prevention and Control (IPPC Directive), a trend towards an integrative and all-inclusive approach to environmental protection and installation safety in the field of European legislation is becoming evident.

The obligations of operators of process installations, who as a rule also employ production personnel, are based on a broad raft of legislation. In very general terms, the purpose of the legislation is to prevent, or at least limit as far as possible, harmful effects on people (employees or people living in the vicinity of an installation), the environment, property or cultural assets etc.

The organisation of operations and in particular of existing processes and installations entails fulfilling an unwieldy number of individual requirements based on the various primary and secondary legislation in force. Primarily, the requirements result from regulations that are oriented to different objects of legal protection and that were often passed and implemented completely independently of one another.

However, in practice, the operator is not able to view the different requirements, such as protection of employees and of the environment, in isolation; on the contrary, he has to create the appropriate technical and organisational conditions to enable him to fulfil all his obligations.

The methods and solutions that operators have to use to fulfil the requirements arising from the different legislation are often identical with regard to the protection of the different "objects of protection" – people, air quality, water, soil etc. – or at the very least cannot be implemented independently of one another.

One of the instruments used to ensure safe operation of an installation and compliance with the requirements of the different legislation is the inspection and auditing of installations and organisational structures and the carrying out of associated testing .

The entire assessment and control concept needs an integrative cohesive approach, comprising three levels:

1. The first level consists of a comprehensive assessment of the technical, organisational, and management-specific systems. The basis for this is, on the one hand, the responsibility of companies for internal controls to prevent detrimental developments, including the appointing of specialised personnel, and, on the other hand, the obligation of the inspection authority to assess the extent to which the requirements of the various legislation are being complied with . Particular mention must be made here of Art. 16 of the Major Accidents Ordinance and Art. 18 of the Seveso II Directive, which explicitly address the inspection by the competent authorities of organisational and management-specific systems in establishments.

   It is also possible to involve or appoint experts as part of this inspection.

2. The second level comprises inspections of technical appliances and equipment by official experts, approved bodies or qualified persons on the basis of the different legislation applicable. These established technical inspections are essential in maintaining safety and minimizing any possible damage.

A particular focus here is the law on the safety of equipment and the regulations anchored therein concerning plant subject to inspection. Depending on the aim and stipulations made, these inspections take place throughout the entire life cycle of the installation.

3. Besides these inspections, other checks and inspections are carried out prompted by the results of inspections from the previous levels or by incidents that have taken place.. They are the responsibility of the competent authorities, who act within the framework of the obligations resulting from the licensing procedures or the implementation of the inspection requirements resulting from individual legal obligations. They review whether there is compliance between the requirements of the relevant technical regulations and the operating license and the actual situation and conditions.

   Similarly, operators of installations also perform checks in their own interest to fulfil their obligations or voluntary commitments or to clarify certain situations. They are usually carried out by specially appointed personnel.

   Both groups call upon expert support when required.

One of the visible trends in the legal requirements is increasing reliance on voluntary commitments by operators, which is reflected in regulatory relief for audited industrial sites (Art. 58e Federal Pollution Control Act and Ordinance on relief from pollution control and waste management monitoring regulations for sites and organisations registered under Regulation (EC) No. 761/2001 –" EMAS Privilege Regulation"). The effect of this is that in future detailed inspections will increasingly be the responsibility of operators themselves. Parallel to this, organisational requirements are being framed in more specific terms.

Comprehensive system audits, in particular to review organisational systems and performance, are acquiring more importance. These give operators and the authorities an insight into compliance with obligations, including detailed obligations, such as those arising from technical regulations.

It is very important here to take into consideration up-to-date technical inspections that have already been carried out by operators and official experts or approved bodies, since practice has shown that they are indispensable for the safety and functional reliability of installations throughout their entire life cycle.

The aim of this report is to describe the constrains and parameters of this system of integrated inspection and auditing of installations. Extensive reference to documents that have already been published will be made.

2 Legal basis and reference sources

Integrated inspection and auditing of installations is significantly influenced by European Directives and German legislation in the field of environmental protection and occupational health and safety. Below, the most important reference sources in this area are listed. No claim to completeness is made.

2.1 Environmental protection

The following EC Directives on environmental protection contain important requirements on licensing and inspection and auditing of installations, for which - due to their type, size or location – the possibility of their having serious consequences for the environment cannot be excluded.

- Council Directive 96/82/EC on the control of major-accident hazards involving dangerous substances (Seveso II Directive) of 9 December 1996
- Council Directive 96/61/EC concerning integrated pollution prevention and control (IPPC Directive) of 24 September 1996
- Council Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment in the version of 3 March 1997
- Council Directive 67/548/EEC on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances (Substances Directive) in the version of 6 August 2001

These EC Directives take a cross-media approach. German law, by contrast, is based on technical legislation that is structured by specific media and consequently leads to parallel appraisals being carried out on the basis of separate technical regulations. For example, the transposition of the IPPC Directive into German law led to amendments of the following laws and several associated ordinances:

- Act on the prevention of harmful effects on the environment caused by air pollution, noise, vibration and similar phenomena (Federal Pollution Control Act - BImSchG) in the version of 06.11.2001
- Act on the regulation of matters pertaining to water (Federal Water Act - WHG) in the version of 12.09.2001
- Act for promoting closed substance cycle waste management and ensuring environmentally compatible waste disposal (Closed Substance Cycle and Waste Management Act - KrW-/AbfG) in the version of 06.11.2001

The integrative approach of the IPPC Directive has been transposed into German law by uniform stipulations in the secondary legislation on how limit values are to be set and how the state of the art technology should be determined. Since other official decisions may be included as a result of the licensing procedure and due to the concentrating effect defined in Art. 13 Federal Pollution Control Act, the effects of the licensing may extend beyond the scope of the Federal Pollution Control Act.

In Germany, the Seveso II Directive was transposed into national law by a revised version of the **Twelfth Ordinance on the Implementation of the Federal Pollution Control Act (Major Accidents Ordinance)** of 26 April 2000.

For the safety assessment of installations within the scope of the Major Accidents Ordinance (StörfallV), the **Technical Rules on Installation Safety (TRAS)** should be taken into consideration in compliance with the state of the art safety technology requirement as defined in the Major Accidents Ordinance. They were drawn up by the Technical Committee on Plant Safety on the basis of the Federal Pollution Control Act and contain requirements that go beyond the extensive regulations on occupational health and safety. The interconnection between occupational health and safety and pollution control is particularly evident in the field of the safety of installations.

In connection with integrated inspection and auditing of installations there is a broad array of relevant reference sources, such as standards, guidelines, and guidance documents along with scientific monographs and technical articles. These reference sources contain both detailed parameters concerning inspections and audits as well as pointers to conceptual approaches to inspection of installations. Below a selection of reference sources that contain general and up-to-date guidance that is relevant to integrated inspection and auditing of installations and citations of further reference sources is listed.

Major Accidents Ordinance

- TAA-GS-23: Definitions under Art. 2 nos. 1 and 2 of the Major Accidents Ordinance (TAA Working Group on the Implementation of the Seveso Directive)
- TAA-GS-24: Standards for safety-relevant parts of installations and safety-relevant parts of establishments. (TAA Working Group on the Implementation of the Seveso Directive)
- SFK-GS-23 (Rev. 1): Guidance on the presentation of a major accident prevention policy as defined in Art. 8 in conjunction with Annex III of the Major Accidents Ordinance of 2000 for establishments that are subject to the basic obligations of the Major Accidents Ordinance of 2000 (SFK Working Group on Management Systems)
- LAI/LASI report: Guidance notes on inspection systems as defined under Art. 16 of the Major Accidents Ordinance

Safety management systems

- SFK-GS-24 (Rev. 1): Guidance on the presentation of a major accident prevention policy and a safety management system as defined in Art. 9 para. 1 no. 1 in connection with Annex III of the Major Accidents Ordinance of 2000. (SFK Working Group on Management Systems)
- SFK-GS-25: A compilation and analysis of material relating to safety management systems (SFK Working Group on Management Systems)
- SFK-GS-31: Aid for integration of a safety management system pursuant to Annex III of the Hazardous Incident Ordinance 2000 within existing management systems (SFK Working Group on Management Systems)
- UBA/BMU research project: Safety management in small and medium-sized enterprises, UBA Texte 67/98

Other reference sources

- Recommendation of the European Parliament and of the Council of 4 April 2001 providing for minimum criteria for environmental inspections in the Member States (2001/331/EC, Official Journal of the EU 27.04.2001, no. L 118, p. 41)
- TAA research project: Development of inspection instruments for carrying out systematic inspections, start date: 01/2002
- Final report of the research project: Industrial parks and major accidents legislation – developing criteria to ensure that major-accident installations assume responsibility for safety in industrial parks (Research report 299 48 325), UBA Texte no. 31/02
- Conclusions and recommendations from the OECD Workshop on Audits and Inspections related to Chemical Accident Prevention, Preparedness and Response (Madrid/Spain, 6-9 March 2001)
- Results of the OECD workshop on “Integrated Management of Safety, Health, Environment and Quality” (Seoul/Korea, 26-29 June 2001)
- SFK-GS-32: Guidance: Human factor aspects for establishments and installations under the Major Accidents Ordinance (12. BImSchV) (SFK Human Factor Working Group)
- SFK-GS-33: Guidance: Steps for identifying the state of the art safety technology (working group of the same name)
- SFK-GS-35: Guidance: Systematic presentation of questions and answers concerning the term "establishment" as used in Art. 3 para. 5a Federal Pollution Control Act (SFK’s Seveso Directive Working Group)
- UBA research project: Development of guidance notes for developing and assessing the major accident prevention policy, UBA-Texte 15/02

2.2 Occupational health and safety

In the European Union, a distinction is made in the field of occupational health and safety between requirements relating to the construction and requirements relating to the operation of equipment (tools, appliances, machinery, plant). Some of the most important Directives, which like the Seveso II Directive, include requirements relating to environmental protection and occupational health and safety, are listed below:

Construction of equipment

- Directive 98/37/EC of the European Parliament and of the Council of 22 June 1998 on the approximation of the laws of the Member States relating to machinery (Machinery Directive)
- Directive 94/9/EC of the European Parliament and of the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres
- Directive 97/23/EC of the European Parliament and of the Council of 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment (Pressure Equipment Directive – PED)

Operation of equipment

- Directive 1999/92/EC of the European Parliament and of the Council of 16 December 1999 on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres (15th individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC)
- Council Directive 89/654/EEC of 30 November 1989 concerning the minimum safety and health requirements for the workplace (first individual Directive within the meaning of Article 16 (1) of Directive 89/391/EEC)
- Council Directive 95/63/EC of 5 December 1995 amending Directive 89/655/EEC concerning the minimum safety and health requirements for the use of work equipment by workers at work (second individual Directive within the meaning of Article 16 (1) of Directive 89/391/EEC)

The directives relating to condition of equipment such as Directive 94/9/EC (ATEX 100a) or Directive 97/23/EC (PED) have been transposed into German law as secondary legislation to the

- Act on technical equipment – Equipment Safety Act – as promulgated on 11 May 2001

The Equipment Safety Act also applies to the construction and operation of plant subject to inspection. Since 3 October 2002, the safety requirements for plant subject to inspection and the provision and use of equipment at work have also been regulated by the

- Ordinance on safety and health protection in the provision of equipment and its use at the work place, on safety during the operation of plant subject to inspection and on the organisation of occupational health and safety (Operational Safety Ordinance – BetrSichV)

Since the requirements relating to the construction of equipment, in particular for plant subject to inspection, are largely harmonised by EC Directives, both the Technical Regulations for Plant Subject to Inspection and the rules and regulations of the institutions for statutory accident insurance and prevention, which to date were generally applicable, in particular in the area of equipment, can – or must – be transposed into operation regulations. At present the Technical Regulations for Plant Subject to Inspection are being revised, as are the rules and regulations of the institutions for statutory accident insurance and prevention, in order to separate off the requirements relating to the construction of equipment and harmonise them with the requirements of the Operational Safety Ordinance. The Committee on Operating Safety plans to publish these revised regulations as" state of the art technology" via the German Ministry of Labour and Social Affairs in the Bundesarbeitsblatt (Federal Labour Gazette).

3 Distribution of roles and duties

Integrated inspection and auditing of installations consists of the following elements:

- Voluntary internal auditing and control by **operators**
- Inspections by the **competent authorities**
- Safety testing and inspections by official **experts or approved bodies**

In connection with the inspection and auditing of installations, the area of conflict within which the state must fulfil its obligations becomes clear. The state is both guarantor of certain constitutional rights, such as freedom of ownership, occupational freedom, general personal freedom and freedom of trade, while at the same time being trustee of the public interest and therefore responsible for protecting the public and the common goods such as air, water, soil etc.

