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**REFERENCE HANDBOOK ON
ENVIRONMENTAL COMPLIANCE AND ENFORCEMENT
IN THE MEDITERRANEAN REGION**

Part III

HUMAN INFRASTRUCTURE

In cooperation with



WHO

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Part III

HUMAN INFRASTRUCTURE

PREFACE

Within the framework of the MED POL Programme Phase III for the Assessment and Control of Marine Pollution in the Mediterranean adopted in 1996, special reference is made on the pollution control component to assist countries to fulfill the provisions of the Protocol for the Prevention of Pollution from Land-based Sources and Activities (LBS Protocol). In fact, Article 6 of the Protocol, which was signed in 1980 and revised in 1996, calls for the strengthening and/or establishment of systems of inspection related to land-based pollution.

Among the activities for the promotion of the environmental inspections, a workshop of experts on Compliance and Enforcement of Legislation in the Mediterranean for Control of Pollution resulting from Land-based Sources and Activities, was convened in Sorrento, Italy in 2001, to review progress in that field and discuss future activities. As a result, it was recommended that guidelines on compliance and enforcement be developed, indicating the general lines to be followed rather than going into detailed recommendations.

These guidelines have been prepared, reviewed and commented upon by the National MED POL Coordinators and the final text provides the framework for the enhancement and strengthening of the environmental inspection systems in the Mediterranean. The countries may use them to specify their own code of conduct and practices to be followed by their Inspectorates.

Following the preparation of the said guidelines, it was felt that more information was needed on a number of technical issues, so that reference information developed adequately could better assist the implementation of the guidelines. As a result, the Handbook containing more detailed information was produced, under the technical supervision of WHO/MED POL and with the assistance of a team of five experts.

The purpose of the Handbook is to raise the level of performance of the environmental inspectors and support the above mentioned guidelines by providing details on assessing, developing, implementing and sustaining a viable inspection programme.

All aspects of an inspection programme are covered, including planning and designing enforcement programmes, international cooperation, non-point sources of pollution and compliance strategies, enforceability of permits, self-compliance, environmental negotiations, public participation, voluntary agreements, profiles of inspectors, inspection policies and planning, sampling, inspection techniques and training. To address those elements of comprehensive inspection programmes, the Reference Handbook includes the following:

- Organization issues
- General procedural issues
- Human infrastructure
- Sampling

The above structure appears in the four volumes, each one presenting a specific subject related to environmental inspections. The experts team is composed by professionals with long-standing experience on inspectorates in their countries. The texts reflect the authors experience from different angles and different philosophies that enrich the contents. It may happen that some issues are mentioned in more volumes. This is due to the fact that repeated issues provided another perspective and/or are needed for the complete understanding of the specific volume. The experts team is composed by the following scientists:

Mr Yasser Sherif is a former Head of the Environmental Inspection Unit in the Egyptian Environmental Affairs Agency (EEAA). He was responsible for preparing Part I related to "Organizational issues".

Mr Rani Amir is the Director of Marine and Coastal Environment Division in the Israeli Ministry of Environment. He was responsible for preparing Part II related to "General procedural issues".

Mr Allan Duncan is former Chief Inspector of Her Majesty's Inspectorate for Pollution (HMIP) in the UK. He was responsible for preparing Part III related to "Human infrastructure".

Mr Robert Kramers is a specialist in the Dutch Information Centre for Environmental Licensing and Enforcement. He was responsible for preparing Part IV related to "Sampling".

Mr Robert Glazer is former Head of a regional inspectorate for the Ministry of the Environment in the Netherlands and coordinator of the European Network for the Implementation and Enforcement of Environmental Law (IMPEL). He was responsible for preparing the Guidelines on compliance and enforcement and acted as a coordinator and reviewer for all four parts of the Reference Handbook.

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1. INTRODUCTION

The purpose of this compliance and enforcement manual is to assist Mediterranean countries combat pollution of the Mediterranean Sea. The sources of pollution will vary from country to country. In general, however, they are likely to include:

- Discharge of liquid effluents directly into the sea, or into the rivers or sewers that flow into it.
- Release of pollutants from buried waste or contaminated land, by way of groundwater.
- To a lesser extent, deposition on the surface of the sea of pollutants originally discharged into the atmosphere.

All significant sources of such pollution will be subject to some form of environmental law governing the operation of polluting processes and protection of the environment. They will be subject also to checking for compliance with the permits or agreements made under the relevant legislation and supporting regulations. The form of legislation and, more particularly, the systems adopted for securing compliance with relevant permits or agreements, or for achieving associated environmental objectives, may differ widely depending upon the regulatory approach adopted by individual countries.

The following approaches are typical of modern environmental regulatory systems.

- The Traditional Policing approach. This is what is known as a “regulation of process” approach in which environmental and/or performance standards are defined in an operating permit. It is also described as a “command and control” approach. Checking for compliance with permit conditions is carried out on a routine basis and sanctions of various kinds are applied in cases of non-compliance.
- The Goal-Based approach, in which environmental objectives or targets are defined in a permit, or in an equivalent regulatory document, after agreement with the operator who is then responsible for proposing management arrangements for achieving the agreed objectives or targets. Compliance checking in this case is a matter of ensuring that the management arrangements are in place and working satisfactorily, and that the appropriate objectives and targets are being met. Enforcement action would follow any failure to comply with the defined objectives and targets in an appropriate and timely way. This is otherwise described as a “regulation of outcome” approach.
- The “Environmental Management System (EMS)” approach. This is very similar in principle to the “Goal-Based” approach but, in situations where an EMS, certified to a defined standard such as ISO 14000, is in place and where regulators can be confident about the quality of the audit process, an element of the formal compliance checking may be delegated to the accredited auditors.
- The “Voluntary or Negotiated Agreement” approach in which an operator or, more usually, a sector of industry agrees at Government level upon environmental or performance objectives, and takes the initiative for their delivery. This approach has the attraction of allowing industry to work constructively and co-operatively with Government in achieving desired environmental outcomes. Governments would be ill-advised, however, to embark on such an approach without the necessary infrastructure for taking enforcement action if the voluntary agreement does not work.

- The “Economic Instrument” approach in which financial incentives or penalties are devised in order to influence the environmental behaviour of polluters.

The choice of regulatory approach is usually a matter of policy or culture, specific to individual countries. Within each of these approaches, further operational choices have to be made about the extent to which inspectors promote compliance by education and persuasion or concern themselves simply with deterrence and enforcement, and about the extent to which inspectors may exercise discretion in achieving desired outcomes as opposed to adhering strictly to defined procedures and systems. In actual practice, however, it is likely that any modern approach to environmental protection and regulation will be some combination of the above approaches, applied appropriately to different sources of pollution or sectors of industry. The choice of regulatory approach, or combination of approaches, will inevitably influence the precise role of an inspector but the essential characteristics of the role, and of the types of individual best suited for the role, are generic to most of the regulatory approaches and associated operational choices.

2. DUTIES OF INSPECTORS

The activities associated with regulation and control of environmental pollution generally involve the following steps.

- Policy planning and setting of environmental protection objectives.
- Development of legislation and supporting regulations.
- Permitting or making agreements about objectives and targets.
- Compliance promotion.
- Compliance checking
- Enforcement.
- Assessment and feedback of information to legislation or permitting.

This sequence of steps, with feedback of information to the legislative step or to the permitting step, is now widely recognised as a generic “regulatory cycle”.

In all of the conventional regulatory systems, the inspector will certainly be involved in the steps of compliance control, enforcement, and assessment and feedback of information about the effectiveness of the system in achieving its objectives. In well-established systems he or she is also likely to be involved in other steps as described below.

Policy planning and setting of environmental protection objectives:

This activity is the usual Government response to a generally accepted need, or to pressure from domestic society or from the international community. The planning of environmental protection policy and the setting of associated objectives at Government level involves recognising and balancing various factors, including social and economic issues as well as environmental considerations. The inspector’s role at this stage is to contribute professional experience and knowledge of sources of pollution, of their effects in the environment and of the practicality and implications of various courses of action and, hence, to assist in the setting of practical objectives for environmental protection. Involvement in this work is invaluable background for the subsequent task of explaining to operators, and to members of the public, the broad context of regulatory requirements.

Development of legislation and supporting regulations:

The experienced inspector plays a key role in this step by advising legislators on the practicability and enforceability of proposed legislation and regulations. Absence of inspector involvement at this stage may result in legislation that is unenforceable or otherwise deficient and which, therefore, fails to deliver the desired policy objectives.

Permitting or making agreements about objectives and targets:

Depending upon the administrative or organisational arrangements within a regulatory body, the inspector may be directly responsible for the issue of permits or for agreeing environmental targets or objectives. Even if he or she is not directly responsible for this task, however, the inspector will be almost invariably called upon to advise on the conditions and limitations to be included in permits or on practically achievable objectives or targets for a particular process or installation.

Compliance promotion:

The Inspector is usually at the critical interface between Government policy makers, operators of industrial installations and members of the public. Advantage may be taken of this situation by giving the inspector a responsibility for promoting good environmental performance, in the sense of educating or influencing operators towards improved environmental behaviour and practice. The role, in this context, is to explain to all concerned the relevant environmental objectives and targets, together with the reasons for them, and

where appropriate to provide guidance and support to operators without subsuming the operator's responsibility for his installation.

Compliance control:

This is the core task of an inspector in any regulatory approach, and it is generally described as "Inspection".

In its broadest sense, it entails:

- Checking the compliance of industrial installations with requirements stated in laws, regulations, ordinances, directives, prohibitions, agreements and/or permits etc.
- Monitoring the general and environmental impacts of specific industrial installations that might indicate the need for enforcement action or for more detailed investigation.

The key elements of this task are:

- Planning, i.e. setting out a clear framework for inspection activities.
- Collection of site-specific information from visits, site surveys etc.
- Analysis of results and follow up at the site/company level.
- Regular evaluation and reporting of inspection activities.

The findings from each site visit need to be carefully evaluated. They should lead to clear conclusions regarding any further action and should be properly recorded in a formal site visit report. Incidents, accidents or non-compliances need to be followed up rigorously by:

- Establishing the cause, or causes, of failure, and clarifying the resulting impact on the environment.
- Determining the actions to be taken for mitigation of environmental impacts.
- Specifying the action to be taken to prevent further such accidents, incidents or non-compliance.
- Carrying out subsequent inspection to ensure that the operator completes all the required actions on the appropriate timescale.
- Forwarding a report of conclusions to the enforcement authority as appropriate.

Enforcement.

Depending upon administrative or organisational arrangements, and upon the extent of the inspector's authority, he or she may have to exercise legal sanctions in the event of any non-compliance with the terms of a permit or agreement. In any case, the inspector's report, together with any additional advice, will be required for the exercise of sanctions provided by the law. In most regulatory systems, however, the inspector's authority will extend at least to requiring immediate action upon discovery of imminent risk of serious harm to the environment. Thus, he or she will be required to exercise powers of discretion and of reasonable or proportionate regulation, having regard to environmental, economic and social factors.

Assessment and feedback of information:

On the basis of his or her experience of implementing the regulatory system, the inspector will be required to evaluate its effectiveness in delivering the policy objectives set by Government, and to help in formulation of any necessary improvements. These may be at the fundamental level of changes to primary legislation or to supporting regulations but, in the short term, are more likely to concern the processes of drafting and issuing permits or the setting of environmental objectives and operational targets. For these purposes, it is clearly helpful for the inspector to have been involved in the early steps of the regulatory cycle.

3. PROFILE OF AN INSPECTOR

The authority and credibility of a regulatory body, and the respect in which it is held by operators of industrial installation and by the public, depends in large part upon the reputation of its inspectors. This is reflected in the widely accepted view that an effective body needs to employ a sufficient number of personnel with the necessary qualifications, skills and experience to undertake all of its functions and responsibilities. Within any regulatory body there may be positions of a general nature and of a more specialist nature, as well as positions that are a combination of both, depending upon the structure, managerial arrangements and precise role of the organisation. It must be expected, therefore, that the profile of necessary qualifications, skills and experience across the corps of inspectors will vary from organisation to organisation.

In the context of the range of duties described in the previous section, however, the skills and attributes that constitute the profile of an inspector are most usefully categorized and described by way of:

- Personal attributes and competencies.
- Technical knowledge, skills and experience.

3.1 Personal Attributes and Competencies

The personal attributes that describe the ideal, fully effective inspector include the following:

- Mature.
- Professional and disciplined.
- Able to communicate.
- Integrity.
- Helpful and constructive.

Mature:

This is not necessarily a matter of age, or years of experience. It is the innate characteristic that allows an inspector to exercise a natural authority in dealing with operators at the most senior level, and to command respect while retaining the ability to exercise sensible discretion where appropriate. It also allows the inspector, in discharge of other duties, to interface effectively with policy-makers, legislators, Ministers and with members of the public. In essence, it is the attribute of an inspector who is confident in his or her understanding of the inspector remit and of the legal and technical issues associated with it, and who neither abuses his or her authority nor concedes it under pressure.

Professional and Disciplined:

It is perfectly normal and desirable for environmental regulatory bodies to attract staff with an interest in the environment and a commitment to its protection. The inspector's role, however, is to exercise powers granted under the environmental law, whose provisions will have been designed to implement Government policy and to balance environmental, social and economic factors. He or she, therefore, needs to be able to differentiate between any personal views, on the one hand, and his or her legal remit, on the other. This may bring the inspector into occasional personal confrontation, with single-issue pressure groups of one kind or another for example, but the professional discipline to carry out his or her duties according to legal provisions is essential for delivery of government policy, and for avoidance of legal challenge.

Able to Communicate:

The role played by the inspector at the interface between policy-makers, operators, and the public requires an ability, natural or acquired by training, to communicate effectively in terms that are comprehensible by the relevant audience. This is essential for effective explanation of regulatory decisions, and their associated policy context, to operators and the public and for effective feedback of information on practical implementation to policy-makers and Government.

Integrity:

This attribute is closely related to the attributes of professionalism and discipline but it includes, also, the innate resistance to improper influences by whatever means. The credibility of the regulatory body, and the respect in which it is held by the public and by its peers, depend heavily on the assurance that the inspector's decisions relevant to protection of the environment are not subject to inducement by those with an interest in influencing his or her judgment for whatever reason. This attribute might be described otherwise as being "firm but fair and honest".

Helpful and Constructive:

In the context of the wider duties described in the previous section, an inspector needs to be both helpful and constructive. His or her ready co-operation and willingness to share knowledge and experience will be welcomed by policy-makers, operators, the public and colleagues alike. It is a key element in building respect for the individual inspector, and for his or her team, and it is an essential part of extending the influence of the regulatory body as a whole.

In terms of identifiable personal competencies, the ideal inspector should display most of the following abilities or skills.

- Self-motivation
- Judgement
- Thoroughness
- Assertiveness
- Persuasiveness
- Relates to others
- Resilience
- Organisation and time management
- Planning to achieve objectives
- Analytical capability
- Negotiation
- Networking
- Self development
- Application of experience

These may be defined simply as follows:

Self-Motivation.

Willing and committed to pursuing own and organisational plans and objectives.

Judgement.

Researches and evaluates data and opinions. Studies problems from many perspectives. Reaches balanced decisions, giving proper weight to all relevant considerations. Sets clear priorities, based on legal requirements and policy objectives.

Thoroughness.

Compiles as much relevant information as possible within time constraints. Checks and examines data before coming to decisions. Checks details of all communications to and from operators and others. Verifies and validates information before acting on it. Checks own judgements with others. Complies with organisational procedures.

Assertiveness.

Speaks and acts forcefully in order to achieve objectives, but in a way that does not impede or deny the rights of others.

Persuasiveness.

Expresses facts and ideas fluently in face-to-face contacts and on public platforms. Is discreet, honest and consistent in communication. Encourages others to express their views, and listens actively. Shows understanding of other points of view, and is open to reasoned argument. Uses persuasion to achieve environmental improvement where appropriate.

Relates to Others.

Interacts easily and effectively with others, irrespective of their status or background. Able to establish professional relationships with people, regardless of their status. Acts with integrity towards others to build trust. Monitors and modifies relationships to maintain professional integrity and independence.

Resilience.

Able to cope with high levels of pressure at work, and in hostile situations. Recovers quickly from setbacks and disappointments.

Organisation and Time Management.

Allocates own time, plans targets, sets priorities and manages caseload efficiently. Arranges information systematically, and processes paperwork and other information effectively and in timely fashion. Personally well organised. Builds trust by keeping to commitments.

Planning to Achieve Work Objectives.

Sets clear goals and develops detailed strategies and schedules to meet them. Anticipates obstacles and makes contingency plans. Obtains resources necessary to achieve goals and objectives.

Analytical Capability.

Persists in finding out what is happening. Does not take information at face value. Questions facts and is willing to change course of inquiry if necessary. Draws justifiable conclusions from quantitative and qualitative information. Applies scientific and engineering principles and techniques, as appropriate, to identify problems and potential solutions.

Negotiation.

Resolves differences when necessary by identifying best, mutually agreeable solutions. Uses negotiation techniques, when appropriate, to promote and protect organisational and policy objectives. Prepared to compromise wisely in order to resolve issues and achieve progress.

Networking.

Identifies key people who have the motivation and ability to contribute to achievement of objectives. Builds and joins relevant networks. Uses appropriate channels of communication to exchange information, test opinion and to influence.

Self Development.

Keeps professional, political and commercial knowledge and understanding up-to-date. Invites and provides clear and constructive feedback to enhance learning. Knowledgeable on a broad front about the organisation, its functions and methods of operating. Actively promotes cross-functional interaction and awareness.

Applying Experience.

Reviews and learns from own experience. Identifies how to use experience to deal with current and emerging challenges and issues. Recognises the difference between useful experience and simple repetition of past practice.

3.2 Technical Knowledge, Skills and Experience

In addition to the personal attributes and competencies described above, an inspector must have a range of relevant technical knowledge, skills and experience in order to be fully effective. The precise requirements will depend upon the range of duties he or she is required to undertake. This, in turn, will depend upon the precise remit of the regulatory body and upon the way it organized and managed. In the context of environmental regulation, however, the inspector's main duties will normally be in the steps of compliance control and enforcement, but the knowledge, skills and experience necessary for these functions will equip him or her adequately for effective contribution to the other steps in the regulatory cycle.

For practical purposes, the necessary knowledge, skills and experience, described generically as "competencies", may be sub-divided into three groups as follows:

- Core competencies.
- Clusters of role-related competencies.
- Specialist competencies.

The core competencies are required of all inspectors in an environmental regulatory body. They represent a base of knowledge and understanding of the environmental regulatory role that may be used as a foundation for further development for a particular role. Clusters of role-related competencies are relevant to inspectors assigned to the related role. (For the purposes of this document, the relevant role is taken as "compliance control and enforcement". Other roles such as assessing permit applications and the writing of permits may require a slightly different cluster of competencies.) Specialist competencies are required of those inspectors who may have a specialist role within the regulatory organization or who may have a need for such competencies in order to carry out a particular assignment.

The portfolio of competencies required of individual inspectors may vary, at the level of detail, depending upon how the regulatory body is organized and upon the extent to which it relies on inspectors working in teams. In team-based organisations, the key requirement is for the team as a whole to have the full range of competencies and to be managed accordingly.

3.2.1 Core Competencies

The core competencies include areas of knowledge that underpin, at a general level, most of the activities associated with environmental regulation. These include:

Environmental Law:

This includes a general knowledge of the legislation relevant to the role of the regulatory body and of the statutory basis for its regulatory duties and powers.

Pollution Control and Regulatory Principles.

This includes an understanding of the regulatory policies adopted by the regulatory body for pollution prevention and control, and for exercise of sanctions in cases of breach of the law.

Legal Procedures.

This covers understanding of the legal process that applies in cases of non-compliance or legal breach. Where prosecution is a relevant sanction, it should include matters concerned with the proper collection of evidence and its production before a court of law.

Scientific and Engineering Principles.

This includes a basic knowledge of the behaviour of pollutants in the environment and of how to detect and measure them. It may also include some understanding of the chemical engineering of potentially polluting processes, together with relevant abatement techniques, and may extend to the principles of electrical or electronic engineering associated with process instrumentation, control and monitoring systems.

Risk Assessment.

This aspect borders on a specialist area but it is desirable for an inspector to have some understanding of the relationships between sources of hazard, pathways in the environment, receptors or potential targets for impact, probability and consequent risk.

Environmental Management.

The general principles and logic of environmental management systems should be understood, from assessment of environmental affects, through development of environmental policies and targets and organising and managing their delivery, to reporting on achievements and progress and identifying areas for further improvement.

Team Management.

This is relevant for inspectors destined to be managers of teams and should include knowledge or experience of organization and management of multi-disciplinary teams, of finance and other resources, and of related performance statistics.

3.2.2 Cluster of Competences related to Compliance Control and Enforcement

This cluster of competencies is broadly relevant to the main duties of an inspector under any form of environmental regulatory regime. The detailed specification of the cluster needs to be tailored to the particular remit, policies and objectives of the individual regulatory body but the essential elements are largely generic. The key competencies, described here in terms of activities, are as follows:

Site Assessment and Advice to Operators regarding Permission to Operate in Compliance with Specific Legislation:

This involves assessing sites covered by environmental legislation, regulations or agreements, establishing appropriate contact with the site operator and advising him of the relevant legal requirements and of how to prepare and submit the necessary application for a permit.

Assessment of Applications and Issue of Permits. (Where appropriate to inspector role.)

This requires checking and validating the content of an application for a permit, specifying conditions and limits which apply to the permit, specifying programmes for process improvement or modification, and determining the programme for monitoring of the process by the operator. It also involves all the administrative steps, including public consultation etc, associated with preparation and issue of the permit.

Securing Compliance with Statutory and Environmental Objectives.

This involves keeping up to date with developments in technology, business operations and the economy of an industry sector, guiding operators towards continuous improvement and reviewing/revising regularly the terms and conditions of existing permits. It also involves

inspecting sites and assessing process releases for compliance with the requirements of relevant permits, and investigating any breaches or complaints against the site operator.

Instigating formal Enforcement Action.

In cases of non-compliance this may involve issue of various kinds of formal enforcement notice ranging from a simple notice requiring some specified improvement through to a prohibition notice requiring shutdown of a process in the event of imminent risk of serious harm to the environment. In cases where prosecution is intended it also involves gathering and recording evidence of breach and eventual presentation of evidence in court.

Emergency Response.

Where it is within the inspector's remit, this means ensuring that the necessary action is taken to recover control of the source of emergency, to protect people and the environment and to keep the public informed. It then involves ensuring that any necessary remediation is undertaken, that all possible lessons are learnt and action taken to avoid repetition, and that any appropriate enforcement action is taken.

Monitoring Releases and Assessing their Environmental Impact.

This involves planning an environmental and release monitoring programme, reviewing the results of it and assessing the impact on the environment. It then means considering whether environmental objectives are being achieved by way of existing permits and seeking their modification if necessary.

Representing the Regulatory Body at Meetings with the Public, Local Authorities and other Bodies.

In situations where others need to be consulted or informed about developments or incidents on sites under the inspector's control, this generally requires explanation of the regulatory role, of the events or developments of concern, of actions proposed by the regulatory body and of how others may make representations and how they will be dealt with.

Contributing to the Development and Continuous Improvement of Regulatory Policy and Operations:

In the light of experience of the above activities, this involves feedback of information to those responsible for developing legislation, regulations and regulatory policies and procedures, with a view to improvement if necessary. It also involves sharing of experience and accumulated knowledge with fellow inspectors and specialist staff.

3.2.3 Specialist Competences

These competencies cover areas of specialist knowledge or skills required by the regulatory body for effective discharge of its duties. The acquisition and maintenance of such competencies is generally such that inspectors skilled in these areas are likely to provide an internal specialist advisory or consultancy service to more generally qualified colleagues who have the broader compliance and enforcement role. The range of specialisms required will depend upon the remit of the regulatory body but typical specialist competences include the following:

- Sampling and analysis of particular pollutants in the environment. (e.g. dioxins)
- Characterisation and modelling of groundwater movement.
- Modelling of pollutant dispersion in the atmosphere and aquatic/marine environments.
- Risk assessment.
- Detection of causes of ecological damage.
- Knowledge of major industrial processes and associated abatement techniques. (i.e. Best Available Techniques (BAT)).

- Knowledge of contemporary continuous monitoring techniques and their application.
- Remediation of contaminated land.
- (Drafting and issue of complex permits.)
- (Presenting cases for prosecution in court.)
- Management of R&D.

3.3 Profile of New Recruits

It is most unlikely that new recruits to a regulatory body will comply fully with this profile. The essential requirement of new staff is that they demonstrate evidence of having at least the personal attributes and competencies and the potential to acquire, by practice or specific training, the further professional regulatory and technical competencies. Decisions by individual regulatory bodies on the level of experience and technical competence required of new recruits will depend to a large extent on the availability of appropriate training programmes, internal or external, or on the availability of fully trained staff to provide internal tuition, support and supervision.

3.4 Accreditation of Inspectors

Individual regulatory bodies will also have to decide, on the basis of their legal or constitutional situation, whether or not inspectors need to be formally accredited to carry out inspections. If accreditation is necessary, they will also have to decide what level of competence must be reached for this purpose, and by what means should it be tested and maintained.

4. INSPECTION POLICIES

Various important aspects of inspection policy need to be decided before planning any inspection programme or specifying techniques to be used. In this context, “inspection” refers primarily to the routine checking of compliance with laws, regulations, permits, etc. It is not concerned, in the first instance, with reactive or “ad hoc” inspections for the purpose of investigating accidents, incidents or complaints. The policies adopted for routine inspection by individual countries or regulatory bodies are generally influenced by factors such as national regulatory culture, relationships with operators and other interested stakeholders including the public, available resources and, possibly, by the existence of certified Environmental Management Systems (EMSs) and properly accredited certifying bodies. Policy aspects that need to be addressed include:

- Regulation of “process” or “outcome”, i.e. choice between deterrence and enabling role.
- Extent of direct supervision by inspectors of compliance with laws, permits, etc.
- Extent of dependence on operators’ own monitoring data. (So-called “self-monitoring.”)
- Announced or un-announced inspections.
- System for quality assurance of inspection standards.
- Procedures for prevention of “issue-blindness, regulatory capture or simple corruption.
- Role of cost-recovery charging, if any, for inspection and environmental monitoring.

4.1 Regulation of “process” or “outcome”

This is an important choice which effectively defines the nature and tone of the inspector’s approach to regulation. Regulation of “process” is generally recognised as a “command and control” approach in which environmental and/or performance standards are defined in an operating permit. Checking for compliance with permit conditions is carried out on a routine basis and sanctions of various kinds are applied in cases of non-compliance. The general tone is one of traditional policing, and deterrence from violation of well-specified laws, permit conditions etc.

In the regulation of “outcome” approach, environmental objectives or targets are agreed with an operator who is then responsible for proposing management arrangements for achieving the agreed objectives or targets. Compliance checking in this case is a matter of ensuring that the management arrangements are in place and working satisfactorily, and that the appropriate objectives and targets are being met at the appropriate time. This is a goal-based system that requires a somewhat different approach from the traditional policing approach.

The choice of regulatory approach is largely a matter of national regulatory culture. The regulation of “outcome” has the advantage that the operator is involved in the setting and agreement of objectives and targets and can reasonably be expected to be committed to delivering them. This means that the regulatory activity can be concentrated on ensuring the ultimate of objective of protecting and improving the environment. It involves an element of trust that the operator will deliver, but with the disadvantage that breach of such trust would inevitably have to result in severe regulatory sanctions. The regulation of “process” has the advantage that compliance checking against conditions in a permit is a more straightforward and transparent approach, but it has the disadvantage that unless permits are carefully written the operator may be in full compliance without necessarily achieving the desired environmental outcome.

4.2 Extent of direct supervision by inspectors

Three broad policies may be identified as follows:

- Frequent checking for compliance with laws, permits, etc. on a daily or weekly basis.
- Regular, but less frequent, checking for compliance, typically on a 3-6 monthly basis.
- Partial delegation of compliance checking to accredited certifying bodies in cases of installations where a certified EMS is in place.

Frequent checking for compliance.

This policy is appropriate in situations where there is serious doubt on the part of the regulatory body, or on the part of the concerned public, about the reliability or integrity of individual operators or, more usually, operators within a particular sector of industry. Until such time as operator practices or attitudes can be changed by education, persuasion or rigorous exercise of legal sanctions, it may be necessary to adopt a policy of frequent checking in order to provide the necessary assurance that all legal requirements are being met, that government objectives are being achieved and that the environment is being properly protected. This policy does, however, checking is carried out by less experienced staff, it may be appropriate depend to a large extent on the discretion of an experienced inspector and, where compliance for senior management to set minimum inspection frequencies.