The German Basic Law, or constitution, is based on the idea of the responsible and self-determining citizen, which automatically implies that the operator of an installation must take responsibility for the safe operation of his installation. Consequently, this responsibility primarily involves the operator carrying out auditing and control activities himself. Having said that, the state may – or indeed must – as a result of its responsibility set standards for how internal control is carried out by the operators themselves. Ultimately it has been proven to be the case that the more operators carry out their own internal control, the more effective is state inspection. Correspondently, a concerted interaction between the two parties should be ensured.

However, the inspection authorities must also fulfil the responsibility they have for protecting the general public and carry out inspections to check whether installations are actually being operated in compliance with what is required by law (here: requirements imposed when the permit was granted as well as obligations anchored within laws and ordinances and other regulations such as those issued by the institutions for statutory accident insurance and prevention). To this end, the authorities carry out their own inspections and audits. Where necessary, they may also call upon external expertise to review particular safety issues, an option which is explicitly enabled in various legislation (e.g. Art. 29a of the Federal Pollution Control Act, Art. 16 para. 3 of the Major Accidents Ordinance).

In the field of occupational health and safety in Germany, the system of institutions for statutory accident insurance and prevention, designed to prevent accidents in the workplace, occupational disease and risk to health from occupational factors, exists alongside the state system. The provisions of Chapter 2 of the Social Security Code *VII (Sozialgesetzbuch VII)* () constitute the basis for the prevention mandate of the statutory accident insurers. These state that the statutory accident insurer shall not only give advice on but also carry out inspections of the to ensure occupational health and safety. Special mention is made of the need for collaboration between statutory accident insurers and the competent authorities at *Länder* level responsible for occupational health and safety.

The inspection activities of the statutory accident insurers (in the field of industry and commerce these are the institutions for statutory accident insurance and prevention - *Berufsgenossenschaften*) are comparable to those of the occupational health and safety authorities and in the references to distribution of roles and obligations in this report are included within the term “inspection by the competent authorities."

Process installations, including storage and filling-facilities are highly complex structures and consist of components such as apparatus, machinery, pipelines, process control equipment etc., the operation and inspection of which is regulated by different legislation both within and beyond the field of pollution control legislation. The Equipment Safety Act and the regulations on plant subject to inspections based on it are of particular importance here. On the basis of existing EC Directives, national ordinances and the corresponding technical regulations, the necessary inspections are carried out by official experts or approved bodies and qualified persons in the proven manner.

The term approved bodies, used here as a collective term, applies both to notified bodies referred to in EC Directives (e.g. Pressure Equipment Directive) that inspect both the construction and production of plant subject to inspection and to authorised inspection bodies, which are cited in the Operational Safety Ordinance as the inspection institution.

Within this overall framework, operators, competent authorities and official experts or approved bodies have different duties to fulfil. This applies to the type of audits, controls and inspections, the extent of the inspections, the depth and content of inspections, audit and inspection intervals, inspection procedures and documentation of inspection and audit activities.

3.1 Internal auditing and control by operators

The control systems implemented by operators themselves as a part of integrated inspection and auditing of installations cover principally the areas of technical and organisational safety of installations, infrastructure, activities, processes and procedures. Many operators now have an integrated management system, which covers all relevant safety aspects and requirements applicable to installations throughout their entire life cycle. Checks and controls are continually carried out by a large circle of different people.

Within the framework of internal auditing and control by operators, people employed include:

- Representatives appointed by the company, as required by law, including the Major Accidents Officer
- Experts and inspection bodies
- Inspectors from inspection departments within the company
- Qualified persons

The auditing and control measures are carried out on the basis of internal guidelines and instructions resulting from the operator putting into practice his own operating experience, whilst also taking into account the relevant legal parameters. An explicit t mention of the legal basis is not made here.

For the safe operation of installations it is first necessary to identify the hazards associated with them and assess the risks. The measures required to avoid or control these risks are mainly technical and organisational in nature and, taken in their entirety, make up the safety concept for an installation.

Auditing and control activities begin as early as the planning stage of an installation and the corresponding concepts are then updated throughout the entire lifetime of an installation. **Annex 1** describes the ongoing auditing and control activities of an operator, using the

example of a company in the chemical industry. There may be a number of differences between this installation and those in other industry sectors, but they are a question of degree, because the legal framework, which ensures installation safety in the context dealt with here, is comparable.

3.2 Inspections by the competent authorities

In accordance with the Basic Law (Grundgesetz), inspections by public authorities in the Federal Republic of Germany is normally carried out at *Länder,* or state, rather than federal, level.

The inspection activities of the authorities must fulfil the state duty to protect the objects of legal protection the legal rights of third parties (e.g. health, life etc. as set out in Art. 2 para. 2 of the Basic Law). They must furthermore comply with the constitutional mandate to protect the environment (Art. 20a of the Basic Law) .

In any integrated approach to inspections and auditing of installations, the inspection activities of the authorities, as prescribed by the following legislation, are of particular importance:

- Pollution Control Act,
- Federal Water Act,
- Chemicals Act,
- Equipment Safety Act, and
- Occupational Health and Safety Act

The specific inspection obligations of the prevention departments of the statutory accident insurers in the field of occupational health and safety have already been described in the previous chapter.

In the field of installation safety, the significance of inspections by state authorities is given special emphasis in the provisions of the Seveso II Directive. These stipulate that the competent authority must set up an inspection system appropriate to the type of establishment in question and facilitate a regular and systematic inspection of the technical, organisational and management systems of the establishment. This provision was incorporated into Art. 16 of the Major Accidents Ordinance as an obligation of the authorities and sets out in concrete terms the inspection duties of the authorities that are anchored in Art. 52 Federal Pollution Control Act and Art. 21 of the Chemicals Act (ChemG). The provisions and jurisdictions provided for under technical legislation that exist alongside the Major Accidents Ordinance are unaffected. It is important that the competent authority/authorities with lead responsibility ensure that the results of the technical inspections undertaken on the basis of other areas of legislation are taken into account when inspecting establishments as set out in Art. 16 para. 1 and para. 2 of the Major Accidents Ordinance to ensure that duplication of inspections is avoided.

The authority is authorised by law to call upon third parties to assist in their inspection duties. For example, Art. 52 Federal Pollution Control Act stipulates that third parties – as a rule official experts – may be appointed and Art. 29a of the Federal Pollution Control Act states that safety inspections (Art. 29a-BImSchG – inspection) by official experts may be ordered.

In the case of installations that are subject to licensing, the authority verifies compliance with legal requirements in advance, i.e. during the licensing process. During construction and subsequent operation of the installation and following shutdown, the authority inspects whether the operator is meeting his obligations. Irrespective of whether the installation is subject to licensing or not, the authority may use administrative compulsion instruments to implement any necessary measures.

3.3 Safety inspections by official experts or approved bodies

Various areas of legislation, such as the Federal Pollution Control Act, Occupational Health and Safety Act, Equipment Safety Act and Federal Water Act, make provision for the authorities, manufacturers or operators to appoint official experts or approved bodies to carry out safety inspections.

These acts also form the basis for the transposition into national law of EU Directives such as the Pressure Equipment Directive and the Seveso II Directive. The bodies that have (usually) been accredited by the individual EU states to carry out these so-called conformity assessment procedures – in so far as required by the Directives – are notified to the EU Commission in Brussels, which publishes them in a list.

For the integrated inspection and auditing of installations official experts named by the individual state ministries, publicly accredited and sworn in by the Chamber of Industry and Commerce or recognised by the Association of Indemnity Insurers, e.g. with expertise in the field of fire protection in buildings, ventilation systems or electrical installations (including emergency alarm systems) play an important role.

Federal Pollution Control Act (BImSchG)

Under the provisions of the Federal Pollution Control Act, official experts are contracted by the operator or the authorities. Art. 29a para. 1 of the Federal Pollution Control Act states that *"the competent authority may order the operator of an installation subject to licensing to contract an official expert who has been notified by the competent authority according to state (Länder) legislation (Art. 29a-BImSchG - official experts) to carry out certain safety inspections and inspections of documentation on safety systems. The order may also permit the inspections to be carried out by the Major Accidents Officers (Art. 58a BImSchG), by an approved body as set out in Art. 14 para. 1 of the Equipment Safety Act or by a named official expert as set out in Regulations issued in accordance with Art. 2 para. 2a of the Equipment Safety Act, provided that said expert possesses the required expertise and equipment and is deemed reliable; the same applies to official experts appointed under Art. 36 para. 1 of the Trade and Industry Code (*Gewerbeordnung*) providing proof of particular expertise in the field of safety inspections. The competent authority is authorized to issue detailed requirements regarding the type and extent of the safety inspections and the submission of the inspection results."*

In 1995, the Länder Committee on Pollution Control (LAI) passed a" Guidance on the notification of experts in accordance with Art. 29a para. 1 of the Federal Pollution Control Act." On this basis, the Länder notify official experts as set out in Art. 29a of the Federal Pollution Control Act.

Art. 16 para. 3 of the Major Accidents Ordinance states that *"without prejudice to Art. 29a of the Federal Pollution Control Act, the competent authority may appoint a suitable official expert to carry out the inspection as required by para. 2 no. 1, to prepare a report as required*

by para. 2 no. 2 and to review any necessary follow-up measures as set out in para. 2 no. 3. The brief must include the requirement to submit to the competent authority the report, as required under para. 2 no. 2 and the result of the inspection as required under para. 2 no. 3, within four weeks of completion of the report or completion of the inspection."

Art. 13 of the Licensing Procedure Ordinance (9th BImSchV) prescribes that *"as far as necessary to assess the licensing prerequisites, the licensing authority obtains reports by official experts The official expert should, if possible, be commissioned by the time of notification of the project (Art. 8). If, in accordance with Art. 4b para. 2 of the Licensing Procedure Ordinance, the application is required to include a safety report for the installation as set out in Art. 18 para. 1 of the Major Accidents Ordinance or those sections of the safety report required by Art. 9 of the Major Accidents Ordinance , which correspond to sections II no. 1 and 3, III, IV and V no. 1 to 3 of Annex II to the Major Accidents Ordinance, reports by official experts are generally required to appraise the information given in these documents."* With the consent of the applicant, official experts may also be called upon if it is to be expected that this will accelerate the licensing process.

Equipment Safety Act (GSG), Pressure Equipment Directive (PED) and Operational Safety Ordinance (BetrSichV)

Under legislation valid to date, inspections of the construction and operation of installations subject to inspections with a high hazard potential were carried out in an integrated approach by official experts. The basis for this is defined in the Equipment Safety Act .

After introduction of the EC Directives, which regulate free movement of goods including components of installations subject to inspections, regulations about inspections during construction in the individual ordinances cited above had to be repealed to avoid duplication of inspections. In the field of inspecting the construction of pressure equipment that is potentially hazardous, PED (97/23/EC), under which inspections during manufacturing are carried out by Notified Bodies, has been applicable since 29.11.1999. The PED was implemented by the 14th Ordinance on Equipment Safety (Pressure Equipment Ordinance) in conjunction with the Operational Safety Ordinance. Since 29.05.2002, the PED alone must be used to determine the construction of Pressure Equipment. As prescribed under the PED, the Federal Government notifies the German inspection bodies to the EU Commission in Brussels following a national accreditation process with the Central Office for Safety Technology of the German States (Zentralstelle der Länder für Sicherheitstechnik - ZLS). This form of technical inspection is carried out by organisations.

As a result of a resolution by the *Bundesrat,* or Parliamentary Upper House, the individual responsibility for technical inspection during operation of plant subject to inspection is transferred to organisations. The Equipment Safety Act was amended correspondingly on 27 December 2000. The old, individual ordinances for plant subject to inspection were made obsolete by the restructuring of operational and installations safety legislation. Instead the comprehensive Operational Safety Ordinance was created. It deals with plant subject to inspection, such as pressure vessel plant (including simple pressure vessels), elevators , plant in areas of explosion risk, as well as storage facilities for flammable, highly flammable or extremely flammable liquids. This ordinance became applicable to the operation of plant subject to inspection on 01.01.2003 .

For assessing compliance with operating requirements, instead of official or officially recognised experts, Authorised Inspection Bodies were defined and criteria for their approval listed. The *Länder* can also influence the requirements and appointment of Authorised Inspection Bodies.

A so-called “model *Länder”* ordinance is currently being drawn up. In the case of the Autorised Inspection Bodies, the authorities will no longer appoint individual official experts but the organisation per se. The management of the organisation will have sole responsibility for ensuring that the inspection activities are carried out in adherence to the stipulations of the Operational Safety Ordinance.