This is a regime of almost constant supervision, in effect. It is very resource intensive and is generally regarded as a last resort. It is most likely that, if such a policy is necessary at all, it will only be for a limited period of time or only for limited sectors of industry. (In some countries, in the past, the waste disposal business has been such a sector, requiring the daily presence of an inspector to prevent improper disposals or disposal practices.)

Regular, but less frequent, checking for compliance.

This policy is appropriate in situations where there is a substantial measure of trust and respect between operator and regulator. The regulator must trust the operator to notify him or her in the event of incidents resulting in, or likely to result in, breach of any legal provision or condition, and to provide him or her with a full and frank account of events and environmental performance in the period between inspections. Equally, the operator must trust the inspector in a professional and proportionate manner, given that this policy may require an element of self-incrimination by the operator.

This regime is appropriate for sectors of industry that are generally committed to efficient operation, with sound management and supervision systems in place, together with proven concern for the environment and associated business reputation. It is relatively economical with regulatory resources but, because it depends on trust, there must be a clear regulatory commitment to severe punishment of any breach of trust such as concealment of information or falsification of data.

The confidence of the public in the effectiveness of regulatory control under this regime also needs careful attention. The regulatory body and operators must ensure that the public understands the nature of their relationship and is reassured, by ready access to relevant information for example, that there is no improper collusion and that the interests of all stakeholders are properly protected.

Delegation to an accredited EMS-certifying body.

This is a relatively new concept in the field of environmental regulation. It depends, firstly, upon an operator having in place ***an EMS certified to a defined standard such as ISO***

14000, and upon the regulatory body having confidence that the operator is committed to protection of the environment and to compliance with the law. It also depends upon the regulator's confidence in the ability of the certifying body's auditors effectively to check and validate compliance with certain elements of a permit. In essence, this system entails agreeing the environmental policies and targets upon which an EMS is based, then relying on accredited auditors to validate certain elements that are common to the EMS and the permit while conserving regulatory resources for checking elements that are specific to the permit or that require an inspector's statutory powers.

This system requires a large measure of mutual trust by all parties and requires, in particular, that the public is sufficiently reassured as to the level of environmental protection provided by it. In this regard, it is similar to the "Regular but less frequent checking" approach.

The Environmental Protection Agency in Ireland has applied this approach to a small number of larger processes. After rigorous inspection to ensure that all systems are operating properly, and that audit arrangements are sound, it reduces its inspection frequency to once in about five years. The Brussels Inspectorate for Management of the Environment, in Belgium, applies a similar policy for smaller processes, and the Environment Agency in England has been testing the potential of the system. As yet, however, there is no substantial body of experience with this system, and there are still some doubts about its ability to provide the required measure of public reassurance.

4.3 Extent of dependence on operator's own monitoring data

This is an aspect of policy that has implications for maintenance of public confidence in the regulatory system, and also has substantial implications for the staff and financial resources required by the regulatory body. Generally, the public and other interested parties will look to information about releases of pollutants from an industrial installation for reassurance about its effect on the environment. If this information has to be provided entirely by way of the regulatory body, or some independent contractor hired by the regulator, in order to maintain public confidence, the costs of the regulatory process will be high, regardless of the question of who has to pay for them. If these costs are to be avoided, or reduced, the regulator may choose to depend on monitoring data gathered by the operator in the course of plant operation, and as specified in a permit. This is sometimes described as "Self-monitoring", a term that may raise doubts in the public mind about validity of the information. In this case, some provision for ensuring the validity of the data must be made. This may be by way of a smaller, independent "check- monitoring" programme whose results may be compared with the operator's data. Alternatively, the operator's information may be gathered by way of instrumentation and systems that are subject to certification and independent validation. **This is discussed in more detail in Part D, under the heading of "Self-monitoring"**, but it will be clear from this brief description that regulatory choices for this aspect of policy will have substantial implications for the planning and conduct of inspections and for the deployment of regulatory staff.

4.4 Announced or un-announced inspections

This is a policy choice that is normally influenced by the record of operator performance or behaviour. In situations where there are doubts about operator reliability or integrity, or any suggestion of concealment or falsification of information, the choice will almost certainly be for unannounced inspection. In other situations it is sometimes judged more effective to announce inspections some time in advance, so that an operator may be well prepared with relevant staff available and relevant records and data ready for presentation. In normal

circumstances, however, and for consistency of policy, it would be normal to adopt a policy of unannounced inspections.

4.5 Quality assurance of inspection standards

The senior management of any regulatory body will generally wish to be assured that the quality of inspections carried out by its staff is of a consistently satisfactory standard. Where individual site inspections are carried out by only one inspector, or by only a few inspectors, it is often difficult to gather the necessary information to provide this assurance, and the issue may need to be addressed as a matter of policy. Various options are available for dealing with this, including the occasional oversight of site inspection by an experienced senior manager. Another effective, and more formal system involves the creation of a small group of experienced inspectors to carry out occasional “team inspections” of individual sites and to report their findings to senior management. Such inspections may be incorporated into any specific inspection campaign that may be planned for other reasons. The choices for this aspect of policy will have implications for staff numbers, the deployment of staff and for the programming of routine inspections.

4.6 Prevention of “issue-blindness”, “regulatory capture”, etc.

Issue-blindness arises where an inspector has become so familiar with a particular site or installation and has become so accustomed to the operational arrangements that he or she no longer recognises some feature as a hazard to the environment. Regulatory capture is close to the issue of corruption and may arise where, for whatever reason, an inspector has formed an improper relationship with an operator, to the extent that his or her regulatory judgement is compromised and, again, there may be an unchecked hazard to the environment. Methods of dealing with these issues are likely to be tailored to individual situations and to be influenced by national regulatory culture. Common ways of dealing with both, however, include regular rotation of inspectors’ duties or requiring that inspectors work in pairs and that pairings change from time to time. Hence, policy choices in this area have implications for programming of inspections and for inspection techniques. **This topic is discussed in more detail in Section C, under the heading of “Code of conduct for inspectors/inspection protocols”.**

4.7 Role of cost recovery charging

The “polluter pays principle” is sometimes implemented, as a matter of policy choice, by charging to operators the cost of regulatory activities, including site inspection and environmental monitoring. If this policy choice is made, and if specific financial allocation has been made for the relevant activities, then planning of inspection programmes, allocation of inspector time and design of monitoring programmes will all have to take this aspect into account. In some cases this may constrain choices for inspection frequency and the extent of independent monitoring, for example.

Furthermore, arrangements will be required for the recording of inspector time against specific activities and of costs of environmental monitoring.

5. INSPECTION PLANNING

Effective management of a regulatory body requires a systematic, overall plan for checking and promoting the compliance of industrial installations with relevant environmental laws, permits, etc. This is separate from the planning of individual inspections, which is described in Section 6 under the heading of "Inspection Techniques and On-Site Activities". This overall plan should cover all installations within the remit of the regulatory body and should cover a fixed period of time, with clear arrangements for its renewal or revision as necessary. The plan should reflect both long-term environmental goals and short-term objectives as well as the regulatory body's choice of inspection policies, and it should take account of the available staff and financial resources. In general, the plan should cover routine inspections, including inspections that are part of planned specific campaigns. It should also make some allowance for the inevitable reactive inspections required for the purpose of investigating accidents, incidents or complaints. The extent to which this plan is made publicly available will depend, to some extent, on the policy choice between announced and un-announced inspections and, if cost recovery charging is applied, on the extent to which details of cost-recoverable activities have to be published in advance, in a corporate plan for example.

Essential elements of planning and prioritisation of inspections include the following:

- Database of installations to be inspected.
- Number of inspectors available
- Total effort available for inspections
- Specific commitments.
- Frequency of inspections
- Estimating resources for inspections
- Reactive inspections
- Prioritisation
- Evaluation and Reporting
- Revision of the Plan

5.1 Database of installations to be inspected

A definitive list of all the installations within the remit of the regulatory body needs to be prepared. When the list has been developed, an appropriate data management system should be employed to record, maintain and up-date relevant information about each installation. This information should be sufficient to allow the classification and grouping of installations for the purpose of calculating the total resources required and allocating duties to inspectors. An effective database is likely to include information on the following:

- Statutory or legal basis of the permitting and inspection system for an installation.
- Location of installation by region or area.
- Operator contact information and permit number.
- Details of the installation and process.
- Permit types, conditions and other relevant data including expiry dates.
- Inspection dates and details.
- Non-compliances, enforcement actions and complaints relating to the installation.
- Information supplied by installations, e.g. from operator self-monitoring.
- Environmental impact information. (air, water and soil).
- EMS audit information, if relevant.
- Reporting of other data, for example consultant reports or relevant reports from other regulatory authorities.

5.2 Number of inspectors available

The balancing of staff resources and duties requires information on the total amount of inspector time available to the regulatory body. This requires a review of the number of qualified, in-house inspectors available. It might also include personnel from agencies, consultancies or certifying bodies, or otherwise available by way of secondment or short term contracts, for example. Some inspectorates have their complement of permanent staff fixed by the legislation that created the inspectorate itself, as in the Brussels Inspectorate for Management of the Environment, for example. In such circumstances it is sometimes difficult to vary the numbers of permanent staff to match increased workloads. In Brussels, Ireland and in some regions of Germany, for example, it is common practice to employ contractors on short or medium term contracts. In the UK, the Environment Agency has also adopted the practice of employing staff seconded from technical consultant organizations to supplement the complement of inspection staff.

5.3 Time available for inspections

In addition to the total number of inspectors available, detailed calculation of effort available for inspection requires analysis of all the other duties of an inspector. This will vary from country to country, and from regulatory body to regulatory body, depending upon organisational remit and managerial arrangements. The typical duties of an inspector, in addition to inspection, may include permitting, administration, advising other inspectors in any areas of personal expertise, advising on the development of legislation and supporting regulations, training, responding to general queries, presenting or attending seminars, research management, report writing, attending meetings on behalf of the organisation, and enforcement actions including prosecutions. Some allowance will also have to be made for unscheduled leave of absence or, conversely, for the working of extra hours. This will be a matter of management judgement based on past experience.

This analysis will allow estimation of the total in-house inspector time available for inspection. It may also afford the opportunity to evaluate the relative effectiveness of the duties carried out by inspectors and to determine the best use of inspectors' time. For example, time spent advising policy-makers or legislators on the practicalities of new environmental legislation or regulations may seem at first sight to be an unjustified diversion of inspectors from their proper role. However, analysis of the time spent on such activity, together with an evaluation of the benefits of having legislation which is practical and enforceable, is likely to show that time devoted to giving such advice is well spent for the longer-term effectiveness of the regulatory process and for protection of the environment.

5.4 Specific commitments

International/Regional/National commitments.

A regulatory body may be committed by its national government to deliver certain actions in regard to protection of the environment beyond its own national boundaries, as well as within them. This may arise from environmental legislation, international or regional treaties or simply as a result of action agreed on the basis of reports on the state of the environment in a specific region, e.g. the Mediterranean Sea. Such actions may include a campaign of inspections in a particular location, or in a particular sector of industry that uses a particular type of equipment or releases particular substances. A commitment may be made to prioritising inspection of certain installations with the objective of effecting improved environmental performance by reduction of emissions through enhanced compliance with permit conditions, or by revision or issue of new permits. Planning of inspection programmes will generally be required to accommodate such commitments.

Regulatory body commitments.

For reasons based on review of reports on the state of the domestic environment, or on the performance of particular installations, a regulatory body may also commit to a specific campaign of inspections in a particular location or on a particular sector of industry, as described above. Again, to the extent that this is an organisational commitment, the planning of inspection programmes will be required to meet it.

Commitment to co-operation with other regulatory bodies.

Where responsibility for inspection is shared with other regulatory bodies, e.g. for Occupational Health and Safety, the inspection plan will have to take account of the requirements for coordination and interaction with the other bodies. In addition, details of the plan will need to be agreed with other such bodies in advance.

5.5 Frequency of inspections

Before preparing an inspection plan, regulatory bodies should set baseline frequencies for each classification or group of installations, categorised by reference to the database of relevant information. It is most likely that such groups or categories will be based, in the first instance, on the nature of the processes involved. Baseline frequencies will have to take account of risks to the environment, of any relevant national regulations or guidelines, of any specific policy choices in regard to regulatory approach, and of the need to use available resources efficiently and effectively.

In order to establish the inspection frequency appropriate to individual installations, it is then necessary to develop an assessment and scoring system for adjusting the baseline frequency for each installation according to its specific circumstances and the level of risk it poses to the environment. Regulatory bodies will wish to select such a system according to their own national culture and regulatory policies, but suggested criteria for assessing the overall risk from an individual installation may include:

- the previous environmental performance of the operator;
- any previous prosecutions, orders or administrative fines;
- the technical knowledge and competence of the operator.
- the scale of pollution hazard represented by the installation
- use by the operator of self-monitoring systems such as continuous measurement systems and/or remote control data-combined systems;
- presence of a certified EMS, such as ISO 14001.
- results of monitoring of the state of the environment (for example, water, air, soil quality).
- complexity of facilities;
- age and condition of plant;
- the local situation taking into account the sensitivity or vulnerability of environmental receptors, the distance to residential areas, hospitals, environmental protection areas, etc.
- a change of operator, which may require checking of knowledge and reliability, and giving advice.

Whatever system is selected for assessing the relevant criteria and for adjusting baseline frequencies for individual installations, it will inevitably depend finally on the professional judgement of a knowledgeable inspector. This judgement should be made at the time of issuing a permit, and then reviewed at periodic intervals thereafter. An example of a well-developed system for assessing the risks associated with operator performance and pollution hazard is described at Annex 1

5.6 Estimating resources for inspections

In order to calculate the total time required for a particular inspection programme and, hence, to plan the number and types of inspections possible with available staff resources, it is necessary to estimate the time taken to carry out each type of inspection. Different types of inspections require different amounts of time. This depends on the nature of activity to be undertaken, the number of inspectors involved, on practicalities such as the travelling distance to the individual installations and on the time required for related, follow-up actions.

The various types of inspections and site-related activities include:

- a subject specific inspection
- an investigative inspection
- a broad scope inspection
- an environmental management audit
- checking of compliance data
- a monitoring inspection (e.g. sampling, measurement or analysis)
- assessing self-monitoring data
- assessing data prepared by a consultant or other bodies.

The related follow-up activities may range from report writing, through analysis or survey of supplementary information, to various types of enforcement action. It is essential that the time required for these important inspection-related activities be recognized in balancing the resource requirements of the inspection programme with the available resources.

5.7 Reactive inspections

All regulatory bodies will have to carry out reactive inspections in response to accidents, polluting incidents or to complaints by members of the public. It is difficult to calculate the time required for such events for the purpose of programme planning, but it is possible to review past experience and to extrapolate into the future. Based on such an estimate, a proportion of time may then be set aside for foreseeable but unplanned events. The plan for inspections should take into account any procedures or guidelines prepared by the regulatory body for carrying out reactive inspections. If no such guidelines exist, it may be advisable to improve the estimate of time required for such inspection by categorising incidents according to their environmental significance and allocating an amount of time to the responses in each category. Experience is likely to show, for example, that the majority of reactive inspections are in response to complaints by members of the public and that such responses, individually, need less time than investigation of a major pollution incident.

5.8 Prioritisation

The information above will allow calculation of the amount of inspector time available to the regulatory body for conducting inspections and related activities, and will allow estimation of the staff and financial resources required for a fully effective inspection programme. In the likely event that there are insufficient resources available, of course, priorities will have to be assigned to the various activities and the planning process reiterated until resource requirements and available resources match. Such prioritisation will be a matter for the regulatory body and government, and will have to consider whether the final programme will deliver the necessary environmental objectives. If the process results in an inadequate level of inspection, the information and related calculations may be a valuable element of any submission for more staff or financial resources. Publication of such information may be required, in any case, if cost recovery charging is implemented and if related information has

to be made available to operators and others. The process of prioritisation may also be assisted by reference to information on the risks associated with operator performance and pollution hazard of the kind described in Annex 1.

5.9 Revision of the plan

Progress of inspections against the plan should be reviewed regularly. Where there are significant changes in circumstances, or in available resources, the plan should be reviewed and revised, if necessary, on the basis of agreed priorities. In any case, performance against the plan should be reviewed at the end of its allotted time period and a new plan created, having regard to the results of the review.

6. INSPECTION TECHNIQUES AND ON-SITE ACTIVITIES

The regulatory step of compliance control requires inspectors to conduct on-site inspections of individual installations, according to the overall plan described in the previous section. The precise nature of any particular inspection will be defined, in the first instance, by the regulatory approach adopted by the regulatory body, i.e. regulation of “process” or “outcome”, as described in Section 4 under “Inspection Policies”. It will also depend on whether it is to be routine or reactive and, if routine, which of the particular types of routine inspection, as described in Section 5.6, it is to be.

For any type of inspection, however, the generic techniques and activities may be described broadly as follows:

- Preparation for on-site inspection.
- On-site activities and procedures.
- Production of inspection report.
- Follow-up activities.

6.1 Preparation for on-site inspection

Inspection planning concerns all activities related to the scheduling, organisation, timing, execution and follow-up of inspection work. The degree of preparation for an inspection depends on the type of inspection and the size, scale and complexity of the installation, but it is the key to success and therefore should be done carefully.

Review of Details of Installation.

The first step is to assemble and review all relevant details about the installation to be inspected. In general, all relevant information should be available in the files of the regulatory body. For inspectors new to a particular installation or process, consultation of any related technical guidance, standards or handbooks on the specific activities and/or production processes is also very useful.

The files are likely to include the following details:

- Location and name of operator.
- Installation permit, with reference to related legislation, and details of the application;
- Management organisation chart;
- Technical drawings and site lay-out drawing the plant;
- Process diagrams;
- New plants;
- Essential environmental facts, including information about permitted releases;
- Incidents which have taken place on-site;
- Earlier infringements or non-compliances;
- Aspects of the company's operations which have not been thoroughly investigated and approved during a previous inspection;
- Reports and letters, etc. from previous inspections;
- Notices sent to the installation;
- Complaints by members of the public;
- Research reports or environmental reports.

The inspector should confirm that all details are up to date and, on the basis of this information, should determine the most important environmental issues relating to the installation and the type of inspection to be carried out. He or she can then determine the way in which the

inspection is to be carried out and what its focus will be. For inspectors new to a particular installation, discussion with previous inspectors or senior managers will also be useful in preparation for a first on-site inspection.

Development of an inspection plan.

The development of a clear inspection plan, before going on-site, is essential for the conduct of an effective inspection. It provides the inspector with a step-by-step guide to compiling relevant evidence about the procedures and practices that are to be included in the scope of inspection of the installation, and it serves as a record of the reasons for the inspection.

The detail and complexity of the inspection plan may vary according to of the type inspection and the nature of the installation but it should at least:

- State the reason for inspection: a brief history of why the inspection is taking place and the inspection objectives (i.e., what is to be accomplished).
- Record the scope of the inspection: identifies the functional areas, assessment topics, and level of inspection.
- Specify inspection procedures and associated rationale: which field and analytical techniques will be used to collect what information; what record-keeping systems will be reviewed; which personnel will be interviewed; which samples will be collected;
- Permit clear definition of task assignments, objectives and time scheduling.
- Detail resource requirements (costs) based upon planned activities and time allocations.
- Provide clear specification of evidence to be collected and documented.
- If the inspection plan includes a Quality Assurance Project Plan (e.g. if the inspectorate is certified according to an ISO management standard), it should include a set of well-defined targets for objectives to be met and the method for showing that these objectives have been met.
- Identify a personal safety plan, where required. This is particularly relevant in case inspection takes place upon the occurrence of an accident.

The following checklist summarises the main elements of a good Inspection Plan.

Objectives.

- What is the purpose of the inspection?
- What is to be accomplished?

Tasks.

- What records, files, permits, regulations will be checked?
- What co-ordination with laboratories, other State or local authorities is required?
- What information must be collected?
- What samples will be taken and/or tests will be conducted?

Procedures.

- Announced or unannounced inspection?
- What specific facility processes will be inspected?
- What procedure will be used?
- Will the inspection require special procedures?
- Has a Quality Assurance Plan been developed and understood?
- What equipment will be required?
- What are responsibilities of each member of the team? (If more than one inspector involved.)
- How will the reporting be organised?

Resources.

- Which colleagues, if any, will be required?
- Which of the operator's staff will be required?
- What equipment will be required?
- Has a safety plan been developed and understood?

Schedule.

- What will be the time requirements and order of inspection activities?
- What will be milestones? What is essential/what is optional?
- What follow-up is likely to be required?

Inspection tools

The inspection plan is only one of the tools for on-site inspection. Other tools may need to be prepared or acquired. They may be specific to the type of inspection planned or to the particular installation to be inspected but typical requirements are as follows:

- Warrant or identity card;
- Copies of relevant extracts from legislation, regulations, standards, guidance, etc;
- Relevant parts of the installation file,
 - The permit and details of the application;
 - Technical drawings of the premises and the plant;
 - Process diagrams;
 - Reports and letters, etc. from previous inspections;
 - Notices sent to the installation;
- Writing material/laptop computer;
- Equipment for sampling and/or analysing liquid discharges, waste, soil, air-emissions, noise-emissions etc.;
- Mobile phone where appropriate (permission may be required to bring on the site);
- Photo/video camera (permission may be required to bring on the site);
- Personal protection equipment:
 - Safety glasses;
 - Safety shoes/boots;
 - Special clothing;
 - Safety gloves;
 - Safety helmet;
 - Overalls;
 - Ear protection;
 - Face protection.

Administrative arrangements.

Before preparation for an on-site inspection is complete, a decision is required as to whether the inspection is to be announced to the site operator or not. Announced and unannounced inspections both have advantages. Announcement will allow operator and inspector the opportunity to discuss the scope of the inspection so that the operator may have the appropriate staff available and the necessary documentation ready for presentation. The advantage of an unannounced inspection is that the installation is likely to be seen in its normal operating condition. If an announced inspection is chosen, preparation will include making the necessary arrangements with the operator and his staff.

Also, where other inspectors, or the staff of other regulatory bodies, e.g. Occupational Health and Safety regulators or Local Authorities, need to be involved in the inspection or in related activities, preparation needs to include the necessary administrative arrangements.

6.2 On-site activities and procedures

On-site inspection is the primary face-to face interaction between a regulatory body and an operator. The credibility and respect in which the operator holds the regulatory body depend to a large extent, therefore, on the behaviour, appearance and professionalism of the inspector. (Refer to Section 3.1 "Personal Attributes and Competencies.") In this regard, first impressions are important. If the inspection has been announced and appointments made, it is good practice to arrive a few minutes ahead of schedule and wait patiently at reception. This is not time wasted. Much can be learned about an organisation by standing in reception and looking, listening and, in some cases, smelling. In the case of an un-announced routine or reactive inspection, which may cause some inconvenience, the inspector must be firm but above all polite and reasonable.

An inspection will generally comprise the following basic stages

- Arrival and opening meeting.
- The examination of the installation, or other aspects related to the nature of the inspection.
- Preliminary evaluation of findings.
- A closing meeting.

Arrival and opening meeting.

On arrival at the installation the inspector should register his presence on-site according to normal site procedures. He or she should be aware of the operator's on-site safety arrangements and should comply with them. The instrument of the inspector's authority, i.e. warrant or identity card, should always be carried and produced when identification is required.

Upon meeting the operator's representative on-site, the inspector should allow about 15-30 minutes for an explanation of the purpose, scope and expected duration of the inspection. A typical agenda, or checklist, for an opening meeting is as follows

- Introductions of personnel involved.
- Objectives and scope of inspection, together with any brief, explanatory review of past history
- Plan and schedule for inspection.
- Any limitations, constraints or exceptions.
- Administrative arrangements.
- Arrangements for covering matters that involve confidentiality.
- Arrangements for closing meeting.
- Questions.

The inspector should record the names and positions of participants in this meeting for his or her inspection report.

Examination of the installation, or other aspects etc.

Having regard to the objectives of the inspection and to the details of his or her inspection plan, the inspector should then proceed directly with checking for compliance with the terms of the installation permit and with any agreements made, or, in the case of a reactive inspection, with appropriate investigation. If, for any reason, it becomes obvious that the inspection cannot be carried out according to the prepared plan, the inspector should modify the immediate objectives without, if practicable, losing sight of the overall objectives and priorities.

Generally, the inspector will have powers to inspect any aspect of the installation. Although not exhaustive, the following list illustrates the likely, main areas of inspection:

- The operating plant
- Abatement systems and the associated control and alarm systems
- Control room
- Alarm testing log books
- Drain systems
- Sample points and sampling equipment, both liquid and gaseous
- Storage areas
- Analytical laboratory; testing and calibration procedures
- Compliance monitoring results log books
- Abnormal incident reporting log book
- Public complaints log book
- Process operation procedures

In checking compliance with the terms of the permit, the inspector first must check that no new plant or equipment has been installed without having been registered in the permit. He or she then needs to check whether the plant is operating according to the conditions in the permit. Typically, the inspector will address the following questions:

- Are the plant and its pollution control equipment still as described in the permit, or in the related application?
- Is it well maintained and fully operational (see logbooks etc.)?
- Do the staff follow all operating instructions referred to in the permit?
- Are the logbooks and administrative records (required by the permit) complete and up to date, without any alteration that is not transparent and signed?
- Have the required periodic tests been carried out, and what were the results?

In addition, he or she may take samples, e.g. of liquid discharges, waste materials or soil. Measurements of gaseous emissions, or of noise level, may also be made. In some cases inspectors may be qualified and empowered to take all the samples and make relevant measurements for compliance checking purposes. In most cases, however, the results of the analyses of samples taken by the inspector, and his or her measurements, will be considered only indicative, as sampling, analysis and measurement, for compliance checking purposes, will normally involve certified systems, procedures and personnel.

If there is a requirement for self-monitoring in the permit, this must be examined to evaluate operation of the relevant systems. This should address the following questions:

- Does the self-monitoring system cover all important emission aspects?
- Is the self-monitoring system sufficient and reliable?
- Does the system ensure that the self-monitoring procedures prescribed in the permit are followed?
- Are the results from the operator self-monitoring adequately reported to the authority?
- Are the results of the self-monitoring in accordance with the terms stipulated in the licence?
- Do the self-monitoring reports from the installation give a clear picture of level of compliance?

Where an installation has a certified EMS, and it is clear that the operator takes his environmental responsibilities seriously, consideration of an alternative the approach to on-site inspection may be possible. In most countries the presence of an EMS still has little influence on the approach to compliance checking. In some others however, the compliance checking

arrangements are somewhat different. Although the operator of such an installation is still obliged to comply with the environmental law, regulations and a permit, the regulatory approach may be different. Such differences may include the following:

- Essential environmental objectives and targets are set in the permit and become the key issues for inspection;
- The management arrangements for their delivery are covered by the management system of the EMS.
- Assessment of environmental performance (emissions, measures, etc.) may be carried out on the basis of audits, which may be conducted on behalf of the regulatory body by accredited auditors;
- Even with a properly certified EMS, site inspections by the authorities will remain necessary, but may need to be done less frequently. (Refer to Annex 1, "Operator and Pollution Risk Appraisal.).

Even if such inspections are conducted at a more administrative level, however, non-compliance with the permit, in whatever form, will still entail the full regulatory response with exercise of all appropriate sanctions and a likely reversion to the traditional regulatory approach.

Preliminary evaluation of findings.

After physical examination of plant, equipment, records, etc, or after particular parts of the examination, the inspector should take some time to make and record a preliminary evaluation of his or her findings, and to resolve any points of doubt. Where it appears, on preliminary evaluation, that there is some non-compliance, it should be drawn to the attention of the operator's representative and recorded in the Inspector's Note Book for further consideration. Details of any non-compliance recorded should include the date, time, names of those present and any comments made. The Inspector's Note Book is a record that should be acceptable as a reference document in a court of law. Hence all entries should be made in permanent ink and where entries are deleted or corrections made, the previous entry should be struck through by a single line to ensure that the original entry is still legible. Re-statements of deletions should be made by inserting the word "stet" adjacent to the deletion.

Where the Inspector is of the opinion that there is a significant risk of release of any substance likely to have serious consequences for the environment, he or she should consider the courses of action open to him or her under the law, and within his or her powers. If the law and the inspector's powers allow for ordering of shut-down of the installation, and if it is the appropriate course of action, this is the time to prepare the instruction or order, which will need to describe the fault or likely failure, the associated hazards and the actions that need to be taken by the operator. In the absence of such powers, he or she will have to take such action as is appropriate under the law.