The revised version of the Equipment Safety Act represents a fundamental departure from the former individual-related system of technical inspection, around which their entire structure was built. To be able to deal with the restructuring required, particularly within the technical inspection organisations (e.g. TÜV), a transitional period has been defined, which has become known as “5+2.” This means that until the end of 2005 those inspections of plant subject to inspection which in the Operational Safety Ordinance are allocated to the Authorised Inspection Bodies will be carried out only by official experts or those officially approved for this purpose.

After two more years, pre-existing plant will also be inspected solely by these official experts.

Federal Water Act (WHG)

Art. 19i para. 2 of the Federal Water Act in conjunction with the provisions of *Länder* law (Art. 23 of the Ordinance on Facilities for Handling Substances Hazardous to Water and on Specialist Firms - VAwS) stipulates the conditions under which the operator of an installation handling substances constituting a hazard to water must be inspected by official experts. Official experts as defined under Art. 19i para. 2 no. 3 of the Federal Water Act are persons appointed by legally responsible organisations (Art. 22 VAwS) to carry out the inspections . These organisations are approved by the competent authorities at *Länder* level. The authority thus does not appoint official experts individually but the organisation, accepting its internal procedures for appointing experts.

As a rule, installations that handle substances constituting a hazard to water are also subject to other legal standards (e.g. the Operational Safety Ordinance), which similarly require inspections of operating safety to be carried out at specific times. To some extent it is therefore possible to comply with the requirements of the Federal Water Act through these other inspections that are not connected to water legislation. It therefore makes sense that official experts can act within different areas of the law at the same time whilst carrying out a single inspection.

4 Units of inspection

The observations of the Working Group on Inspection and Auditing of Installations refer to establishments and installations that are subject to the Major Accidents Ordinance. The units under inspection as part of a system of integrated auditing and inspections of installations are:

Establishment	Installation
Safety-relevant part of an establishment	Safety-relevant part of an installation

Establishment

The stipulations of the Second and Fourth Part of the Major Accidents Ordinance apply to establishments in which dangerous substances are present in quantities that reach or exceed the threshold quantities cited in the Annex to the ordinance. Art. 3 para. 5a of the Federal Pollution Control Act defines the establishment as" *the entire area under the control of an operator, in which dangerous substances as defined in Art. 3 no. 4 of Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances (Official Journal of the EC 1997 no. L 10 p. 13) are present in one or more installations, including common or related infrastructures or activities including storage as defined in Art. 3 no. 8 of the Directive in the quantities described in Art. 2 of the Directive. "Present" includes the actual or anticipated presence or the presence of those, which it is believed, may be generated during loss of control of an industrial chemical process; the equipment, hazards and activities listed in Art. 4 of Directive 96/82/EC are excluded."*

Infrastructure includes energy and media supply, pipeline systems, loading and unloading facilities, since product can be transferred through pipelines, for example, from one plant to be used in another.

Activities can be, for example:

- Transport, supply
- Storage, loading and unloading of substances and preparations
- Manufacture of substances by chemical reaction
- Handling substances (grinding, mixing, transfer, packaging etc.)
- Synthesis and analysis of substances, e.g. in laboratories
- Application of protective metallic coatings to metal surfaces
- Varnishing
- Operation of refrigerating plants

An establishment may comprise one or more installations .

Safety-relevant parts of an establishment

This term covers parts of an establishment that contain particular substances in certain quantities, safety equipment or other equipment and systems that are important to operating safety. Generally speaking, safety-relevant parts of an establishment exceed the dimensions of safety-relevant parts of an installation and can therefore comprise several safety-relevant elements of an installation, a process unit or even an entire installation.

Installation

Art. 3 para. 5 of the Federal Pollution Control Act defines installations as

- *"Facilities and other stationary works ,*
- *Machines, equipment and other non-stationary technical facilities, as well as vehicles with the exception of those subject to the provisions of Article 38, and*
- *premises used to store or deposit materials or to carry out work which might cause emissions, with the exception of public highways."*

The scope of the Major Accidents Ordinance is no longer confined to installations subject to licensing; installations not subject to licensing may now also come under the scope of this area of the law. That means that both installations subject to licensing and installations not subject to licensing are to be considered

Safety-relevant parts of an installation

The safety-relevant parts of an installation to which the Major Accidents Ordinance refers are those parts of the installation that are identified during a hazard analysis.

Safety-relevant parts of an installation are:

- Parts of an installation containing particular substances
- Safety equipment
- Other parts of an installation necessary for operational safety.

Reference is made to report TAA-GS-24 .

5 Extent of inspections and procedures within integrated auditing and inspection of installations

The aim of integrated auditing and inspection of units considered according to chapter 4, is to bring the establishment, installation and/or parts of an installation into a technical, organisational and managerial condition that ensures safe operation, prevents major accidents and limits the consequences of major accidents as far as possible, and to maintain that condition.

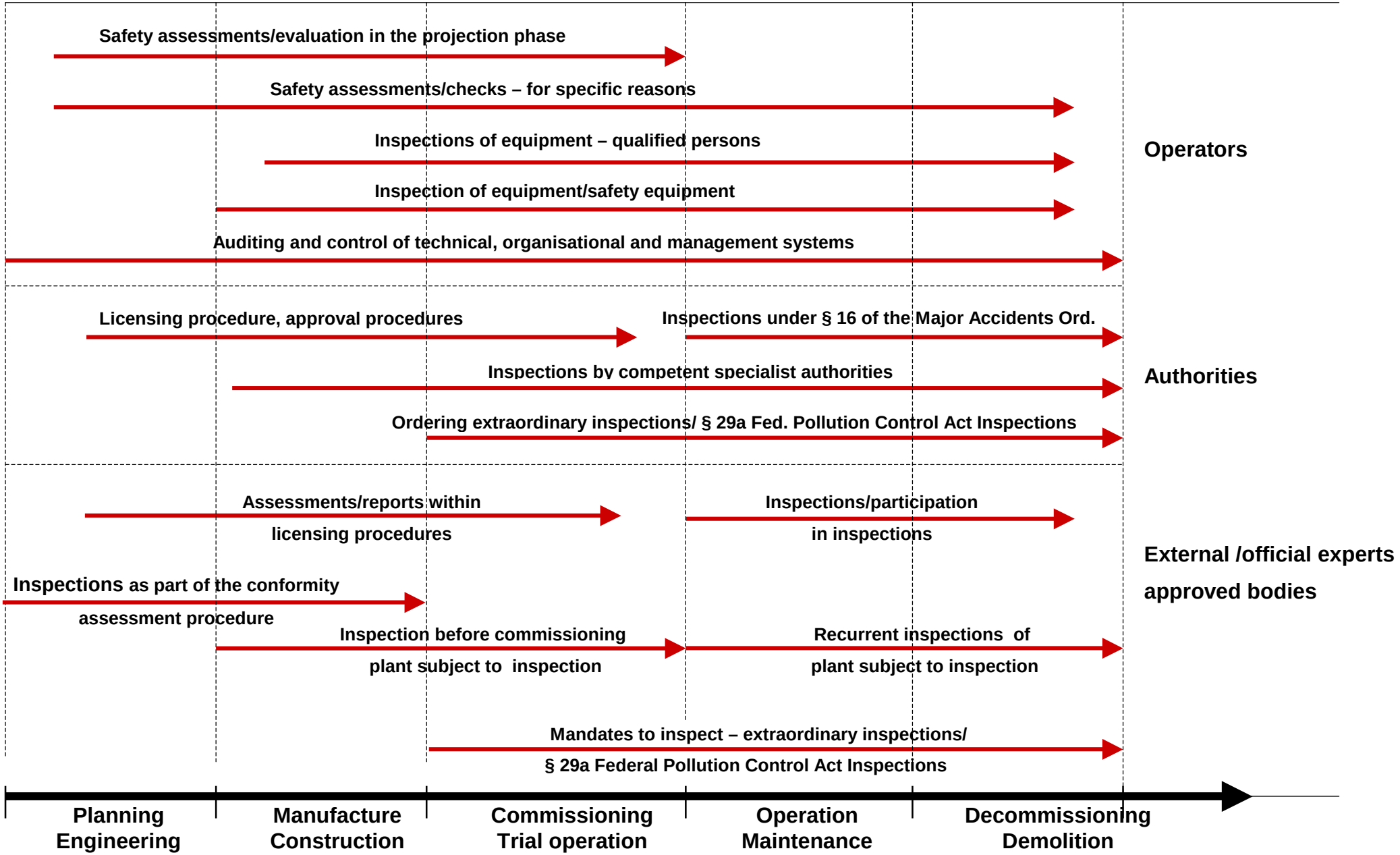
Integrated auditing and inspection of installations is a cohesive system, comprising the safety inspections required by different areas of the law (Pollution control, occupational health and safety, water pollution control, soil protection), industrial standards (VDMA, VdTÜV, VDE, DIN, VDI etc.) and regulations of the institutions for statutory accident insurance and prevention and internal company standards/guidelines that cover the entire life cycle of the units being considered :

- Planning and engineering
- Manufacture and construction
- Start-up and trial operation
- Operation, maintenance (servicing, checks, repair)
- Decommission and demolition

The relevant control measures can be assigned to the individual phases by the operator, the authorities and the official/external experts or approved bodies acting within the scope of an integrated system of auditing and inspection installations.

Fig. 5.1 gives an overview of the safety control measures in the sense of an integrated auditing and inspection of installations throughout all the phases of an installation’s life cycle and cites the parties involved (operators, authorities and official/external experts and approved bodies).

Figure 5.1: **Safety control measures in the sense of an integrated auditing and inspection of installations throughout all the phases of an installation's life cycle**



The purpose, subject and timing of the individual inspections, as depicted in Fig. 5.1, are listed in Tables 5.1 to 5.3 by party involved (operators, authorities and external/official experts/approved bodies) and described in detail.

The procedure followed in the individual inspections is determined by the legal provisions, technical regulations etc. upon which they are based (cf. Chapter 2); the same applies to the form in which the results of the inspection are documented.

Procedure and documentation of other internal audits and control measures and maintenance operations carried out by the operator are regulated within the safety management system.

Table 5.1 Internal audits and control measures carried out by the operator (by in-house personnel or by contracted experts)

1. Inspections/safety assessments during the projection stage

Purpose	Subjects	Time (period)
1. Identifying and evaluating safety concepts and solutions	- Safety assessments - Identification of hazards/analysis of hazards - Catalogue of measures	Early on in the planning procedure
2. Inspections/checks during the preparation of detailed planning documentation to implement the safety concept	- Implementation of the safety concept and solutions in the detailed planning - Further safety assessments - Compliance with requirements imposed by primary and secondary legislation - Compliance with conditions imposed	During the detailed planning phase
3. Inspections and assessments during the development of licensing documents	- Whether documents are complete - Whether licensing requirements have been met - Whether deadlines have been met - Description of the extent to which the state of the art safety technology is being used	Before the licensing procedure and accompanying it
4. Inspections/checks/acceptance, including on site, to implement planning conditions at the installation	- Whether documentation is complete - Whether necessary inspections have taken place and documentation is available - On-site inspections to check compliance with planning documents - Compliance with requirements imposed by primary and secondary legislation - Compliance with conditions imposed	During the later stages of the project, during manufacture, delivery, construction and commissioning
5. Inspections and assessments during the preparation of documentation to fulfil certain operators' obligations (e.g. safety report, internal alarm and emergency plan)	- Whether necessary documents are complete and informative - Whether deadlines have been met	Within stipulated deadlines

Table 5.1 Internal audits and control measures carried out by the operator (by in-house personnel or by contracted experts)

2. Safety assessments/inspections – for specific reasons

Purpose	Subjects	Time (period)
Review of special situations	- Inspection of installations/parts of installations - Assessment of modifications in installations - Investigation of events - Internal studies	At any time

3. Inspection of technical and organisational conditions and systems

Purpose	Subjects	Time (period)
Inspection of existing systems following a defined scheme or for a particular reason	- Safety assessments for installations - Inspection of operational and organisational units - Compliance with legal requirements and internal regulations and agreements - Functional achievements of the organisation/business unit - Assessment of operational procedures - Audits - Analysis of events and follow-up - Assessment of management system	At any time

Table 5.1 **Internal audits and control measures carried out by the operator (by in-house personnel or by contracted experts)**

4. Inspection of equipment/specific installations subject to inspections by qualified persons/experts

Purpose	**Subjects**	**Time (period)**
1. Inspection of equipment and certain installations subject to inspection before commissioning	- Proper assembly and condition - Safe functioning - Hazard appraisal (equipment) - Safety assessment - Establish timetable for recurrent inspections - Accompanying documentation/operating instructions	Before commissioning
2. Recurrent inspections of equipment and certain installations subject to monitoring	- Proper condition - Safe functioning - Freedom from damage/defects - Incorporation of hazard assessment - Establish timetable for recurrent inspections	After commissioning within specified deadlines
3. Extraordinary inspections of equipment and specific installations subject to inspection	- Proper condition - Safe functioning - Freedom from damage/defects	For specific reasons, as ordered by the authority, after serious accidents