Closing meeting.

The closing meeting is the formal completion of an on-site visit and is an important part of the inspection process. Its purpose is to maintain constructive dialogue with the operator and his staff by giving them immediate feedback on the results of the inspection. It is also to ensure that they are aware of and fully understand the initial findings, their implications and the likely follow-up action. A typical agenda, or checklist, for such a meeting is as follows.

- Introduction of personnel, if different from opening meeting.
- Thanks for co-operation, administrative arrangements, etc.
- Résumé of objectives for inspection, with any modifications that might have been made during its conduct.

- Summary of general findings.
- Indication of preliminary evaluation of any non-compliance found.
- Indication of any corrective actions required, and of any other follow-up activity, that will be formally notified by letter in due course. (In the case of a significant risk being found, and depending on the law and inspector's powers, this will be the time to issue any formal instruction or order.)
- Questions.

Details of this meeting should also be recorded by the inspector for future reference.

Additional note on reactive inspection.

Where a reactive inspection is made because of some incident, accident or abnormality on the installation, the extent and character of the incident should be determined as quickly as possible. In the case of serious or extended incidents, involvement of and co-ordination with fire brigades, emergency services etc. should take place. In the case of a public emergency the inspector should be aware that issues of safety and the work of the emergency services might take precedence over his or her environmental concerns and issues.

In case of more limited or local incidents, the following procedure may be followed:

- Ask for the responsible site representative. In most cases this person is known from previous visits or from previous correspondence with the company;
- Explain the purpose of the inspection;
- The inspector should question the site representative and other site operators/staff as necessary to establish the exact details of on site-operations and potential problems that have resulted in the incident. Also, the installation fire brigade and/or Environment, Health and Safety department may be involved;
- If the incident is more serious, the inspector should be accompanied by a colleague in order that corroborated legal evidence may be collected if necessary, and any staff being questioned should be given the caution that any information given may be used in evidence in court;
- All relevant areas of the installation and the neighbouring area should be inspected unless the incident has resulted in conditions which are unsafe; the inspector must follow the site safety requirements;
- The site representative should be given the opportunity to accompany the inspector on the inspection (in some large sites the inspector should not enter the site unless accompanied by a site representative);
- Where appropriate, samples of discharges etc. should be taken and, if necessary, should be taken in accordance with the legal procedures (which differ from country to country) for use as evidence;
- The inspector should write down all statements made by the site staff and if appropriate take photographs or video recordings as information or as evidence;
- Where appropriate, information and advice should be given to the site operator regarding action that may stop an ongoing incident, prevent a recurrence, or remedy damage caused. In some circumstances, depending on his or her legal powers, the inspector may

strongly recommend or insist that certain action is taken to stop an incident and/or prevent further pollution;

- Before leaving the site the inspector should ensure that the site representative is aware of any further action that is required by the operator, and that the inspector's course of further action is clear.

Effective follow-up of such a visit is important in order to assess the operator's response to any instructions or guidance from the inspector.

Additional note on Personal Incidents.

Personal incidents or accidents involving the inspector in the course of on-site inspection, no matter how trivial, should be recorded in the installation accident record book, or equivalent log, before leaving the site and should also be reported to the inspector's own management.

Summary of general guidance for on-site inspections.

- Be well prepared.
- Be on time.
- Ensure operator understands purpose of inspection.
- Do not argue with operator's staff.
- Use the inspection plan.
- Discuss problems when they are found.
- If information is not available from one part of the installation, seek it elsewhere.
- If faced with non-cooperation from any person, try another.
- Always seek evidence to verify any verbal statements.
- Follow investigations to ultimate conclusion.
- Return to areas or staff for more information, clarification or confirmation if necessary.
- Ensure operator understands findings and seek agreement to them as appropriate.

6.3 Production of inspection report

The results of an on-site inspection must be recorded in a formal, written report. Proper documentation of an inspection is essential for the purpose of providing a factual record, including information about measurements made and samples and other data collected during the inspection. It may also become evidence in the case of any legal actions or sanctions arising from the inspection.

The basic requirement of an inspection report is that it organises and presents all evidence gathered in an inspection in a comprehensive, useable manner. It is not the place for analysis and conclusions about non-compliance or other operator failures. To meet this objective, information in it must be:

- Accurate. All information must be factual and based on sound inspection practices and procedures for the taking of evidence. Any subsequent enforcement action must be able to depend on the accuracy of all information.
- Relevant. Information in an inspection report should be pertinent to the subject of the report.
- Comprehensive. The subject of the report should be substantiated by as much relevant information as is feasible. The more comprehensive the evidence, the better and easier it is for any subsequent enforcement action.
- Objective. Information should be objective and factual.

- Clear. The information in the report should be presented in a clear, well-organised manner.
- Co-ordinated. All information pertinent to the subject should be organised into a complete package. Documentary support (photographs, statements, sample documentation, etc.) accompanying the report should be clearly referenced so that so that anyone reading the report will get a complete, clear overview of the subject.

The actual contents of any inspection report will depend on the nature of the inspection but the following outline for an inspection report may be adapted to most situations.

Introduction

- General information
 - Purpose of the inspection
 - Facts of the inspection (i.e. date, time, location, name of the site representative.)
 - Participants in the inspection
- Summary of Findings
 - Brief summary of the inspection findings
 - Names and titles of staff interviewed
- History of Facility
 - Status of the facility
 - Size of the organisation
 - Related firms, subsidiaries, branches, etc.
 - Type of operations performed at the facility under inspection

Inspection Activities

- Opening Meeting
 - Procedures used at arrival, including presentation of credentials and written Notice of Inspection (the latter only if required)
 - Special problems or observations if there was reluctance on the part of site officials to give consent, or if consent was withdrawn or denied
 - Topics discussed during the opening meeting; what is the inspector's objective?
- Records
 - Types of records reviewed
 - Any inadequacies in record-keeping procedures, or if any required information was unavailable or incomplete
 - Note if record-keeping requirements were being met
- Evidence Collection
 - Statements taken during the inspection
 - Photographs taken during the inspection
 - Drawings, maps, charts, or other documents made or taken during the inspection
- Physical Samples
 - Purpose for which samples were obtained
 - Exact location from which they were obtained
 - Sampling techniques used
 - Physical aspects of the sample
 - Custody procedures used in sample handling
 - Results of laboratory analysis (if available).
- Closing Meeting
 - Receipts for samples and documents given to facility officials

Procedures taken to confirm claims of confidentiality
Recommendations made to facility officials

Attachments

- List of Attachments
List of all documents, analytical results, photographs, and other supporting information attached to the report
- Documents
Copies of all documents and other evidence collected during the inspection. All documents should be clearly identified.
- Analytical Results
Sample data and quality assurance data.

6.4 Follow-up activities

Distribution of report.

When the factual inspection report has been completed, the inspector will need to distribute it to appropriate individuals and bodies. This will vary from country to country depending upon the remit of the regulatory body, upon statutory arrangements for enforcement and non-compliance response (**Refer to Part C, “Non-Compliance Response Strategy”**), and upon the policy for making such information available to the public and others.

Review of results.

He or she will then need to review the recorded information, examine it for evidence of non-compliance and communicate the conclusions to the operator and/or enforcement authority as appropriate. At this point it may be necessary to arrange for further sampling or analysis to be carried out, or for some further investigation in order to verify details and draw definitive conclusions.

Enforcement action.

When conclusions have been drawn, and confirmed according to any regulatory body quality management system, items requiring action by the operator, or significant issues resulting from the inspection, such as the need to modify a permit, should be communicated to the operator in writing, or notified to the appropriate enforcement authority or permitting body if that is not the regulatory body itself.

Where non-compliance has been identified and confirmed, the inspector will have to follow procedures defined under relevant policies for non-compliance response (**Refer to Part C, “Non-Compliance Response Strategy”**) and may have to prepare for supporting any prosecution with evidence from his or her inspection.

Follow-up checking.

Where an operator has been required to carry out specific actions, such as remediation actions or changes to plant or procedures, the inspector should set a time for carrying out a check to confirm that the actions have been satisfactorily completed.

Follow-up administration.

When all details have been verified and actions completed, or satisfactorily under way, the inspector should bring the installation file up to date by recording all the relevant information. Where arrangements are in place for publication of environmental data, e.g. in a Pollution Emissions Register or State of the Environment Report, he or she should also ensure that the necessary information is delivered to those responsible for compilation of such documentation.

Finally, the inspector should review his or experience of the on-site inspection and related activities to see if there are lessons to be learnt for the future and, if so, feed them back to his or her management.

7. TRAINING OF INSPECTORS

The profile of an effective inspector has been described in Section 3, where it was also emphasised that the authority and credibility of the regulatory body depends, in effect, on the development and maintenance of this profile. For this purpose, a regulatory body needs to have a structured process for training and development of its staff that will be robust enough to reassure all stakeholders, including the public, that its staff are competent for all of their duties and that a system is in place for assessing their competence and keeping it up to date. In this context, it is important to recognise that the process must deliver the two functions of training new inspectors and also of refreshing and developing the skills of established inspectors. This section outlines such a process and discusses its main elements.

7.1 Outline of training and development process

The process has five key elements as follows.

- Definition of competencies: Description of inspector capabilities and activities that need to be of a satisfactory standard for effective conduct of his or her assigned duties.
- Personal development plans: Statement of what an individual inspector needs to learn or become proficient in, together with a plan and programme for achieving it. This is based on assessment of current status of competencies and on management plans for his or her deployment. These should be prepared for all new inspectors and kept under review as part of a regular process of staff appraisal.
- Training: Formal learning opportunities, such as structured courses, probably away from his or her job.
- Planned experience: Learning on the job by doing it, with coaching and support from a manager or experienced colleague.
- Assessment: Evaluation of competencies to check that required learning has taken place and has been effective. This should also be carried out routinely, as part of the regular appraisal of staff performance, and the results fed back into personal development plans.
- Management of training programme: Formal arrangements by which the regulatory body ensures that all elements of process are properly conducted.

7.2 Definition of competencies

The competencies of a fully effective inspector have been described in Section 3, in the context of "Inspector Profile". This covered:

- Personal competencies required of any inspector. (Many of these are inherent in the character of individuals best suited to be inspectors.)
- Role-related, technical competencies.

The technical competencies were those associated with the duties of "compliance control and enforcement" in a typical environmental regulatory body. They were sub-divided into:

- Core competencies that all inspectors in such a body should have.
- Clusters of competences that relate to the duties of a typical, generalist site inspector engaged in compliance control and enforcement.
- Specialist competences likely to be confined to inspectors in defined specialist roles supporting the tasks of compliance control and enforcement.

These competencies were described in broad terms in Section 3.2, recognising that precise details depend on the remit of the regulatory body and on the regulatory approach adopted. In the context of regulatory approach, the required range of competencies will be influenced, at the level of detail, by the policy choice between a traditional policing (“process”) approach and a more goal-based or educative (“outcome”) approach. In the case of the latter, goal-based approach, inspectors are likely to have to be more knowledgeable about the effect of releases into the environment, about setting environmental objectives and targets, and about environmental management systems. In the traditional approach, the emphasis is more likely to be on knowledge of particular processes, plant operation and process control, treatment and management of waste, etc. In either case, however, training programmes for the staff of environmental regulatory bodies with a typical range of responsibilities are likely to have to include the following subjects. These are set out below on a sector basis although, in practice, they may be applied in an integrated or cross-sectoral basis.

Air Quality

- Air quality management strategy development and implementation.
- Securing of any statutory ambient air quality standards.
- Establishing conditions and limits for permitting of discharges to atmosphere.
- Ambient air quality monitoring and assessment.
- Preparing plans for dealing with exceedance of air quality limit values.
- Establishing a system for public notification when alert thresholds are exceeded.
- Compilation of national inventory of emissions to atmosphere.
- Implementing phase-out of ozone depleting substances.
- Maintaining inventory of greenhouse gas emissions and preparing national programme for limiting emissions under UN Framework Convention on Climate Change

Water Quality

- Developing methodology for establishing water quality objectives.
- Establishing programmes for water quality protection and risk management.
- Establishing programmes for reduction of emissions to aquatic environment.
- Establishing and enforcing technical standards and codes of practice in relation to the achievement of water quality objectives. (Surface waters, groundwaters, bathing waters.)
- Reducing marine pollution and mitigating its effects.
- Deciding and establishing emission limit values.
- Establishing conditions for permitting of discharges to sewerage systems and to the marine environment. .
- Maintenance of a discharge register.
- Notifying wastewater treatment plant about potential pollution incidents.
- Enforcing measures for emission control of priority substances

Waste Management

- Assessing and verifying qualifications and suitability of permit applicants and holders.
- Preparation of technical standards and codes of practice for waste management.
- Establishing conditions for permitting of waste management activities and establishments.
- Establishing producer responsibility and compliance schemes for recovery and recycling/treatment of certain waste categories
- Controlling transboundary movements of waste

Pollution Control and Risk Management on Major Industrial Installations

- Current awareness of best available techniques for major processes.
- Identifying establishments with increased risk of major accident hazard.
- Reviewing emergency plans.
- Implementing a system of inspection relating to major accident hazards
- Arrangements for response to major accidents.

Nature Protection

- Establishing policies and guidelines
- Designating sites and species for enhanced protection
- Establishing species protection measures and plans
- Implementation of plans and policies
- Issuing licenses and permits for import and export of listed species of plants and animals.
- Control of development on, or affecting, protected sites
- Establishing management practices for protecting sites and species
- Data collection and reporting

Cross-sectoral matters

- Permitting and inspection of installations or sites.
- Monitoring, sampling and analysis.
- Negotiating self-monitoring arrangements for installations.
- Initiating and pursuing enforcement actions in cases of non-compliance.
- Licensing, inspection, monitoring, data collection and reporting on activities involving Genetically Modified Organisms.
- Providing for public access to environmental information.
- Evaluation of Environmental Impact Assessments.
- Principles and auditing of Environmental Management Systems.

7.3 Planned Experience and Training

Implementation of the training process first requires identification of the most appropriate method of developing the competencies described above, and those described in Section 3. Planned experience, i.e. training on the job, will be appropriate for some, and structured education courses or seminars for others.