Table 5.1 **Internal audits and control measures carried out by the operator (by in-house personnel or by contracted experts)**

5. Other inspections carried out in installations by qualified personnel under the responsibility of the operator (e.g. process control equipment, safety-relevant equipment)

Purpose	**Subjects**	**Time (period)**
1. Receiving inspection and testing of equipment parts	- Proper condition - Size of delivery /identity of equipment - Accompanying documentation	Before assembly
2. Inspection before commissioning	- Proper assembly - Safe functioning - Establish timetable for recurrent inspections	Before commissioning
3. Recurrent inspections	- Proper condition - Safe functioning - Freedom from damage/defects - Establish timetable for recurrent inspections	Within stipulated deadlines

Table 5.2 Inspection/assessment activities of the authorities

1. Assessment within licensing/permit/approval procedures

Purpose	Subjects	Time (period)
1. Assessment of the licensing application by the authority in preparation for the licensing decision	- Appraisal of licensing requirements/state of the art safety technology - Fulfilment of legal requirements - Completeness of documents	After submission of licensing documents
2. Assessment by technical authorities	- Opinions on technical aspects	Within the licensing procedure

2. Permit procedure for certain installations subject to inspection

Purpose	Subjects	Time (period)
Assessment by the competent authority in preparation for the permit decision	- Appraisal of documents and requirements	Before commissioning an installation that is subject to permitting

3. Inspections required under Art. 16 of the Major Accidents Ordinance

Purpose	Subjects	Time (period)
Inspection of establishments by the competent authority	- On-site inspections set out in the inspection programme - Regular and systematic inspection of the technical, organisational and management-specific systems - Verification of whether measures necessary to prevent major accidents have been put in place - Verification of whether appropriate means of mitigating the effects of a major accident are planned - Verification of whether information given in the safety report, major accident prevention policy or other information submitted, properly reflects the actual situation - Verification of whether the necessary information to the public on safety measures and the requisite behaviour in the event of an accident has been provided - Review of follow-up measures	At recurrent times during operation

Table 5.2 Inspection/assessment activities of the authorities

4. Inspections by competent technical authorities on the basis of relevant legislation

Purpose	Subjects	Time (period)
1. Inspection of installations, buildings, workplaces as timetabled or for a specific reason	- Proper condition of technical equipment - Compliance with legislation - Fulfilment of requirements - Compliance with conditions imposed during licensing and any other conditions imposed - Review of follow-up measures - On-site inspections	From start of construction through to disposal
2. Inspections/review of organisational measures	- Compliance with legislation - Fulfilment of requirements - Compliance with conditions imposed - Review of follow-up measures - On-site inspections	From start of construction through to disposal

Table 5.3 Inspections by official experts and approved bodies

1. Inspections/expert reports within the licensing procedure (new licenses and amendments to licenses)

Purpose	Subjects	Time (period)
Inspections/assessments of particular aspects or application documents	As commissioned by the competent authority or operator, e.g. - Report to review information given in the application documentation - Report on specific questions regarding the project - Compliance with technical regulations - Description of the extent to which the state of the art safety technology has been used	Within the licensing procedure

2. Participation in inspections required under Art. 16 para. 3 of the Major Accidents Ordinance

Purpose	Subjects	Time (period)
Inspections in establishments	- On-site inspections set out in the inspection programme - Regular and systematic review of technical, organisational and management-specific systems - Verification of whether measures necessary to prevent major accidents have been put in place - Verification of whether appropriate means of mitigating the effects of a major accident are planned - Verification of whether information given in the safety report, major accident prevention policy or other information submitted properly reflects the actual situation - Verification of whether the public has been given access to the required information - Review of follow-up measures	After commissioning, when ordered by the competent authority

3. Performance of extraordinary inspections ordered by the authorities including those under Art. 29a-Federal Pollution Control Act

Purpose	Subjects	Time (period)
Specially defined safety inspections commissioned by the operator or ordered by the competent authority (e.g. Art. 29a-Federal Pollution Control Act)	As commissioned by the competent authority or operator, e.g. - Defined safety inspections - Inspection of safety documents - Compliance with conditions imposed including licensing conditions - Clarification of incidents	When initiated by the competent authority or when commissioned by the operator

Table 5.3 Inspections by official experts and approved bodies

4. Inspections within the conformity assessment procedure (example: pressure equipment and assemblies)

Purpose	Subjects	Time (period)
1. If Module A1 is used: monitoring of manufacturer's final assessment following internal manufacturing checks	- Appraisal of manufacturer's final assessment - Checks on pressure equipment in manufacturing and storage facilities - Monitoring in the form of unannounced visits	At the beginning of manufacture and throughout the manufacturing process at specified intervals
2. If Module B is used: EC type-examinations	- Assessment of a representative example, (where applicable, assembly), known as" type" - Verification that the manufacture of the type complies with the technical documents - Establish which components were designed in compliance with the national standards that implement the harmonised standards - Examine the technical documentation in terms of design and manufacturing procedures - Assess the materials used where these are not in conformity with the relevant harmonized standards or with a European approval for materials - Check the certificates issued by the material manufacturer - Approve the procedures for the permanent joining of pressure equipment parts or check that they have been previously approved - Verify that the personnel undertaking the permanent joining of pressure equipment parts and the non-destructive tests are qualified or approved - Where the manufacturer has chosen to apply the relevant standards, verify and carry out tests to establish that these have been correctly applied - Where the manufacturer has chosen not to apply the relevant standards, verify and carry out tests to establish the solutions adopted by the manufacturer meet the essential requirements of the PED - Issue EC type-examination certificate	Before further manufacture of the type of pressure equipment described in the type-examination
3. If Module B1 is used: EC design-examination	- Establish which components were designed in compliance with the national standards that implement the harmonised standards - Assess the materials used where these are not in conformity with the relevant harmonized standards or with a European approval for materials - Approve the procedures for the permanent joining of pressure equipment parts or check that they have been previously approved - Verify that the personnel undertaking the permanent joining of pressure equipment parts and the non-destructive tests are qualified or approved - Where the manufacturer has chosen to apply the relevant standards, verify and carry out tests to establish that these have been correctly applied	Before manufacture of corresponding pressure equipment

Table 5.3 Inspections by official experts and approved bodies

4. Inspections within the conformity assessment procedure (example: pressure equipment and assemblies)

Purpose	Subjects	Time (period)
	- Where the manufacturer has chosen not to apply the relevant standards, verify and carry out tests to establish the solutions adopted by the manufacturer meet the essential requirements of the PED - Issue EC type-examination certificate	
4. In cases where Module C1 is used and there is an EC type-examination certificate: monitoring of manufacturer's final assessment	- Appraisal of manufacturer's final assessment - Checks on pressure equipment in manufacturing and storage facilities - Monitoring in the form of unannounced visits	At the beginning of manufacture and throughout the manufacturing process at specified intervals
5. In cases where Module D is used and there is an EC type-examination certificate and EC-design-examination certificate: assessment (approval) and monitoring of the manufacturer's quality system for production, final inspection and other tests	- Assessment and approval of the quality system - In the case of quality systems that are based on the corresponding harmonised standard (DIN ISO 9000 series), compliance with the requirements is assumed - Periodic checks/audits with reassessment every three years - Where necessary, assessment of planned modifications to the quality system - Monitoring to ensure that the manufacture fulfils the obligations arising out of the quality system as approved - Unannounced check-up visits to the manufacturing plant to verify that the quality system is functioning correctly	At the beginning of manufacture and throughout the manufacturing process
6. If Module D1 is used: assessment (approval) and monitoring of the manufacturer's quality system for production, final inspection and other tests	Subjects as in 5.	At the beginning of manufacture and throughout the manufacturing process

Table 5.3 Inspections by official experts and approved bodies

4. Inspections within the conformity assessment procedure (example: pressure equipment and assemblies)

Purpose	Subjects	Time (period)
7. In cases where Module E is used and there is an EC type-examination certificate: assessment (approval) and monitoring of the manufacturer's quality system for production, final inspection and other tests	Subjects as in 5., taking into consideration the manufacturer's - final inspection, and - other tests	At the beginning of manufacture and throughout the manufacturing process
8. If Module E1 is used: assessment (approval) and monitoring of the manufacturer's quality system for final inspection and other tests	Subjects as in 5., taking into consideration the manufacturer's - final inspection, and - other tests	At the beginning of manufacture and throughout the manufacturing process
9. If Module F is used and there is an EC type-examination certificate and EC-design-examination certificate: individual product testing	- Examination and testing of each individual item of pressure equipment to verify that it conforms to the type that applies to it and to the requirements of the PED - Verify that the personnel undertaking the permanent joining of pressure equipment parts and the non-destructive tests are qualified or approved - Check the certificates issued by the material manufacturer - Final inspection - Proof test - Examine the safety devices - Issue a certificate of conformity - Affix the identification number	Before delivery

Table 5.3 Inspections by official experts and approved bodies

4. Inspections within the conformity assessment procedure (example: pressure equipment and assemblies)

Purpose	Subjects	Time (period)
10. If Module G is used: EC testing of individual products	- Examine the design and construction of each item of pressure equipment and during manufacture perform appropriate tests to ensure its conformity with the requirements of the PED - Examine the technical documentation with respect to the design and the manufacturing procedures - Assess the materials used where these are not in conformity with the relevant harmonized standards or with a European approval for materials - Check the certificates issued by the material manufacturer - Approve the procedures for the permanent joining of pressure equipment parts or check that they have been previously approved - Verify that the personnel undertaking the permanent joining of pressure equipment parts and the non-destructive tests are qualified or approved - Final inspection - Proof test - Examine the safety devices - Issue a certificate of conformity - Affix the identification number	Before delivery
11. If Module H is used: assessment (approval) and monitoring of the manufacturer's quality system for design, manufacture, final assessment and other tests carried out by the manufacturer	Subjects as in 5., taking into consideration - design - manufacture - final inspection, and - other tests carried out by the manufacturer	At the beginning of manufacture and throughout the manufacturing process
12. If Module H1 is used: assessment (approval) and monitoring of the manufacturer's quality system for design, manufacture, final inspection and other tests carried out by the manufacturer, with design examination and particular monitoring of the final assessment.	Subjects as in 5., taking into consideration - design - manufacture - final inspection - other tests carried out by the manufacturer; plus in addition: - examination of the design - Issue of an EC design-examination certificate - Special monitoring of the final assessment in the form of unannounced visits (including examinations of the pressure equipment)	At the beginning of manufacture and throughout the manufacturing process

Table 5.3 Inspections by official experts and approved bodies

5. Inspection of installations/equipment subject to inspection

Purpose	Subjects	Time (period)
1. Inspection of installations subject to inspection prior to commissioning	- Proper assembly and installation - Review of completeness - Accompanying documentation - Incorporation of the safety assessment - Safety accessories - Establish schedule for recurrent inspections - Assembly and erection inspection - Safe functioning	Before commissioning
2. Recurrent inspections of installations subject to inspection and other equipment	- Proper condition - Safe functioning - Freedom from damage/defects - Establish schedule for inspection intervals	After commissioning within specified deadlines
3. Extraordinary inspections of installations subject to inspection and other equipment	- Proper condition - Safe functioning - Freedom from damage/defects	For specific reasons, as ordered by the authority, after incidents and accidents

6 Inspections required under Art. 16 of the Major Accidents Ordinance

Integrated inspection and auditing of installations was extended significantly by Art. 16 of the Major Accidents Ordinance of April 2000. This article stipulates that the competent authority must set up an inspection system that allows a planned and systematic inspection of the technical, organisational and management-specific systems of establishments at specified intervals.

The content and extent of the inspection are described in the guidance document issued by the LAI/LASI to implement Art. 16 of the Major Accidents Ordinance. The key steps involved in the inspection are described below.

6.1 Technical aspects

The extent of the safety inspections that form part of the inspection system stipulated under Art. 16 of the Major Accidents Ordinance results essentially from identifying the safety-relevant parts of an installation and/or safety-relevant parts of an establishment (as defined in TAA-GS-24).

Safety-relevant parts of an installation are:

- Parts of an installation where particular substances in certain quantities are present
- Safety equipment
- Other parts of an installation essential to its operating safety

The depth of inspection results from the safety concept, the engineering specifications for the safety-relevant parts of an installation, applicable Ordinances, Technical Rules and Standards, and specifications and available information concerning the state of the art safety technology (Art. 2, no. 5 of the Major Accidents Ordinance) used in each individual case.

Thus, the process of identifying the safety-relevant parts of an installation and developing a safety concept also defines the documentation required. The totality of this documentation is both the basis for, and an integral part of integrated auditing and inspection.

The documentation includes all the texts and graphics which are related to the technical construction and the function of the individual pieces of equipment and overall installation, the interconnection between individual process parts, the process technology , the design data, substances, energy supply, etc. and operation during the entire life cycle of the elements considered.

The key elements of the documentation are:

- Planning documentation
- Licensing documentation
- Construction documentation

– Technical documentation
  - Documents relating to the processes used
  - Documents relating to machinery and apparatus
  - Documents relating to the piping
  - Documents relating to the electrical installations
  - Documents relating to instrumentation and control
  - Documents relating to the building structure and structural steelwork
  - Technical documents relating to the construction of the installation in general, such as technical acceptance / release documentation etc.

– Operating documentation
  - Information about commissioning and trial operation
  - Technical information concerning operation
  - Operating instructions
  - Maintenance instructions and maintenance documentation
  - Acceptance and licensing documents for plants and parts of installations subject to licensing and inspection.

6.2 Organisational and management aspects

Apart from technical aspects, organisational and management aspects are also essential components of the safety inspections prescribed within the inspection system as set out in Art. 16 of the Major Accidents Ordinance.

The extent to which organisational and management aspects are inspected is determined on the basis of Annex III of the Major Accidents Ordinance, which sets out principles for safety management systems.

For all organisational and management-specific measures, i.e. the occupational health and safety, environmental and quality and safety management system, the extent of the inspection can, for example, be determined on the basis of SFK guidelines “Guidance notes on the integration of a safety management systems as defined in Annex III of the Major Accidents Ordinance 2000 into existing management systems” (SFK-GS-31 Rev. 1).

The depth of inspection is based on the requirements placed by the mayor accident prevention policy on the relevant processes or elements of the management systems in order to achieve a company’s safety objectives.

The management handbook and accompanying procedural and working instructions along with audit and review reports on the safety management system are major components of, and indeed form the basis of, the safety inspection of organisational and management-specific aspects within an integrated auditing and inspection approach.

6.3 Procedures for the inspections

The inspections carried out within the inspection system prescribed under Art. 16 of the Major Accidents Ordinance can be divided into two basic types:

(1) A review of the installations/parts of installations and their operation to establish,
   - Whether the safety equipment that has been incorporated into the design is appropriate for the given hazard potential,
   - Whether the design has taken into account the relevant primary and secondary legislation, ordinances, technical rules, internal standards, standards valid under civil law (DIN, VDE, VDMA, VdTÜV, VDI etc.), licensing conditions etc.,
   - Whether the installations/parts of installations have been constructed and are being operated, maintained and inspected as licensed (compliance inspection).

(2) A review of the establishment to establish whether the operator has set up a management system and corresponding organisational structures that comply with the safety objectives and safety guidelines of the underlying safety concept, taking into account the relevant legal stipulations (system inspection).

The inspections can only be carried out properly using a systematic approach and using appropriate inspection tools such as checklists, data bases, manuals etc. (cf. the report of TWG 2: Guidance on Inspections as Required by Article 18 of Council Directive 96/82/EC, DG XI of the EC). Successful projects looking at comparable inspections of installations in Germany have confirmed this. Cf. Annex 2.

The inspection procedure can be divided into the following stages:

- Preparation
- Carrying out the inspection
- Assessment and documentation
- Planning and implementation of measures

The requirements that the inspection tools must fulfil are a direct result of the objective and can be summarised as follows:

- Preparation

  Systematic recording of the criteria, which differ according to the use of the subject of the inspection, e.g.

  - Criteria relating to substances
  - Criteria relating to the installations
  - Criteria relating to safety equipment
  - Criteria relating to management structures.

- Carrying out the inspection

  Standardisation of the execution and evaluation of the inspection by

- Determining the content of the inspection (depth of inspection)
- Determining a systematic procedure to be used
- Structured documentation of the results of the inspection
- Documentation of assessment criteria

– Documentation

  Implementation of a systematic and standard method for preparing inspection documentation to support a transfer of information by:

  - Documentation of the basic data
  - Documentation of the scope of the inspection (details of spot checks)
  - Documentation of the depth of inspection
  - Documentation of the results

– Implementation of measures

  Developing a systematic procedure to ensure that implementation of measures is comprehensively followed up

  - Determining the extent and structure of the procedure for following up the implementation of measures
  - Checking deadlines.

6.4 Incorporating control measures carried out by bodies other than the authorities into the inspection system required by Art. 16 of the Major Accidents Ordinance

6.4.1 Requirements

The structured approach described above for carrying out inspections of installations using inspection tools is not only crucial if the inspection procedure is to run smoothly and effectively, both in terms of time and content, but is also essential if internal control measures by operators themselves and the appointment of external experts are to be incorporated into the inspection activities of the authorities. For this reason it is useful to draw up inspection tools in the form of written checklists, interview guidelines and instructions for action and to coordinate them with both the authorities and the operator. These inspection tools should either directly specify the content or, if this is not possible, the methods and, wherever possible, evaluation criteria that define the inspectors' scope for action and thus ensure that both the conduct of inspections and the evaluation of situations are standardised.

The depth of inspection of a particular area of work should be designed in a way that facilitates a final evaluation of situations. For that reason, it is preferable to carry out a smaller number of spot checks in detail rather than perform at a greater number of spot checks in a more superficial manner.

Similarly, when inspections by official experts are incorporated into an inspection programme carried out by the authorities, in which an appropriate inspection tool is available, the process of making detailed lists of individual points to be inspected within the specific context of the inspection, e.g. an official order, can be significantly simplified by specifying there only the elements of the inspection tool to be applied and the parts of the installation to be inspected.

Thus, here too the use of checklists, interview guidelines and instructions for action that have been set out in writing and accepted by the authorities can be useful. The requirements to be fulfilled by the design of an inspection system for internal control measures by the operator and that for inspections by official experts will be essentially identical.

6.4.2 Possibilities for incorporating control measures by bodies other than the authorities

Inspections by bodies other than the authorities can be incorporated into the inspection system prescribed under Art. 16 of the Major Accidents Ordinance in a number of different ways. In all cases the authority responsible for the inspection will be obliged to fulfil the role it has been assigned with certain restrictions. The sole objective of incorporating inspections by bodies other than the authorities is to optimise the implementation of the requirements of the inspection system by making use of external expertise wherever possible, avoiding duplication of inspections, and avoiding or minimising interface problems.

The possible structures for incorporating control measures by bodies other than the authorities, taking into account the parties involved, are described below.

Inspections carried out solely by the authorities

In cases where inspection is carried out solely by the competent authority, where necessary with the collaboration of other technical authorities, an inspection system should be established in compliance with the requirements set out in Art. 16 of the Major Accidents Ordinance. The following steps are required:

- Complete registration of the establishment to be inspected (Art. 16, para. 2)
- Drawing up of an inspection schedule, detailing frequency and subject of inspection for the establishment in question (Art. 16 para. 1, para. 2 no. 1)
- Drawing up of inspection tools (checklists, instructions for performing the inspection, assessment criteria etc. (cf. Chapter 6.3)
- Drawing up of an inspection plan (timetable, auditors, inspectors, content of inspections, units to be inspected in the establishment in question)

Using the above documents, the inspection can be carried out by the authority in the establishment in question.

Incorporating the operator's internal system of control measures into the inspection system of the authorities

Provided that the operator has introduced and practices an internal system of control measures, which includes as a minimum the auditing and control measures listed in Chapter 5, Table 5.1, these control measures can be incorporated into the authority's inspection programme. The content, extent and results of each inspection must be documented.

For upper tier establishments that are subject to the requirements of the Major Accidents Ordinance, a safety management system (Art. 9 para. 1 no. 1 of the Major Accidents Ordinance) must be introduced which, as determined in Annex III, nos. 3 f and g of the Major Accidents Ordinance, requires documented internal monitoring of performance, audits and

reviews. These reports and documentation should be taken into account by the authority carrying out a compliance inspection.

Incorporating control measures carried out by bodies other than the authorities into the implementation of Art. 16 of the Major Accidents Ordinance in this way requires coordination between the authority and the operator. The advantage is that it avoids duplication of inspections, and the operator's responsibility as set out in Art. 5 of the Federal Pollution Control Act is enhanced. The inspection itself remains the duty of the authority. Internal control measures by operators cannot replace these inspections, but simply reduce the extent of the inspection. In this connection, it is pointed out that, as a rule, the eco-audit (EMAS II) looks at questions of safety to only a very limited extent.

Participation of third parties appointed by the authority or the operator

The authority may commission official experts to carry out the corresponding inspections (Art. 16 para. 3 of the Major Accidents Ordinance). In terms of the inspection tools to be used, two different cases can be distinguished:

- The authority appoints an official expert to carry out the inspections and specifies in detail the extent and content of the inspection, i.e. the official expert is given the inspection tools to be used (cf. examples 1 and 4 in Annex 2).
- The authority appoints the official expert to carry out the inspections and draw up the inspection tools to be used. Alternatively, official experts may already have their own inspection tools that can be used.

Independently of Art. 16 para. 3 of the Major Accidents Ordinance, it is also possible for the operator to call upon official experts to carry out internal control measures. In cases like this, the official experts perform the internal control measures and audits alone or in conjunction with the operator's inspectors/auditors. With regard to the inspection tools, either those of the operator (cf. example 2 in Annex 2) or those of the official expert may be used. The approach corresponds in essence to scenarios in which the operator's system of control measures is incorporated into the authorities' inspection system.

6.4.3 Conclusion

Making use of the possibilities of incorporating control measures carried out by bodies other than the authorities into the inspection system set out under Art. 16 Major Accidents Ordinance requires:

- Coordination of the inspection and auditing activities of the different areas of legislation by the competent authority.
- Determining common minimum contents in terms of what is to be inspected and their publication by the competent authority (e.g. LAI/LASI Guidance Notes on the Implementation of Art. 16 of the Major Accidents Ordinance).
- Determining the extent of the authorities' inspection measures, the competent authority taking into account the results of the operator's internal programme of control measures.
- Determining the minimum contents and evaluation criteria for the operator's internal system of control measures and audits, the competent authority taking them into account in their inspection system.

– Setting up an integrated system of internal control measures and audits by the operator, incorporating any existing auditing and monitoring activities .
– Development of inspection tools by the operator to specify
  - Content of inspection (overall extent of control measures and audits)
  - Depth of inspection
  - A systematic procedure to be used (guidance)
  - Assessment criteria
– Coordination between operator and authorities to be assured at an early stage

The possibilities described for integrating control measures carried out by bodies other than the authorities into the inspection system required under Art. 16 of the Major Accidents Ordinance take into account the experiences with existing programmes for the inspection of installations, such as those listed in Annex 2, in terms of approach and inspection tools used. All concerned – the authorities, operators and official experts - should make use of them.

Currently a research project initiated by the TAA[1] is developing inspection tools on the basis of the LAI/LASI Guidance Notes on the implementation of Art. 16 of the Major Accidents Ordinance[2].

[1] TAA - Technical Committee on Plant Safety at The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

[2] To be published 2004

7 Benefits of integrated inspection and auditing of installations

As a result of sustained efforts to improve the safety of installations in Germany, a tried and tested system for inspection and auditing of installations described in this report has become established. It is based on three pillars that are crucial for installation safety:

- Internal auditing and control by the operator,
- Inspection by the authorities, and
- Safety testing and inspections by official experts or approved bodies

The Working Group on Inspection and Auditing of Installations believes that this system achieves the necessary balance between the operator's responsibility and the authorities' obligation of verification, and contains – not least by involving official experts, qualified persons and approved bodies – sufficient flexibility to meet all the concerns connected with installation safety.

At present, since the standard of safety achieved to date allows for it and EU legislation requires it, there is currently a trend towards increasing the operator's responsibility. To a certain extent, inspection regulations are being made more flexible and in some areas there is a departure from the rather rigid inspection regulations of the past in favour of inspections that are orientated on the mode of operation and hazard or risk based.

At the same time, there is an increased interest in systematic audits and inspections by the competent authorities as a result of their need to be certain that operators of installations have the necessary technical and organisational capabilities to be able to meet their responsibilities and to make use of their increased scope for discretion for the benefit of a sustainable positive trend in installation safety.

It is first and foremost the existing management systems that determine installation safety by virtue of their effectiveness and the way they are implemented. Systematic audits must therefore concentrate on reviewing management systems. For example, any safety deficits identified during an inspection programme are an indication of possible weak points in the management system – even if the deficits are of a technical nature. An important stated aim must therefore always be optimisation of safety management systems.

The well-established technical inspection, particularly as prescribed under the Equipment Safety Act, is of undisputed benefit. The inspection activities of official experts or approved bodies and qualified persons at installations and equipment subject to inspection constitute a crucial basis for the safety of installations.