Planned experience means that inspectors and their managers have to look for opportunities for the inspectors to work on issues that have been identified in Personal Development Plans. Also, managers have to be able, and have to have the time, to coach staff to a satisfactory level. Otherwise, they have to be prepared to devote the time of experienced colleagues to do it. Learning on the job is a generally a progressive process involving, first all, an element of demonstration, or “showing how to do it in practice”, followed by an indeterminate period during which mentoring or advising is adequate. The selection of competencies for development in this way, and the progression of the coaching and mentoring process, are essentially matters of judgement by the relevant manager or “competence assessor” having regard to the abilities of the particular candidate for training and to any other relevant circumstances such as the number of staff under similar training at the same time.

Training by way of courses or seminars is likely to include foundation or induction training for groups of new inspectors. The contents of such training will include practical information about the regulatory body and its administrative, financial and management systems together with appropriate elements of the core technical competencies described in Section 3.2.1 such as relevant environmental law, pollution control and regulatory principles, and legal procedures.

Other courses or seminars will need to address specific issues for the purpose of professional development. These may be relevant for both new inspectors and established inspectors. In the first instance, new inspectors will need to attend courses and seminars in order to complete development of their core technical competencies and to build the cluster of technical competencies relevant to their assigned duties. Established inspectors may need to develop a new cluster of technical competencies upon change of assignment or may need to refresh existing skills. Therefore, the design of training programmes needs to differentiate between:

- Basic technical training for new inspectors in general.
- More advanced technical training for inspectors likely to be engaged on complex duties, such as inspection of major industrial processes.
- Specialised training for specialist inspectors.
- On-going professional development of established staff, and refreshment of existing skills and knowledge.

Such courses and seminars can be delivered in various ways. They may be organized and taught internally by staff of the regulatory body or by invited lecturers. In the case of a regionalised regulatory body this may be done at a local level or at a central, national level. They may also be organized and taught externally by way of colleges, learned institutions, or industrial companies or associations. In the case of external sources, there may also be the opportunity of "Distance Learning" by way of computer-based packages. A variation of the learning process, which lies between planned experience and external courses, is secondment to another regulatory body or to an industrial company for experience.

The detailed design of an overall training and development programme is, therefore, largely a matter of choice by individual regulatory bodies and is likely to depend heavily on the size of the body, the rate of recruitment of new staff, the availability of in-house mentors and lecturers, and upon the financial resources available for buying external training.

7.4 Assessment

Training and development is an on-going, cyclic process, and the step of assessment applies at the beginning and end of the cycle. It is the procedure used first of all to evaluate the existing competencies of an inspector, to identify any outstanding requirements and then, subsequently, to confirm that training has been successful in bringing him or her to the necessary standard.

Ideally, the procedure should be carried out by the inspector's manager, provided he or she has sufficient personal competencies to make a credible judgement of what an inspector requires for satisfactory conduct of his or her assigned duties. If this is not practicable for any reason, the manager may wish to delegate the task to another senior colleague. Assessment of new inspectors should be carried out upon recruitment and should be the basis of a first personal development plan. It should be carried out regularly, thereafter, as part of the routine appraisal of staff performance and updating of personal development plans.

This procedure is important for effective performance of any regulatory body, but it assumes a special significance if inspectors are warranted or accredited for their duties on the basis of having achieved defined standards of competence. Any regulatory body operating on this basis must have a policy for dealing with the possibility that an established inspector may fall below the required standard and be unable or unwilling, for whatever reason, to refresh his or her skills and to re-acquire the necessary level. Such a policy will also have to address the possibility of appeal against the results of assessment.

The allocation of time for training depends upon the relevant knowledge and experience of inspectors and upon the complexity of the processes they regulate. It also depends on the technical development of processes and upon changes to the regulations. Against this background, and in addition to general induction training and learning on the job, a well resourced inspectorate might allow 6-7 weeks over a two year period for the technical training of a beginner engaged on inspection of basic processes with a further 2-3 weeks for those engaged on more specialist or complex processes. For experienced inspectors, whose requirement is for training on new developments in technology and legislation, an allocation of 5-10 days per year may suffice, depending upon the extent of relevant developments.

7.5 Management of training programmes

Depending upon the size and complexity of the regulatory body, management may wish to make special arrangements for supervision of the training and development programme. Appointment of a competent supervisor is likely to ensure that assessments are undertaken when due, that appropriate courses or "on the job" training is organised, that personal development plans and records of training are kept up to date and, particularly where accreditation depends on the acquisition and maintenance of competencies, that management is informed of any difficulties arising from the assessment process.

ANNEX 1

OPERATOR AND POLLUTION RISK APPRAISAL (OPRA) Guidance on Implementation

1. System Overview

OPRA consists of two separate appraisal packages: Operator Performance Appraisal (OPA) and Pollution Hazard Appraisal (PHA). The two packages have identical structures and scoring systems. Both OPA and PHA contain seven attributes that are considered to represent the main issues affecting operator performance and pollution risk.

Each attribute is evaluated and given a score of 1, 2, 3, 4 or 5. Each attribute has an associated weighting factor that represents the relative importance of each attribute. The OPA and PHA scores are derived for the *process as a whole*, irrespective of the size and complexity of the process. However, processes may be considered as several smaller 'sub-processes' in order to assist the derivation of overall process scores. This may be appropriate for large or complex processes. The approach to deriving an overall process score from sub-processes is different for OPA and PHA, as discussed in the following sections.

Guidance on selecting a score for each attribute is provided in this annex. Application of the guidance by trained inspectors will ensure maximum consistency and transparency of the approach. Specific guidance on what might constitute a score of 1, 3 or 5 is provided; scores of 2 and 4 are for intermediate cases. Where no information is available on scoring of a particular attribute, a default value should be selected. Default values will be derived as experience is built up with the system. In the absence of specific defaults, a general default score of 3 should be selected and a comment placed on the form to indicate this. In scoring any given attribute it is important to remember that overall OPRA scores will be used for work planning on a national level, that is across all installations. Therefore the scale of 1 to 5 is not specific to any particular process, geographical area or industry sector. The full range of scores from 1 to 5 should be encountered.

OPERATOR PERFORMANCE APPRAISAL

OPA evaluates operator performance against seven key attributes:

- OPA1:- recording and use of information
- OPA2:- knowledge and implementation of permit requirements;
- OPA3:- plant maintenance;
- OPA4:- management and training;
- OPA5:- process operation;
- OPA6:- incidents, complaints and Non-compliance events;
- OPA7:- recognised environmental management systems

The purpose of OPA is to evaluate operator performance in relation to managing risks to the environment from the process; this requires consideration of the systems and procedures in place, but also whether they are effective in achieving the operator's stated objectives in relation to environmental performance. Performance in terms of productivity, health and safety, etc. is not relevant to the OPA score. For each of the attributes the OPA score should reflect both the presence of the relevant systems and their actual effectiveness. For each OPA attribute the inspector should ask:

- do the appropriate systems exist?
- are the systems used as intended?
- are the systems effective in achieving stated objectives?
- is there appropriate monitoring/feed back on system performance?
- can evidence be provided to demonstrate all of the above?

It is important to avoid 'double-counting' specific issues relating to the operator's performance which may affect more than one attribute score. Each attribute must therefore in all cases be scored separately. Where an issue may affect several attributes the inspector should determine which attribute is most affected and derive the score for that attribute to reflect the overall effects. Where it can be argued that more than one attribute should be affected, this must be stated and justified.

Each attribute is evaluated on a scale of 1 to 5, where 1 represents low performance and 5 represents high performance. For those attributes which relate to compliance with permit conditions, the relationship between the OPA score and compliance is broadly:

- 1 below requirements* and may need enforcement action;
- 3 fully meets requirements* of permit;
- 5 above requirements* in terms of actual environmental performance.

The use of 'requirements' in this context refers to the average requirements normally expected for the process type in general, rather than the specific requirements included in the permit for the process in question. It is emphasised that OPA measures overall performance in managing environmental risks, within which compliance is only one factor. OPA does not assess the acceptability of the operator's performance, and a low overall OPA score may be entirely adequate for a process with a low PHA.

For large processes with variable management conditions over different sections of the process, it may be deemed necessary to consider several 'sub process' sections in order to derive an OPA attribute score for the process as a whole. A score is produced for each sub-process and an overall score for the process generated by aggregating the sub-process scores. In general the approach to aggregation is to weight each sub-process score by the relative importance of that sub-process to the overall process environmental risk. Where there is doubt the lowest sub-process score should be taken as the overall process score. The inspector must exercise judgement in this area.

A similar approach may be taken where an attribute score is the product of a number of factors. These factors may be considered as 'sub-attributes' which can be scored separately and then combined to obtain the overall attribute score.

POLLUTION HAZARD APPRAISAL

Pollution Hazard Appraisal (PHA) evaluates the overall environmental pollution risk inherent in a process. A PHA is performed by evaluating the following seven attributes on a scale of 1 to 5 (1 low hazard potential, 5 high hazard potential). The attributes and their basic meaning are as follows:

Code	Title	Basic Meaning
PHA 1	Presence of hazardous substances.	Inherent environmental hazard posed by the properties of the representative hazardous substance present in the process.
PHA 2	Scale of hazardous substances.	Amount of hazardous substance that could be released from the process.
PHA 3	Frequency and nature of hazardous operations.	Frequency of hazardous releases given the nature of the process and associated operations.
PHA 4	Technologies for hazard prevention and minimisation.	Steps taken to control the hazard at source.
PHA 5	Technologies for hazard abatement.	Steps taken to control the hazard through the incorporation of abatement systems.
PHA 6	Location of process.	Vulnerability and significance of environmental receptors within range of the hazard
PHA 7	Offensive characteristics.	Offensive characteristics of the process and strength of adverse public perception.

Attributes PHA1 - PHA6 represent the sequence of factors which must be evaluated in performing an environmental risk assessment of the releases from the process, starting from identification of potential hazards to assessing impacts on the environment. PHA7 is a separate evaluation of the offensive characteristics of the process, which do not constitute a risk of actual harm to the environment, but generate an adverse public perception. It is very important to separate these out from the 'real' risks to the environment determined in PHA1 - PHA6, given that real and perceived risks may be very different but may both affect the regulatory effort required for any process.

Given that the overall risk is a combination of attributes PHA1 - PHA6, these must be evaluated so that they are consistent with each other. Thus, the risk level will depend on the hazardous properties of substances, the amounts and frequencies of releases and the environment into which they are released. Any process is likely to present a variety of different risks to the environment, from routine releases, accidental releases, air emissions, water discharges, different substances, etc. **In principle, all releases that may potentially harm the environment need to be considered within OPRA.** The key to performing a PHA for any process is to identify, as part of the PHA1 evaluation, the substance and release scenario which represents the major risk to the environment from the process. This may be a routine release, relating to a planned discharge of pollutant; or it may be a loss of containment incident affecting an inventory of substance in the process.

Once the **representative substance** is identified, PHA1 - PHA6 must be scored in relation to that substance to ensure consistency. Each attribute must be scored separately in order to avoid 'double counting' of influencing factors, as is the case with the OPA attributes. For example, if the main pollution risk is a metals discharge to water, PHA1 is based on the aquatic toxicity of the metals, PHA2 relates to the scale of discharge of the metals, PHA3 relates to the frequency and nature of discharge operations, PHA4 and PHA5 relate to technologies to prevent/minimise and abate the metals, and PHA6 relates to the proximity and vulnerability of surface waters to such releases. Note that PHA6 is not scored higher if the metals are particularly toxic; this is already reflected in the PHA1 score.

The appropriate representative substance is that which contributes the major proportion of the overall pollution risk. This corresponds to the substance which results in the highest sum

of PHA1 -PHA6 scores. For some processes (for example large or complex processes handling a range of different substances) it may be necessary to consider the process as several sub-processes and score PHA1 -PHA6 for each separately, in order to determine which process area and substance gives the highest overall sum. The inspector should use judgement and knowledge of the particular process to narrow the choice of candidate substances in order to minimise the number of separate iterations.

It may be difficult to fully characterise the environmental risk from some processes based on one representative substance, for example where there is a highly hazardous material present in small quantities and a less harmful material present in large quantities. The inspector may judge it appropriate to increase individual PHA attribute scores for the representative substance by one or two points to reflect the additional risk from other substances. Typically the PHA1 score may be increased for a process with several significant but different types of environmental risk. Where several substances give rise to similar types of risk, the PHA2 score may be increased. PHA4 and PHA5 scores may be incremented to reflect other specific issues of concern relating to prevention/ minimisation and abatement of hazards. The inspector should exercise particular care in incrementing scores and record this explicitly on the relevant comment boxes in the forms.

The overall PHA score should be consistent with the information contained in the process permit details. Information contained in operator safety and environmental studies may also be consulted to assist the PHA process.

2. Detailed description of OPA attributes

OPA1: RECORDING AND USE OF INFORMATION

OPA1 summarises the following aspects of performance:

- nature of monitoring arrangements and frequency of monitoring activities;
- records of current and historical operating conditions;
- documentation of all reportable/non-reportable events;
- use of information in assessing and managing environmental performance.

This attribute evaluates whether the operator's records are comprehensive in accordance with the process requirements and industry best practice, and that the records are accessible and used appropriately, that is the information is fed back to enable performance to be measured and actions taken to rectify any concerns identified. A complete set of records would be expected to include monitoring arrangements and data for releases to air, water and land, process operation data relevant to environmental performance, reportable events and significant deviations from routine conditions, on-reportable events and 'near misses'. Information on monitoring arrangements includes details on both systems and procedures for monitoring of releases and process data, for example measurement locations, frequency, equipment/personnel requirements, operating requirements, maintenance/calibration of equipment, etc.

Inspectors should make their evaluation based upon whether:

- monitoring is being carried out to meet or exceed the specified frequency for all relevant conditions and releases as required in the permit and by industry good practice;
- monitoring is conducted properly using appropriate techniques;

- records are sufficiently accurate to reflect the present and historical operating conditions of the process;
- information is available on future process operating conditions and releases, changes of workload and other process parameters;
- records are documented and stored to enable easy access, the system audited and the information regularly used to check process trends, compliance and performance;
- the operator uses such information in assessing environmental effects from the process, managing performance and taking corrective action, and communicating with the public.

The inspector should probe the available information to gauge whether all required information is being passed onto the regulatory body, for example in relation to complaints received.

OPA2: KNOWLEDGE AND IMPLEMENTATION OF PERMIT REQUIREMENTS.

OPA2 summarises the following aspects of performance:

- access to permit details by relevant staff,
- understanding of permit details by relevant staff.,
- implementation of permit requirements in process activities;
- compliance with requirements specified by the permit.