Systematic audits or systematic cross-system reviews of establishments and installations – explicit mention must be made in this context of the inspections required in Art. 16 of the Major Accidents Ordinance – can and should rely on the established basis of individual inspections of components and parts of installations by competent, qualified or expert individuals appointed by operators, authorities and approved bodies and should incorporate their results.

The implementation of a uniform, effective and cohesive concept for integrated inspection and auditing of installations links up internal control measures and audits by operators, inspections by the authorities carried out in accordance with Art. 16 of the Major Accidents Ordinance, and further technical tests, assessments and inspections by the authorities and

official experts or approved bodies and qualified persons, and thus avoids duplication of inspections.

The availability of valid documentation is, of course, essential to this. Apart from the safety major accident prevention policy, safety report, internal alarm and emergency plan and documents regarding the information on safety measures for the public, licensing documents, technical documents, documents describing the management system, organisational and operating procedures along with the results of all relevant inspections, audits and reviews must be constantly updated and made available in an appropriate form.

The documentation necessary for the implementation of an integrated system for inspection and auditing of installations also helps to distribute knowledge concerning the safety of installations and establishments in a focused and effective way to everyone concerned, whether within the establishment or to external parties, and facilitates the mutual exchange of information. This, in turn, increases transparency and any gaps in knowledge or uncertainty on the part of individuals involved can be avoided. Similarly, it avoids unmanageable additional work involved in procuring information and documentation and decreases the workload required to prepare for inspections.

Harmonisation of EC regulations on installation safety has the objective of ensuring that there is a standardised, effective and high level of safety throughout the entire Community. Current knowledge suggests that this succeeds best when an integrated overall safety concept with clearly defined protection principles, along with corresponding technical and organisational requirements, is in place. That includes an inspection and auditing system that is distributed, with all concerned shouldering the appropriate responsibility and working together in a spirit of trust.

ANNEX 1

An example of continual internal auditing and control measures of installations by an operator in the chemical industry (BASF AG)

1. Introduction

The hazard potential of chemical installations results from the properties of the substances handled, the physical conditions in the installation, and the possibility of substances or energy being released in the event of a deviation from the specified operation. The aim of the technical/organisational measures put in place is to reduce the hazards associated with an installation to as low a level as possible.

Below key examples of technical and organisational steps taken by an operator to ensure safety are listed.

2. Technical safety

Steps to assess and improve technical safety and inspections begin as early as the planning phase. They include:

- Carrying out safety assessments and documenting the safety concept
- Preparing substances and processes specific safety concepts
- Hazard analyses and risk assessments
- Drawing up explosion protection plans
- Identifying causes of damage with consequences for installations of the same kind

These various aspects taken as a whole produce parameters for inspections and control measures for the installation during operation. Even when the safety assessments are being performed and safety concepts drawn up, decisive parameters arise, which are incorporated into operational and inspection regulations. The principle followed is to build safety into installations right from the planning stage, rather than achieving safety by the use of increased control measures during operation.

The measures listed above are carried out internally by the operator's own personnel or by expert bodies appointed by him. A summary of these measures can be found in Table 5.1. A number of them are explained in more detail below.

Safety assessment

The safety assessment is the central instrument for minimising the hazard potential of any planned chemical installation. It is carried out in several stages, each more detailed than the preceding one. The key points are:

- Identify the hazards associated with installations and processes
- Formulate the tasks for the basic safety concept
- Assess the planned site from a safety point of view
- Draw up a safety concept

- Examine planning documents, in particular P&I diagrams to check for consistency of safety engineering
- Carry out a Hazard and Operability (HAZOP) study
- Draw up explosion protection plans

Safety concept

The safety concept describes the measures that can be put in place to prevent or control the hazards associated with an installation, process or substance. After identifying possible failures, their probability of occurrence and the consequences are estimated and the resulting risk evaluated. In a further step, protective measures are defined and examined with regard to their effectiveness and reliability. The safety concept that has been developed in this way is documented and constitutes the basis for implementing the fundamental requirements for safe operation of the installation.

For general issues, inspection concepts are used that are not specific to the installation. They include for example, concepts relating to substances, apparatus or processes or to plant protection using I&C equipment.

Explosion protection

Explosion protection serves to protect employees and third parties from the hazards due to the ignition of explosive atmospheres. The legal basis for this includes European Directive 1999/92/EC mentioned in Chapter 2, along with Ordinances and Technical Regulations, such as the Operating Safety Ordinance, Technical Regulations for Combustible Liquids and Explosion Protection Regulations. Inspecting an installation with these hazards in mind leads to protection measures that effectively limit the risk of an explosion by, for example:

- Preventing or limiting explosive atmospheres in dangerous quantities (primary explosion protection)
- Preventing active sources of ignition
- Limiting the effects of explosions

If primary explosion protection measures cannot be put in place, or at least not to the degree required, the affected areas must be categorised as explosion protection zones, which involves safety requirements being imposed and inspections during operation.

Hazardous substances

The legal basis for reviewing the dangers associated with the use of hazardous substances includes the Chemicals Act, the Hazardous Substances Ordinance, the Technical Regulations for Hazardous Substances, the leaflets published by BG-Chemie (M series) and operators' internal guidelines for safety, health and environment (measurements of hazardous substances in operating areas).

Inspections, which are for the most part conducted by technical departments, cover a broad spectrum of activities, which it is not described in detail here, in particular:

- Testing, classification and labelling of substances and preparations. Substances not classified by legislation are classified by the operator. This principle of operator responsibility also applies to the setting of threshold limit values for the work place concentration of substances for which TRGS 900[3] does not set limit values.
- Development of internal rules on the safe handling of hazardous substances and protection measures to be taken for specific substances
- Conducting and documenting work place analyses
- Taking measurements of hazardous substances to clarify exposure levels in installations
- Examining substitution possibilities for hazardous substances
- Product-specific measurements to clarify exposure to hazardous substances

These control activities make a key contribution to the safe operation of installations and safe use of substances.

3. Organisational safety

The primary aim of inspections of organisational safety is to ensure compliance with the safety objectives defined in the safety and inspection concept for the installation and to guarantee the safe condition of the installation during operation.

The legal basis consists of the legislation cited in Chapter 2, the Occupational Health and Safety Act and operators' internal guidelines on safety and environment management. Below a selection of inspection instruments is described.

Inspection and maintenance work
The operator of an installation must inspect and maintain his equipment, in particular safety-relevant equipment, at regular intervals. To this end, inspection and maintenance plans must be drawn up in conjunction with the service units. Equipment subject to inspection includes plant and machinery as well as technical and electrical equipment.

The inspection frequency varies from constant presence of personnel (e.g. in the control room) to visits during each shift (e.g. storage installations for combustible liquids), daily, weekly and monthly inspections to inspections at intervals of several years.

Service units can be assigned responsibility for carrying out the inspections; nevertheless the obligation to check that any delegated duties are carried out correctly remains that of the operator.

Site inspections before commissioning

In the case of new installations and modifications to installations, the operator must carry out a site inspection prior to commissioning. Aspects to be inspected are:

- Compliance of the installation as built with the planning documentation and the relevant regulations

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[3] Technical Regulation for Hazardous Substances 900 <TITEL>

- Proper condition of the installation
- Identification of any safety deficits that may be present

Investigation of man-machine interfaces

The investigation of man-machine interfaces is a system of inspection carried out by operators themselves. It is used to identify possibilities to improve the way work is organised in companies. It focuses on how people interact with technology and, in particular, on those aspects that can cause accidents or operational failures. Subjects of inspection include:

- Organisational structures
- Organisational safety precautions
- Changes to installations and processes
- Maintenance and inspection of safety-relevant parts of installations
- Possibilities of operating errors
- Training and instruction of personnel
- Employees' knowledge about operational procedures

On-site operational inspections

Operational inspections investigate the presence of conditions, equipment and behaviour in installations that are defective in safety terms, and initiate measures to rectify these shortcomings. The aim is to avoid accidents or major incidents. Operational inspections are carried out at regular intervals, e.g. monthly, or for specific reasons.

Regular inspection of installations
Inspections of installations are carried out regularly by the operator, where applicable after coordination with technical departments. Aspects of the inspection include:

- Licensing documents and permitting documents
- Operating documents, such as documentation of inspections carried out by official experts, substances handled, emissions, occupational safety, emergency planning and fire protection
- Organisational safety precautions
- Installations and parts of installations subject to inspection
- General working order

Safety and hazard management

If the operator is understood as being ultimately the company, then safety and hazard management measures are also instruments, which the operator can use to inspect and monitor installation safety.

All levels of management have a duty to carry out regular operational inspections and visits to workplaces in order to check the general working order of operations in their area of

responsibility. They also check whether the units they are responsible for are fulfilling their safety and environmental protection obligations. The results of activities to identify effects and hazards, along with corrective measures, are documented.

Management Reviews

At regular intervals the various levels of management carry out inspections (management reviews) to evaluate the effectiveness of the safety, occupational health, and environmental management system in the business units and ensure their ongoing improvement. Corrective measures are determined on the basis of the inspection results.

Revision

One of the things reviewed as part of the regular company audits is whether the standards set for the safety, occupational health, and environmental management system in the company are being fulfilled. Aspects of particular interest here are occupational health and safety and installation and process safety. These audits are systematic investigations carried out by experts. They enable the management board to evaluate the effectiveness of the company's safety, occupational health, and environmental management system and support the unit managers in charge to fulfil their supervisory and monitoring obligations imposed by legislation and company regulations.

4. Other inspections

Finally, two other kinds of inspection should be mentioned. They apply both to technical and organisational safety issues.

Inspections for specific reasons

As well as the statutory inspections for specific reasons prescribed by the relevant legislation – which is not considered here - inspections for specific reasons may also be initiated by the operator, e.g. if knowledge of a technical or organisational nature has been acquired as a result of an accident or incident that might be important to areas other than the affected installation. This can in turn give rise to inspections in installations with similar hazard constellations with a view to improving safety there.

If the knowledge gained is of general interest, it is passed onto external bodies, such as the DECHEMA compilation of incidents that are not subject to notification.

Inspection of existing installations

An operator-led integrated inspection concept that has the aim of identifying and exploiting the potential for improving safety concepts for existing installations is described in Annex 2 in BASF AG's TOP programme (example 5).

ANNEX 2

Examples of audits and inspections of installations for specific reasons

In recent years in Germany systematic inspections of installations have been carried out which were comparable to those required under Art. 16 of the Major Accidents Ordinance. The inspections covered both technical and organisational and management-specific issues. In some cases, the individual areas inspected were very extensive and detailed inspection tools were used. In certain cases, these inspections had to be carried out within a specific time frame.

Below a number of examples for installation inspections of this kind are described.

1. ASCA project of the authorities responsible for occupational health and safety in the *Land* of Hesse

(Example of an inspection of an installation by the authorities)

As a result of a series of major accidents in the chemicals industry in spring 1993 in Hesse, the State Ministry for Women's Affairs, Employment and Social Affairs initiated its ASCA project, ASCA being the German acronym for occupational health and safety checks in installations. The aim of the project was to pinpoint deficits in the field of occupational health and safety and identify the connection between those deficits and the company's organisational structure for dealing with occupational health and safety.

To carry out the fact-finding survey in the establishments by the authorities responsible for occupational health and safety and/or the official experts appointed, an integrated set of tools for occupational health and safety was developed and made available to all parties involved. It divides into two complexes:

- Complex of questions to ascertain objective factors
- Complex of questions to analyse the possible underlying causes of deficits in occupational health and safety

Via the complex of questions "objective factors," the implementation of legal requirements and regulations in establishments is examined. The key areas looked at here are legislation on hazardous substances, installation safety and precautionary measures to prevent major accidents:

1. Legislation on hazardous substances
    - 1.1 Obligation to investigate the presence and characteristics of hazardous substances
    - 1.2 Monitoring obligations
    - 1.3 Bans on manufacture, use and work with certain substances
    - 1.4 Special bans on working with certain substances for specific groups of people
    - 1.5 Order of priority of safety measures
    - 1.6 Operating instructions

1.7 Packaging and labelling when handling hazardous substances

1.8 Storage, warehousing

1.9 Carcinogenic substances

1.10 Occupational health checks

2. Safety of installations

2.1 Storage of combustible liquids (VbF – Flammable Liquids Ordinance)

2.2 Pressure vessels

2.3 Explosion protection

2.4 Accident prevention regulations specific to equipment and installations

3. Control of major accident hazards (safety assessments and safety analyses)

3.1 Safety assessments

3.2 Safety analyses (StörfallV: Major Accidents Ordinance[4], 2. StörfallVwV: Second General Administrative Regulation Implementing the Major Accident Ordinance)

The complex of questions analysing causes is designed to facilitate early detection of mistakes (prevention of deficits in occupational health and safety), and, in particular where contraventions of legal stipulations are found, to identify the possible causes of these deficits. The main area looked at is the organisation and management of occupational health and safety. Within the process of analysing causes, all levels of management, employees whose main work focuses on occupational health and safety issues (e.g. works doctors, specialised occupational safety officers) and employees on site are interviewed.

The complex of questions within the survey tools is divided into two parts:

- Questions to provide information on the organisational structure of occupational health and safety in the company
- Questions to provide information on organisational procedures in the company

In connection with organisational structure, questions are put to personnel at all levels of the hierarchy who have been assigned duties and responsibility for matters of occupational health and safety.

In order to make this data-collection instrument easy to use and effective, the questions are restricted to managerial staff and to those functions with key responsibilities for occupational health and safety, which consequently have the greatest influence on the quality of occupational health and safety. These are line and/or staff managers in the following areas:

- Product and process development
- Production
- Procurement
- Planning

[4] Major Accidents Ordinance in the version of September 1991

- Personnel
- Preparation for work
- Logistics/transport
- Maintenance
- Customer service/assembly

The questions relate particularly to key aspects of the organisational structure:

- Functional-hierarchical assignment of occupational health and safety duties
- Assigning of competences (in the sense of authorization) in coordination with delegated duties
- Arrangements for cooperation between line management and appointed officers.

In connection with organisation of procedures, the questions focus on

- General key areas of occupational health and safety (e.g. organisation of accident prevention, qualifications, training, motivation)
- Company procedures in the form of process chains; here the selection of questions focused on those steps that have the greatest influence on the quality of occupational health and safety, e.g.:
    - Product development
    - Preparation for work
    - Production
    - Maintenance strategy
    - Maintenance planning.

The inspection tools used by the authorities and official experts to work through the complexes of questions were in the main checklists and reminder lists.

The so-called survey phase takes place before the on-site inspections (plant audits).

In preparation for the audit, the companies receive a questionnaire, which they fill in before the audit with the help of officials from the authorities responsible for occupational health and safety and safety technology. The questionnaire consists of two sections, one asking more in-depth questions and the other questions designed to ascertain facts and figures.

The more in-depth question section asks, for example, for information about the hazardous substance register, work place analyses, preventive occupational medicine, work procedures and activities and how occupational health and safety is currently organised. The fact-finding section asks questions on hazardous substances present in the plant, on installations/parts of installations, equipment used and general questions (e.g. on the size of the plant). They are usually closed questions, i.e. can be answered by ticking” yes” or” no.” The information ascertained from the questionnaire is useful, because it gives the auditors (inspectors) an idea about the key areas of the plant that are relevant to occupational health and safety before they carry out the audit. This means that they can focus their preparatory work prior to the audit and thus cut down the time they need to spend in the companies to actually carry out the audits. It also gives the companies a detailed picture of what the audit will entail.

The company audit is carried out under the leadership of the responsible authorities for occupational health and safety and safety technology with the backing of three other auditors. The audit should last three days on average.

The parts of the installation/situations to be inspected are selected during a spot check. These parts of the installations/situations are then inspected in detail.

At the end of the second day, final talks are held involving the management, the auditors and the officials responsible. The initial results and findings of the audit are discussed.

The auditors assisting the officials are experienced chemists, chemical engineers, mechanical engineers, safety engineers, occupational and industrial psychologists, as well as sociologists, management experts and legal experts specialising in organisational structures.

The results of the audit in the individual companies are summarised in writing and sent to the authorities responsible for occupational health and safety and safety technology. Furthermore a general evaluation of the audit results is carried out in order to identify general strengths and weaknesses in the area of occupational health and safety. The results are compiled in a final report on the project.

The instruments used for the survey are published and are available to the general public.

2. Installation inspection system of the former Hoechst AG

(Example of internal control measures and audits of installations carried out by an operator)

In 1996, the former Hoechst AG developed an internal audit system within a scheme of integrated inspections of installations and introduced it with the aim of improving safety and optimising technical processes.

The audit system covers the complexes installation safety, occupational health and safety, health protection, production (economic efficiency and availability), employee qualifications and organisation.

The audit system comprises 18 subject areas and has a strictly modular structure, i.e. the audit instrument is divided into separate units, each leading to a clearly defined result. The audit instruments are checklists, reminder lists, guidelines for structured interviews and instructions for action.

The subject areas covered by the internal audit system are:

- Check the identity of the installation (initial inspection)
- Hazard analysis, failure analysis, process deviation analysis
- Equipment/measures for detecting and preventing deviations from normal operation
- Safety concept to minimise the effects of operational failures
- Fire and explosion protection
- Safety-critical I&C equipment
- Energy supply
- Health protection
- Examination of standard operating procedures for the installation
- Examination of the training system/level of knowledge of employees
- Examination of the inspection and maintenance programme
- Examination of the internal alarm and emergency plans
- Organisation
- Legislation on hazardous substances
- Analysis of process and production technology (economic efficiency)
- Environmental protection (eco-audit)
- License arrangements
- Workplaces, machine protection

The audit in the individual installations was carried out by a team of three auditors external to the plant, one of whom belonged to a technical inspection organisation. The audit team was able to call upon technical auditors for the individual specialist areas.

As part of the hazard analysis, the safety-relevant parts of the installation were identified, and of those a random sample was chosen for inspection.

A detailed inspection report is drawn up to describe the inspection process. It documents which components/parts of the installation were inspected, the findings, any deviations with explanations, measures required to remedy deviations and the estimated costs and deadlines for implementing the necessary measures. Compliance with the implementation deadline is checked.

The internal audit at Hoechst AG ran in parallel to the official SPAS[5] programme run by the Environment Ministry of the *Land* of Hesse. After coordinating with the competent authorities, it was possible for the internal audit to be partially or completely incorporated into the inspections order issued by the authorities. To that end, the authorities carried out a systematic examination of the audit system in advance.

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[5] SPAS: Sonderprogramm Anlagensicherheit (Special Programme on Installation Safety)

3. Hesse's special programme on installation safety (German acronym: SPAS)

(Example of inspection of installations by the authorities)

As a result of a series of major accidents in the chemicals industry in spring 1993, the Environment Ministry of the *Land* of Hesse launched a special programme on installation safety (SPAS). The programme's objective was to check the safety of all installations, which fall within the scope of the major accident ordinance in Hesse. The programme was carried out in several phases, a certain number of installations being inspected in each phase.

The following types of installation were inspected :

- Chemical installations
- LPG installations
- Pesticide storage facilities
- Ammonia refrigeration plants and storage facilities
- Waste incineration plants
- Chemical storage facilities
- Petroleum products storage facilities
- Other installations

For the individual installations, inspection schedules for process plants and storage facilities were drawn up.

The inspection procedure for chemical installations was as follows:

- Select installations.
  The inspection authority selected installations for the individual phases partially on the basis of hazard potential.
- Hold a hearing with the operator
- Review documents, request additional documents.
  Existing documents were examined and evaluated by the inspection authority (e.g. licensing documents, notification under Art. 67 para. 2 Federal Pollution Control Act - safety analysis (safety case), existing technical safety expertise). The operator was asked to supply any missing documents.
- Site inspection
- The authority draws up a concrete inspection framework for the plant. On the basis of existing documents and additional documents requested, and on the basis of the site inspection, the inspection authority prepares an inspection framework with detailed questions for each installation to be inspected using a hazard analysis specific to each installation.
- Preliminary discussion of the inspection framework.
  On the basis of a draft inspection framework, preliminary talks were held between the operator and the authority in which any anomalies in the inspection framework were clarified. The authority then defined the final inspection framework for the order issued under Art. 29a of the Federal Pollution Control Act.

- Issue order to carry out inspection under Art. 29a of the Federal Pollution Control Act
- Inspections by official experts accompanied by the inspection authority.
  The on-site inspections carried out by official experts, authorised under Art. 29a of the Federal Pollution Control Act, were as a rule accompanied by the inspection authority. This meant that, if necessary, any questions regarding the inspection framework could be clarified and the authority was able to gain an impression of the quality of the inspection.
- Draft report
- Final talks, discussion of the draft report
  The draft report was the subject of the final talks between the three parties involved – the inspection authority, official experts and operator. The key results of the inspection were discussed here. It was possible to thoroughly discuss, and as far as possible clear up, any misunderstandings about technical situations and differences of opinion over recommended measures to remedy shortcomings.
- Final report
- Issue order implementing recommendations
- Check implementation of measures ordered

As a rule, an inspection took a total of 12 to 15 months. Apart from the site inspection, the main element was the preparation of an inspection framework. The inspection framework contained very detailed questions on hazardous situations and how they were controlled in the installation.

Examples for the questions asked within an inspection framework:

- Spot checks of safety valves in the ammonia piping and in reactors C 789 and C 765 to identify any possible limitations of their correct function. Examination of the documentation of functional tests.
- Are the measures that are in place to prevent excessive pressure build up in the saponification plant adequate? Can premature closing of the valves in the exhaust gas line cause excessive pressure build up?
- Does valve 123 on RB 456 have a fail-safe position? If so, what is it? If not, why not? It is activated by a safety relevant instrumentation and control device . What happens if there is a power failure? If it has a fail-safe position, why is it not marked on the P&ID?
- What requirement category does the safety relevant instrumentation and control device SZA-123 on RB 456 comply with?
- Is there adequate explosion protection when butanol (flashpoint 35 °C) is being loaded? What safeguards are in place to maintain the vessel temperature at less than 30 °C? Why was the cooling not described in the step analysis of the safety analysis, despite the fact that it is the primary explosion protection measure?

The operator was ordered to implement any measures deemed to be necessary from those that had been identified and compliance was checked.

Inspection of storage facilities

Since storage facilities of a particular type, as a rule, have similar structures, they were inspected using standardised checklists. The procedure can be broken down into the following stages:

- Select installations
- Hold a hearing with the operator
- Determine the current situation
- Request additional documents from operator
- Fill out checklists.
  For each type of installation standardised checklists for the assessment of safety were drawn up by an official expert. The inspection authority then worked through them for each individual installation.
- On-site inspections.
  As a rule, it was the monitoring authority that carried out the on-site inspections of the installation. An order to call in an official expert, provided for under Art. 29a of the Federal Pollution Control Act, was issued only in individual cases when dealing with a particularly complex installation or particularly difficult issues.
- Documentation and issuing of orders
- Checking implementation of measures ordered

In all, checklists were drawn up for LPG installations, ammonia refrigeration plants, ammonia storage facilities, pesticide storage facilities and chemical storage facilities.

These checklists usually comprise three sections:

- Section 1: the survey lists; they record the actual condition, established on the basis of interviewing the operator, examining licensing documents, the safety analysis and site inspections.
- Section 2: the general hazard analysis for the particular type of installation.
- Section 3: the inspection and assessment checklist; this is the link between the hazard analysis and survey checklist. It is used to compile the results of and document the assessment.

The results of the special programme on installation safety in the field of chemical installations were recorded in a database and categorised, so that they are now available as a source of information for future safety inspections or for licensing procedures. The results of the entire special programme were analysed statistically.

4. Assessment of the current safety situation at older installations in the" new" German states

(Example of installations inspections by external experts using the inspection tools prescribed by the authorities)

Following German reunification, the Federal Pollution Control Act became applicable to the "new states" [of former East Germany], making it necessary to inspect the condition of installations there subject to licensing. To do this, the Federal Environment Minister set up an advisory committee on installation safety (German acronym: ASBK). The remit of this committee was to submit a proposal to the competent authorities outlining a procedure for inspecting installations.

The inspections were to be clearly defined in terms of extent and content and carried out by external experts working within a specific time frame stipulated for each type of installation. This approach was determined by the urgency and necessity of checking existing installations in the new states immediately after reunification and by the financial constraints of the project.

In order to meet these requirements checklists were developed to guide their user, which the external experts were obliged to use.

The following checklists were drawn up:

1	List I	Questionnaire in preparation for the on-site installation inspection
2	List II/1-II/5	
2.1	List II/1	Production facilities with explosive dust/air mixtures
2.2	List II/2	Production facilities with exothermic reactions in discontinuous processes
2.3	List II/3	Other production facilities
2.4	List II/4	Storage facilities for flammable liquids, LPG storage facilities, storage facilities for liquefied gases
2.5	List II/5	Pesticide, insecticide, and chemical storage facilities
3	List III	Survey of measures put in place to protect watercourses
4	List IV	Recommendations for retrofitting

These lists are updated by Saxony-Anhalt's state authority for environmental protection and recommended for identifying weaknesses in other existing installations.

5. BASF AG's installation inspection system

(Example of an operator's internal inspection of installations)

Introduction

Integrated monitoring of installations is an approach that BASF AG has been practising for many years now, with a view to ensuring that the safety of its chemical installations is always in line with the very latest state of the art safety technology and working towards continual improvement.