Inspectors should make their evaluation based upon:

- whether the current permit is readily available to all relevant employees, that both management and operators are aware of the conditions and that management is aware of the residual requirements of relevant legislation;
- whether operators show sufficient understanding of the permit details (and any associated improvement programmes) and their implications for the process;
- how well the requirements in any permission, and any residual duties, are implemented, monitoring, improvement programmes, etc;
- the extent to which the operator is auditing performance against compliance requirements.

OPA3: PLANT MAINTENANCE.

OPA3 summarises the following aspects of performance:

- existence of a clearly defined maintenance programme;
- use of appropriate industry standards of maintenance;
- extent to which maintenance programme considers environmental effects;
- effectiveness of maintenance programme in terms of environmental performance.

Inspectors should make their evaluation based upon whether:

- a suitable, effective maintenance programme has been clearly defined and is used to plan, monitor and record maintenance operations. The operator's programme should take appropriate account of the most suitable of industry standards and/or manufacturers' recommendations;
- the maintenance programme identifies and manages process parameters and equipment critical to environmental performance;

- the maintenance programme is audited in relation to environmental effects and kept up to date with current conditions and process equipment;
- an appropriate mix of preventative and breakdown maintenance is employed, based on potential hazards arising from equipment failure, process design considerations, and environmental effects of maintenance operations themselves;
- inspection and monitoring are carried out to ensure maintenance is performed in a timely and appropriate fashion;
- environmental effects of maintenance operations are managed (for example work permits address environmental issues);
- monitoring equipment is properly maintained.

In addition to actual breakdown, equipment performance may deteriorate with time, potentially reducing process environmental performance. The inspector should evaluate to what extent the maintenance programme addresses performance deterioration as well as breakdown, whether these effects are significant, how they are detected and whether appropriate corrective action is taken. If equipment critical to process environmental performance is maintained on a breakdown basis, the effect of this on overall performance should be evaluated.

Parameters which may reflect the effectiveness of the maintenance programme with respect to environmental performance include: breakdown frequency of process, monitoring, control and protection equipment; frequency and nature of environmental releases due to deteriorating performance or malfunctioning equipment; frequency and nature of releases related to maintenance operations. The inspector should review the history of a few critical operating equipment items to determine the effectiveness of the maintenance system.

OPA4: MANAGEMENT AND TRAINING

OPA4 summarises the following aspects of performance:

- senior management commitment to environmental performance;
- environmental policy, objectives and management plans;
- definition of responsibilities and resources for environmental performance and compliance;
- reporting relationships, manning and skill levels;
- training programme;
- awareness of environmental effects of activities and substances

Inspectors should make their evaluation taking into account whether:

- there is a clear commitment to environmental performance from senior management, supported by the relevant policies, objectives, management plans, manuals and associated auditing;
- the plant is effectively manned with personnel of appropriate skill levels;
- an appropriate training programme exists and the extent to which it covers all grades and types of personnel;
- there are clearly identified reporting relationships which are known and understood, particularly for fault or emergency conditions;
- there is at all times a clearly defined responsible person for ensuring permit conditions are complied with;
- all relevant personnel have received training and information on the environmental consequences of releases.

The extent of manning, skill levels and reporting relationships should be evaluated in relation to different conditions (for example routine and periodic operations, emergencies, staff unavailability, etc), and also to the hazard, scale and complexity of the operations undertaken. The extent to which training covers all aspects of process operation which may affect environmental performance should be determined, including training in process operation, compliance with permit conditions, inspection, monitoring, maintenance and reporting. The approach of the operator to management of change should be evaluated as this can play an important role in the control of losses and incidents.

OPA5 PROCESS OPERATION

OPA5 summarises the following aspects of performance:

- clearly defined operating procedures;
- completeness of procedures with respect to all process conditions and permit requirements;
- full execution of these procedures in operation of process;
- effectiveness of procedures in operating process;
- auditing and updating of procedures.

OPA5 covers the complete management cycle in relation to operation, taking into account the quality of written procedures, whether they are carried out in practice, the effectiveness of process operation in terms of environmental performance, and the extent to which the process operation is audited and updated to reflect experience and practice.

The OPA5 score should reflect the degree of experience, control and management of process operations which is applied by the operator and underpinned by the operating procedures. In particular the inspector should take into account whether:

- operating procedures cover all process conditions (for example normal, abnormal, emergency conditions) and include specific factors such as shift handovers, operations outside normal working hours, use of contractors and suppliers, environmental implications of operations, etc;
- procedures are clearly written, easy to understand and accessible;
- procedures ensure that the consequences of change are assessed and approved before any changes are implemented;
- procedures critical to environmental performance are identified.

Evidence of the degree of process control may be accounted for in the OPA5 score. For example, the occurrence of “near-miss” events and process deviations, which do not trigger an actual incident but tend to indicate erratic process control, may be reflected in the OPA5 score. Actual incidents would be reflected in OPA6.

OPA6: INCIDENTS, COMPLAINTS AND NON-COMPLIANCE EVENTS.

OPA6 summarises the following aspects of performance:

- frequency of environmental incidents, justified complaints and non-compliance events;
- severity of environmental effects of events;
- degree of justification of complaints;
- company response to events.

OPA6 represents the overall environmental track record of the process, in terms of the number and severity of reportable incidents and justified public complaints, where these relate to the operator's control of the process or the occurrence of unauthorised releases. Non-reportable incidents and unjustified complaints, or incidents unrelated to control and releases, are generally not relevant. Incidents may relate to actual releases to the environment, or other conditions such as non-compliance of process conditions, failure to report, non-compliance with improvement programme, etc.

The frequency of events should be based primarily on the previous 12 months of records, that is the latest annual average frequency. Earlier events may be taken into account if there is concern that recurrence is possible. The effect of earlier events on the OPA6 score should, however, be reduced according to the elapsed time since their occurrence. Where the reporting of incidents is dependent on the operator, the completeness of the track record may need to be judged in relation to the operator's systems for recording and use of information. The inspector should decide whether it is necessary to take the OPA1 score into account in setting the OPA6 score.

In the event that an incident occurs on the process in question, the OPRA score may require re-evaluation, both in terms of revising the frequency for OPA6 and establishing it any other factors relevant to the other OPRA attributes contributed to the incident. Several OPRA scores could therefore change as a result of an incident. This enables the OPRA score and therefore the level of regulatory attention to naturally adjust to reflect the recent performance of the process. It should not, however, be assumed that an incident automatically requires other OPRA scores to be changed.

The OPA6 score should take into account the severity as well as frequency of events. Severity relates to the extent to which any compliance limit was exceeded and the actual environmental impact of the incident. The following should be considered in determining severity:

- to what extent was any limit exceeded, and for how long?
- how significant was the limit, in terms of environmental protection and the degree of safety margin built into the limit?
- what environmental harm was caused by the event?
- how did the operator remedy/mitigate the consequences of the event?

In the event that a release limit is reduced and the frequency of non-compliance events increases, it will be important to evaluate the severity of new events in order to determine whether a lower OPA6 score is justified; the increased frequency may be offset by the reduced severity of the events under the new limit. However, if a limit has been reduced because the previous limit was inappropriate, it may be necessary to set a lower OPA6 score.

OPA7: RECOGNISED ENVIRONMENTAL MANAGEMENT SYSTEMS (EMS).

OPA7 summarises the following aspects of performance:

- extent to which environmental management system(EMS) has been externally certified to recognised EMS standards.

Inspectors should make their evaluation based only upon the implementation by an operator of the following:

- EMS certified to a nationally recognised standard, such as International Standard ISO14001.

Environmental management systems in the process of gaining certification/verification may be given limited recognition in the OPA7 score. Internally developed systems, or certificates based on quality systems such as ISO9000, are not relevant to this attribute. Environmental management systems which are effective in managing environmental performance, irrespective of whether they have obtained ISO 14001, should naturally be reflected in the OPA1 – OPA6 attributes, since these relate to basic EMS components such as procedures, training, management, etc. OPA7 does not measure overall environmental performance; that is the purpose of the overall distribution of OPA scores. The specific purpose of OPA7 is to determine the extent to which an operator has gone through a systematic processor objectively verifying the environmental management system to nationally recognised standards.

3. Summary of Guidance for Quantifying Operator Performance Appraisal (OPA)

Attribute	OPA score of 1	OPA score of 3	OPA score of 5
1. Recording and use of information.	Limited or non-existent monitoring or records. No evidence of use of information. Failure to record all data required by permit.	Information available as required by permit. Records used in process management.	Recording and assessing environmental information to higher level than specified in conditions. 100 per cent records kept available, copies submitted promptly to inspector. Information used to high level in process management. Use of information in public communications. Information systems audited regularly
2. Knowledge and implementation of permit requirements	Permit unavailable. Operator not aware of legal requirements. Significant outstanding relevant improvement programmes	Key personnel aware of/have access to main permit details, and understand main requirements.	Current registration/permit displayed or immediately available, and relevant staff fully aware of registration/permit conditions and residual statutory requirements. No significant outstanding improvements. Compliance audited regularly
3. Plant maintenance	No coherent maintenance programme, taking no account of environmental effects and dependent solely on breakdown. No priority assigned to environment-critical items. Plant operating requirements riot defined, haphazard maintenance procedures. High	Formally developed maintenance programme based on appropriate industry standards, which takes into account environmental effects of breakdowns and maintenance operations. Intermediate frequency of	Advanced and regularly audited maintenance programme, placing priority on environmental effects of breakdown and maintenance. Plant maintenance procedures clearly defined and followed. All critical equipment and operating parameters monitored and maintained accordingly. Low frequency of breakdown/maintenance-related releases. Maintenance programme

	frequency of breakdown/maintenance-related incidents. Equipment performance deteriorates significantly between maintenance activities	breakdown and maintenance-related releases	ensures equipment environmental performance does not deteriorate significantly
4. Management and training	Ineffectively manned, inappropriate skills, poorly defined reporting structure and no clearly identified responsible person. Personnel not aware of consequences of releases. Little or no training on process or environmental issues	Plant effectively manned with well-trained, competent personnel who are aware of consequences of releases. Controlled by responsible person at all times. Formal training programme	Advanced training in place, involvement of senior management, availability of replacement staff at all times, emergency/abnormal conditions allowed for. Staff receive broad training, refresher courses, further education encouraged. Training process audited thoroughly. Commitment to environmental performance demonstrated within management and policy
5. Process operation	No (or poorly written) procedures/instructions. Operation of plant haphazard, changes not fully controlled. Frequent process deviations/near misses	Effective operating procedures available and implemented. Adequate control of process operations, shift handover and non-routine operations. Limited process deviations/near misses	Fully documented, up-to-date and comprehensive procedures and instructions are in place, audited and being followed. Process operation well controlled. Rare process deviations/near misses. Procedures identify environmental effects of operations
6. Incidents, complaints and non-compliance events	Repeated incidents causing complaints, or one or more serious incidents. Failure to comply with improvement notices. Enforcement action necessary	Fewer than three minor incidents and no serious incidents in last year. Full compliance with improvement notices. No more than one strong letter from regulator.	No reportable incidents or justified complaints about the process in last year. No action taken by Regulatory body, no strongly worded letters sent to operator
7. Recognised environmental management systems	No recognised environmental management systems	Process has environmental management system based on ISO14001.	Process environmental management system is certified to ISO14001.

4. Detailed description of PHA attributes

PHA1: PRESENCE OF HAZARDOUS SUBSTANCES

PHA1 summarises the following aspects of hazard:

- presence of hazardous substances;
- selection of representative substance;

- inherent hazard level of representative substance.

PHA1 indicates the nature of hazards presented by the overall process, due to the presence of hazardous substances and the degree of inherent hazard posed by those substances based on their properties alone. The overall hazard is determined by further considering amount, barriers to release, etc, in subsequent attributes. PHA1 involves hazard identification and selection of the most representative substance for the process, and a rating for that substance in terms of its potential to cause harm to the environment. The selection of representative substance within PHA1 is very important and it should be decided at this stage whether an iterative approach (as described in Section 1 of this annex) is needed.

The first step in PHA1 is to determine the presence of any hazardous substances which could be a significant source of pollution risk. The inspector should consider raw materials, intermediates, products, by-products and possible mixtures (particularly where reactions or synergistic effects are possible) in identifying the presence of hazardous substances. The permit details should be consulted to assist in the identification of substances of concern. Alternative release scenarios should be considered, including both pollution incidents and releases from normal operations. Incidents may include abnormal releases from discharge points, emergency conditions or accidental releases due to equipment failure. Potential 'domino' incidents (that is, combined failure of more than one process item) may also be considered, although these are unlikely to be the critical issue on most processes. Normal operations may cause a risk from the direct effects of routine emissions, or from uncertainties such as variations in weather conditions, changes in the environment or uncertainties in environmental impacts. Examples of the latter may include progressive or cumulative effects on the environment, for example if threshold concentration in the environment is close to being breached. For installations that are also major hazard sites, accident risks affecting humans and the environment should be covered separately and would generally not require consideration within PHA.

A representative substance should then be selected which is judged to best indicate the overall risk from the process as a whole, that is, it is the major contributor to the total risk. Default representative substances for different process types will be generated where possible through future use of OPRA, although site-specific features such as location and hazard control systems should always be considered in selecting the representative substance. As discussed in Section 1, for some processes it may be necessary to take an iterative approach, that is, carry out 'mini' PHA assessments for individual candidate substances and then base the PHA on the substance which gives the highest overall PHA value. Selection of a substance should include consideration of the different sections of the process and possible different set-ups/ feed stocks for the process, noting this as necessary in the recording of the PHA.

86. The final stage in PHA1 is to score the process based on the intrinsic hazardous properties of the representative substance. Properties that may need to be considered include:

- acute ecotoxicity (in air, water and soil), for example LC₅₀ values;
- chronic ecotoxic effects;
- carcinogenic/mutagenic properties;
- pH;
- surface water or benthic blanketing properties;
- Chemical/Biological Oxygen Demand;
- temperature;
- health risk to humans, for example occupational exposure limits;
- persistence in the environment;

- bioaccumulation properties;

In principle the inherent hazard level for a given substance can be determined from a combination of these properties. In practice this may be time consuming and limited by the availability of data. Default scores for each substance maybe generated as the OPRA system is used. In the absence of a default, the inspector should make use of available information on properties, for example VOC classifications (A-C), regulatory threshold inventory limits, Occupational Exposure Levels and other sources of data. In the absence of detailed information on substance properties, it is recommended that a simple approach be taken to assigning scores, as follows:

Substance characteristics	Guide score
Highly harmful effects and persistent.	5
Highly harmful effects but not persistent; or moderately harmful and persistent.	4
Moderately harmful, not persistent.	3
Slightly harmful.	2
Low level of harm	1

As stated in Section 1, the PHA1 score may be increased by one or two points if it is judged that there are other substances present which merit concern and which present a different type of hazard to that of the representative substance.