The hazardous potential of chemical installations arises from the properties of the substances handled, the physical conditions in the installation and from the release of substances and energy that might occur should there be an operational failure.

To ensure safe operation of installations it is essential that the hazards associated with an installation be identified and evaluated. The measures required to prevent or control the hazards can be of a technical, organisational or personnel-related nature and, taken in their entirety, constitute the safety concept for an installation. Here it is not simply a matter of complying with legal requirements. It is also essential that established knowledge about safety matters be consistently put into practice.

In 1996, BASF AG introduced a new programme on integrated inspection of installations, the TOP project, with the aim of identifying and acting upon potential for improving the safety concepts of existing installations.

TOP project

The TOP project is concerned with safety assessments for existing installations. TOP stands for the three components **T**echnology, **O**rganisation and **P**ersonnel. It has the following background:

Safety assessments are obligatory when planning a chemical installation and are integrated into each stage of the planning and execution of a project. However, it is only possible to carry out these safety assessments on the basis of the available planning documents. By contrast, when a plant is operational there is an entire organisational structure to be considered, in conjunction with the fact that the installation is operated by personnel.

Consequently, any review of existing installations must always consider the interaction of the three components Technology, Organisation and Personnel - TOP.

A review of the overall safety concept is carried out in two parts:

- For the technical aspects using a safety assessment based on BASF's HAZOP method (T)
- For the organisational-personnel aspects using an examination of the human/technology interface (OP)

BASF's HAZOP safety assessment

A safety assessment is carried out based on current operational documentation (P&ID diagrams, operational and process descriptions, design data and substance data). To do this,

the classic HAZOP method, which is very time consuming, is modified in order to identify potential hazards as fully as possible and acquire comprehensible documentation while taking up as little time as possible of the installations under inspection. The method comprises the following steps:

- Analysis of operating documents
- Categorisation into functional groups
- BASF's modified version of a HAZOP analysis of the functional groups
- Documentation
  The documentation lists the possible deviations and failures, identifies possible causes, carries out a risk evaluation (effects and probability of occurrence) and describes the necessary countermeasures. These steps are carried out by personnel in the "installation safety" unit in order to take as much pressure off the operating units as possible. The outcome is a draft HAZOP analysis.
- Team discussion
- This draft is reviewed, completed and adopted by a team of experts (operations, technical plant supervision, internal technical installations inspectorate, installation safety unit).
- Planning and implementation of any measures needed to improve installation safety.

Results

Subjects of significance for safety that recurred frequently were:

- Design of safety valves
- Thermal stability of substances
- Effects of emissions
- Scenarios involving loss of cooling
- Modifications to comply with the state of the art safety technology, such as the technical regulation for pressure vessels TRB 600 "Safe discharge from pressure relief equipment", TRB 701 "Pressure vessels in process installations, process control safety technology"

Examining the human/technology interface

The aim of examining the human/technology interface is to identify possible weak points that, during operation of the installation, during start-up or shutdown, in the event of failures or in the course of maintenance and repairs, can lead to incidents or major accidents. It should also highlight possibilities for improving the situation and facilitate discussion. To this end, the structure and organisation of procedures and the personnel situation of the operating units is examined in depth. During the review, members of the management and the shop floor are questioned on operational procedures, employees' level of knowledge is investigated and the operating units are inspected.

The topics touched upon during the interviews cover different areas of everyday operations, in particular:

- Organisation of operational procedures and communication in the operating units
- How changes to installations are handled or how new formulations and products are introduced
- Training and instruction of employees. This includes information necessary for operating the installation, behaviour when there is a deviation in operating condition from set points, behaviour in the event of alarms
- Possible operating errors, including associated risks and how to avoid them
- Carrying out maintenance according to schedule
- Inspection of safety-critical equipment, e.g. pressure vessels, safety valves or process control safety technology and following up faults

Results

The spectrum covers very different installations: batch operations with up to 100 formulations, continuous single-line installations, established installations with long years of experience, and new installations. Repeatedly solutions are found that can be classed as exemplary and that other operating units could therefore benefit from them.

Safety themes that recurred frequently included

- Limit values for alarms and switches. This applies, for example, to the lists for reviewing set points or modifications to them
- Implementing instructions concerning maintenance of process control safety technology
- Operating instructions: are they easy to understand, well organised and up to date?
- In-house training for employees
- Information about changes to the installation

Evaluation

Results to date have shown that the TOP project, with the two components of a HAZOP analysis and an investigation of the human/technology interfaces, is a useful instrument for improving installation safety in existing operating units and for keeping even older installations up-to-date in terms of state of the art safety technology. Acting on recommendations can also avoid deficiencies in the area of organisation/personnel. Overall this method makes it possible to achieve optimum coordination of the components technology, organisation and personnel that in turn leads to an improvement in installation safety.

Installation safety in the BASF Group

In the majority of cases there is a transfer of technology from BASF AG to its international operations and companies within the group. Since concepts for installation safety are always closely intermeshed with process concepts, this automatically leads to a transfer of safety concepts. The transfer of safety concepts brings about a safety standard for installations across the entire group. This is a judicious strategy, both in economic and political terms, making optimum use of resources and ensuring responsible care.

ANNEX 3

List of abbreviations

ArbSchG	Arbeitsschutzgesetz (Occupational Health and Safety Act)
ASBK	Anlagensicherheitsberatungskommission (Consultative Commission on Installation Safety)
BetrSichV	Betriebssicherheitsverordnung (Operational Safety Ordinance)
BImSchG	Bundes-Immissionsschutzgesetz (Federal Pollution Control Act)
BImSchV	Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Ordinance Implementing the Federal Pollution Control Act)
ChemG	Chemikaliengesetz (Chemicals Act)
DIN	Deutsches Institut für Normung (German Standards Institution)
DGRL	Druckgeräterichtlinie (Pressure Equipment Directive)
EMAS	Eco Management and Audit Scheme
Ex-	Explosion protection
GG	Grundgesetz (Basic Law, the German Constitution)
GSG	Gerätesicherheitsgesetz (Equipment Safety Act)
IPPC	Directive concerning Integrated Pollution Prevention and Control
KrW-/AbfG	Kreislaufwirtschafts- und Abfallgesetz (Closed Substance Cycle and Waste Management Act)
LAI	Länderausschuss für Immissionsschutz (*Länder* committee on Pollution control)
LASI	Länderausschuss für Arbeitsschutz und Sicherheitstechnik (Länder committee on occupational safety and safety technology)
PED	Pressure Equipment Directive
StörfallV	Störfall-Verordnung (Major Accidents Ordinance)
StörfallVwV	Störfall-Verwaltungsvorschrift ((Administrative Regulation Implementing the Major Accidents Ordinance)
TRAS	Technische Regeln für Anlagensicherheit (Technical Rules on Installation Safety)
TRB	Technische Regeln zur Druckbehälterverordnung (Technical Rules pursuant to the Pressure Vessels Ordinance)
TWG	Technical Working Group (European Commission)
VAwS	Verordnung über Anlagen zum Umgang mit wassergefährdenden Stoffen und über Fachbetriebe (Ordinance on Installations Handling Substances Constituting a Hazard to Water and on Specialized Facilities)
VbF	Verordnung über Anlagen zur Lagerung, Abfüllung und Beförderung brennbarer Flüssigkeiten zu Lande (Ordinance on Installations for storing, filling and transporting flammable liquids over land - Flammable Liquids Ordinance)
VDE	Verband deutscher Elektrotechniker (Association for Electrical, Electronic & Information Technologies)
VDI	Verein Deutscher Ingenieure (Association of German Engineers)
VDMA	Verband Deutscher Maschinen- und Anlagenbau e. V. (German Engineering Federation)
WHG	Wasserhaushaltsgesetz (Federal Water Act)
ZLS	Zentralstelle der Länder für Sicherheitstechnik (Central *Länder* body for safety technology)
ZÜS	Zugelassene Überwachungsstellen (Authorised inspection bodies)

ANNEX 4

List of publications cited

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(http://www.sfk-taa.de)

SFK-GS-23 (Rev. 1): Leitfaden für die Darlegung eines Konzeptes zur Verhinderung von Störfällen gemäß § 8 in Verbindung mit Anhang III der Störfall–Verordnung 2000 für Betriebsbereiche, die den Grundpflichten der Störfall-Verordnung 2000 unterliegen (Guidance notes for presenting a policy for preventing major accidents as defined in Art. 8 in conjunction with Annex III of the Major Accidents Ordinance of 2000 for establishments that are subject to the basic obligations of the Major Accidents Ordinance of 2000)

SFK-GS-24 (Rev. 1): Leitfaden für die Darlegung eines Konzeptes zur Verhinderung von Störfällen und ein Sicherheitsmanagementsystem gemäß § 9 Abs.1 Nr. 1 in Verbindung mit Anhang III der Störfall-Verordnung 2000 (Guidance notes for presenting a policy for preventing major accidents and a safety management system as defined with Art. 9 para. 1 no. 1 in connection with Annex III of the Major Accidents Ordinance of 2000)

SFK-GS-25: Sicherheitsmanagementsysteme Aufbereitung der Stoffsammlung des Arbeitskreises „Management-Systeme“ der SFK (A compilation and analysis of material relating to safety management systems (SFK Working Group on Management Systems))

SFK-GS-31 (Rev. 1): Leitfaden - Arbeitshilfe zur Integration eines Sicherheitsmanagementsystems nach Anhang III der Störfall-Verordnung 2000 in bestehende Managementsysteme (Guidance notes on the integration of a safety management systems as defined in Annex III of the Major Accidents Ordinance 2000 into existing management systems)

SFK-GS-32: Arbeitshilfe Human Factor-Aspekte für Betriebsbereiche und Anlagen nach der Störfall-Verordnung (12. BImSchV) (Guidance notes: Human factor aspects for establishments and installations under the Major Accidents Ordinance)

SFK-GS-33: Leitfaden Schritte zur Ermittlung des Standes der Sicherheitstechnik (Guidance Notes: Steps for identifying the state of the art safety technology)

SFK-GS-35: Arbeitshilfe Systematisierung von Fragestellungen und Antworten zum Begriff ”Betriebsbereich" des § 3 Abs. 5a BimSchG (Guidance Notes: Developing a systematic approach to questions and responses concerning the term” establishment" as used in Art. 3 para. 5a of the Federal Pollution Control Act)

2) Final reports and guidance documents published by the TAA

Available from: SFK/TAA office at GFI-Umwelt

(http://www.sfk-taa.de)

TAA-GS-11: Abschlussbericht “Ganzheitliche Anlagenüberwachung“ (Final report: Integrated Monitoring of Installations
(Not available on the Internet)

TAA-GS-23: Definitionen nach § 2 Nr.1 und 2 Störfall-Verordnung (Definitions under Art. 2 nos. 1 and 2 of the Major Accidents Ordinance)

TAA-GS-24: Richtwerte für sicherheitsrelevante Anlagenteile (SRA) und sicherheitsrelevante Teile eines Betriebsbereiches (SRB) (Standards for safety-relevant parts of installations and safety-relevant parts of establishments)

3) Publications by the German Federal Environmental Agency (UBA Texte)

Available from: **Federal Environmental Agency**

(http://www.umweltbundesamt.de/uba-info-medien/index.htm
or: http://www.umweltdaten.de/medien/kat-k.pdf)

UBA/BMU-Forschungsvorhaben: Sicherheitsmanagement bei kleinen und mittleren Unternehmen, UBA Texte 67/98, UBA-FB-Nr. 98-101 (UBA/BMU research project: Safety management in small and medium-sized enterprises)

UBA-Forschungsvorhaben: Entwicklung von Arbeitshilfen zur Erstellung und Prüfung des Konzeptes zur Verhinderung von Störfällen, UBA-Texte 15/2002, UBA-FB-Nr. 000235 (UBA research project: Development of guidance notes for developing and appraising a concept for preventing major accidents)

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Available from: Länderausschuss für Arbeitsschutz und Sicherheitstechnik

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Report of the OECD Workshop on Audits and Inspections related to Chemical Accident Prevention, Preparedness and Response (Madrid/Spain, 6-9 March 2001)

Report of the OECD Workshop on Integrated Management of Safety, Health, Environment and Quality (Seoul/Korea, 26-29 June 2001)

6) Other publications

Guidance on Inspections as Required by Article 18 of the Council Directive 69/82/EC (Seveso II) of the Institute for Systems Informatics and Safety

Available from: Major Accident Hazards Bureau (MAHB)

(http://mahbsrv.jrc.it/downloads-pdf/inspecf.pdf)

ANNEX 5

The members of the TAA's Working Group on Inspection and Auditing of Installations are: (as of: January 2003)

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