PHA2: SCALE OF HAZARDOUS SUBSTANCES.

PHA2 summarises the following aspect of hazard:

- amount of representative substance present in the process.

PHA2 represents the scale of the process, in terms of the amount of representative hazardous substance present that may be released to the environment. PHA2 should be scored in relation to the nature of the release scenario identified in PHA1: if a routine release of a pollutant is the key issue, PHA2 depends on the pollutant release rate. For accidental releases or short-term emissions of a substance used in the process, PHA2 may be determined by the inventory and/or the relevant process flow rate.

The scale of hazardous substances should be scored in relation to all other processes that use or release the same type of substance. Regulatory threshold inventories or concentrations may be used to further guide the evaluation of scale.

If there are several additional substances which may contribute a similar risk to the representative substance and which the inspector considers should be taken into account, the PHA2 score for the process may be increased.

PHA3: FREQUENCY AND NATURE OF HAZARDOUS OPERATIONS.

PHA3 summarises the following aspects of hazard:

- nature, range and complexity of operations;
- frequency of operations.

PHA3 represents the frequency (or likelihood) of the representative hazard occurring on the process. PHA3 generally relates to the frequency and nature of operations and the number and type of equipment items, which may give rise to releases or changes in the release rate of the representative substance. PHA3 may also need to take into account the variability in environmental conditions that may affect the environmental impact of the release.

In evaluating PHA3, the inspector should consider the following factors:

- nature, range and complexity of operations, that is, are there many different tasks required, are they by nature inherently prone to incidents, are the tasks complex in nature, do they happen on an ad hoc basis or are well-defined and planned?
- frequency of operations within the process, that is, how often are changes made to the operation of the process and how many equipment items are in use in these operations? Examples include variation of load factor in a continuous process, changeover of feedstock in a batch process, start-up and shutdown of both the process plant and any abatement systems. Thus, any intervention that affects the process is an operation in this context.

The above factors determine the inherent frequency of incidents. In practice the actual frequency may be higher or lower than this frequency, depending on management systems factors such as training, procedures, etc. In particular, an operation may occur infrequently and therefore have a low generic incident frequency, but the actual incident frequency may be higher than expected due to lack of familiarity. Studies of human error rates as a function of task frequency have indicated that the error rate per task for a rare task may be a factor of around 100 times higher than for a frequent task. However such effects are difficult to quantify in a general and simple manner. For the purposes of determining PHA3, these effects may be neglected and the frequency of releases assumed to be fully proportional to operations frequency. Non-linear effects such as familiarity with rare operations are reflected in OPA scores. This is consistent with the concept that PHA measures inherent risk, and OPA measures the effect of the management system on the inherent risk.

PHA4: TECHNOLOGIES FOR HAZARD PREVENTION AND MINIMISATION.

PHA4 summarises the following aspects of hazard:

- technological methods for eliminating hazards at source.

Inspectors should make their evaluation on whether the process technology has been designed to prevent or minimise releases into all media, for example by the use of alternative raw materials or a route for synthesis which eliminates by-product formation. PHA4 relates specifically to process technology including process instrumentation and control systems for prevention and minimisation of harmful releases, but not management techniques such as maintenance and training, which are considered in the corresponding OPA attributes.

The inspector should consider the following aspects and the evaluation should reflect an overall view having taken into account each one:

- age of plant;
- design and construction standards;
- complexity of process plant;
- suitability of instrumentation and controls;

- extent to which the process constitutes best available technique in relation to the inherent process design. A process may be below existing plant standards but subject to substantial improvement programmes.

The PHA4 score is not directly proportional to factors such as age and complexity but rather on the ability of the plant to eliminate or minimise hazards at source. The inspector should appraise whether the plant is functioning within design requirements and seek guidance, from other inspectors if necessary. The permit details for the process should also provide input to the evaluation of PHA4. A simple indicator for PHA4 is the ratio of the main hazardous stream concentration to that of any existing new plant standard concentration, measured upstream of any abatement systems.

PHA5: TECHNOLOGIES FOR HAZARD ABATEMENT.

PHA5 summarises the following aspects of hazard:

- technological methods for mitigation of hazard.

Inspectors should make their evaluation on whether the abatement plant is appropriate for the process and is operating as intended, including all associated instrumentation and control systems. As with PHA4, management techniques relating to the operation of abatement systems are evaluated in OPA attributes.

The PHA5 rating should take into account both the effectiveness and reliability of the abatement equipment in rendering harmless releases to the environment. For example, passive containment systems may be considered more reliable than active systems. Assessment of systems for removal of pollutants from releases to air or water should take into account the factors which determine the ability of the system to maintain its performance under different conditions, for example system capacity and normal operating level, how the system is regenerated, standby systems, etc. The inspector should seek guidance from other inspectors if necessary. As for PHA4, a simple indicator for PHA5 is the ratio of the main hazardous stream concentration to that of any new plant standard concentration, measured downstream of any abatement systems. Inspectors should also appraise the characteristics of any release point to determine the adequacy of dispersion of the substances released, for example for releases to air, the stack height and efflux velocity should be adequate; for releases to water, the efficiency of mixing may vary with flow conditions.

PHA6: LOCATION OF PROCESS.

PHA6 summarises the following aspects of hazard:

- proximity of process to environmental receptors;
- sensitivity of receptors to hazards;
- significance of harm caused to receptors.

The inspector should consider the proximity of the process to human populations and other environmentally sensitive areas. This is evaluated in terms of whether potentially sensitive environmental receptors are within range of the representative hazard from the process. The range depends on the available pathways from the process to the receptors, and the dispersion of representative substance from the process via these pathways. This is determined by the size of the release, the mobility of the released material and environmental factors (such as environmental capacity, topography, meteorology and

hydrology). The scale of effects being considered in PHA is generally short to medium range, that is, within 10-20km of the process boundary. Only those receptors within the expected effect area of releases should be considered. However in some cases more long-range effects may need to be considered, for example for SO₂ releases and critical load impacts. In cases where the scale of effects is regional to international due to the representative substance and type of harm (for example CO₂ for global warming effects), the exact location of the process becomes less important and the PHA6 score would be expected to converge on the average value, that is 3. The inspector should identify if there are any clear pathways from the process to the environment and potentially vulnerable receptors for the sort of releases that are being considered. For example, for the release of liquids of high aquatic toxicity to present a risk there must be a pathway from the site to rivers, groundwater, etc. The analysis of pathways should identify factors such as the presence of water abstraction points, possibility of detection, sewage or water treatment works, etc, which may provide a pathway or obstacle for the pollutant in the environment. Note that releases from remote sites are less likely to be detected. Transport and fate characteristics of the representative substance should also be considered in evaluating pathways, for example does the material sink or float, does it adsorb onto particulate matter, does it react with air or water, etc?

The sensitivity of receptors is the potential level of harm that may be caused given the nature and severity of the hazard specified in PHA1 and the type of receptors within range of the hazardous releases. This may not be straightforward to determine and the inspector should consult with expert bodies if necessary. Other considerations for sensitivity are:

- for surface waters, what water quality classification has been given, and what water quality objectives apply?
- what are the uses of the land or surface water body?
- are any receptors present within the potential effect area, which may be particularly sensitive to the representative substance?
- what is the duration of effects on the environment and how will it subsequently recover?

The significance of harm caused to receptors is based on an evaluation of the above factors combined with a judgement of the relative importance of the receptors affected. This requires considerable care given the nature of the judgement; again, the inspector may need to consult with expert bodies.

PHA7: OFFENSIVE CHARACTERISTICS.

PHA7 summarises the following aspects of the process:

- offensive characteristics which give rise to public concern.

A large amount of regulatory work can arise from public concerns and complaints due to a public perception of risk that may be unrelated to actual environmental risks. Public perceptions can be strongly affected by offensive characteristics such as odours and visible releases. For these reasons it is necessary to evaluate the overall offensive characteristics of the process that give rise to public concerns. These need to be treated separately from actual environmental risks as they can arise for very different reasons.

Inspectors should make their evaluation of offensive characteristics based upon the intrinsic offensiveness of substances present in the process. Offensiveness is particularly related to odour, appearance, taste and/or loss of amenity. Offence is most likely to be caused by airborne releases; examples of these include visible plumes, dust deposition on property, and odours arising from the process. Offence from waterborne releases, for example through discoloration of water or taste problems in water supplies, should also be considered. The

overall public perception of a process can be further gauged from knowledge of local views held and the record of complaints and campaigns against the process that may not be directly related to specific, substantiated problems arising from the process. It is possible that the local public may, however, become accustomed to certain offensive characteristics of processes. These may be considered of lower significance than if they were introduced into another location. The overall score for offensive characteristics of the process should take these factors into account

5. Summary of Guidance for Quantifying Pollution Hazard Assessment (PHA)

Category	PHA rating of 1	PHA rating of 3	PHA rating of 5
1. Presence of hazardous substances	Low toxicity, little or negligible potential to cause harm, for example inert non-hazardous particulates, low-grade heat, CO ₂ .	Medium potential to cause harm, for example NO _x , SO ₂ , PM10's, smog-related VOCs	Could result in serious harm to humans and/or the environment, for example chlorine, fluorine, carcinogenic VOCs, asbestos, dioxins, PAHs.
2. Scale of hazardous substances	Small-scale process with low inventories/releases of representative substance relative to normal industry, concentrations and amounts well below thresholds.	Medium-scale process, average inventories/releases of representative substance, concentrations and amounts around thresholds.	Major undertaking in relation to industry norm, large-scale inventories/releases of representative substance, concentrations and amounts above thresholds.
3. Frequency and nature of hazardous operations	Infrequent and simple changes made to hazardous operations. Clearly defined repetitive operation with little variability possible. For example, simple process operation changed only several times per year.	Relatively frequent or complex hazardous operations.	Complex and frequent hazardous operations. Irregular and highly variable schedule of operations. For example, process with frequent load changes, feedstock variations, equipment outages.
4. Technologies for hazard prevention and minimisation	Meets or exceeds new plant Standards. State-of-the-art, or inherently low polluting processes. No outstanding relevant improvement programmes.	Meets requirements for existing plant standards.	Outmoded/poorly designed processes; significant relevant improvement programmes outstanding.
5. Technologies for hazard abatement	State-of-the-art abatement processes; good dispersion. No outstanding relevant improvement programmes.	Stack heights adequate, dispersion sufficient from discharge points.	Outmoded/poorly designed/unreliable abatement; significant relevant improvement programmes outstanding; plume grounding at significant concentrations.

6. Location of process	Low sensitivity area, for example, heavily industrialised, low quality surface waters, not used for abstraction, absence of designated areas, remote from populations (including other industry workforces) and amenity locations. Additional pollutant releases not likely to cause significant deterioration in environment or exceedance of environmental quality criteria.	Medium sensitivity environment, mixed industrial/residential area, low-density populations nearby, or highly sensitive areas at some distance but potentially in effect range.	Close proximity downwind/downstream to areas of high population and/or highly sensitive environment, for example river used for water abstraction, groundwater, designated areas, etc. Further pollutant releases may exceed critical levels or lead to further harm.
7. Offensive characteristics	Inoffensive process containing substances causing no offence; for example, CO ₂ releases to air, CH ₄ . No record of unsubstantiated public concerns or complaints.	Moderately offensive characteristics, for example, odours from esters, aldehydes, ketones, solvents. Water discoloration or foaming in releases. Moderately visible plumes. Some local public concerns.	Highly offensive characteristics. Extremely unpleasant or annoying, either due to sight or smell. For example, mercaptans, amines, highly visible smuts/particulates, highly visible plumes. Strong local concerns.

6. Practical application of the OPRA system

GENERAL

This section discusses the general approach to the use of OPRA in practice. Comprehensive procedures for performing OPA and PHA have been produced separately. The OPRA system is to be applied in such a way as to enable regular assessment of the OPRA score for the process, without adding significantly to the time and resources required of the inspector and operator. The system and associated procedures are designed to achieve this goal. The initial generation of an OPRA score would generally require all attributes to be evaluated. Thereafter, it is only necessary to identify and re-evaluate those attributes which may have changed. It should be noted however that, given the nature of PHA attributes, a change in one attribute would generally require all other attributes to be reviewed. The evaluation process itself requires judgement and experience to be employed, using information from existing sources and acquiring new information through sampling. A key feature of the system is that all main assumptions and the basis for the evaluation should be recorded alongside the scores.

RESOURCE/TIME REQUIREMENTS

The time expected to perform an OPRA depends on several main factors:

- whether OPRA has been performed for the process previously;
- complexity and size of the process;
- amount of information required to produce confident scores;
- number of attributes that require re-evaluation (in many cases no PHA re-evaluation will be needed, and maybe only one or two OPA attributes will need re-evaluation);
- special circumstances, for example incident, complaint, non-compliance;
- degree of concern from operator as to particular scores or details, and need for justification of scores;
- experience of inspector with process in question and with the OPRA system.

An experienced inspector might be expected to take up to about three hours to complete the first OPRA for a process. Updating of OPRA on subsequent occasions would generally take up to about one hour, and in many cases little or no change may be required to the OPRA scores. These estimates relate strictly to time required to determine the score for a process with which the inspector is already familiar. The inspector is responsible for determining whether a full, partial or no OPRA is required on each occasion. Supporting criteria are given in the procedures.

An indication of any new scores should be given to the operator at the end of the inspection. The inspector will need to be able to justify scores to the operator; however, where the operator has a concern over the score, the inspector may invite the operator to submit further information in writing to the Regulatory body, which may be taken into account later. This should limit the time spent by the inspector justifying the score.

It is expected that an OPA should be performed at least once a year in order to ensure it is up-to-date. A PHA should be performed at least once every four years, given this is less subject to change.

USE OF SAMPLING AND JUDGEMENT IN GENERATING SCORES

While there are detailed techniques available for assessment of operator performance and environmental risk, OPA and PHA are designed as simple screening tools which can be used on a regular basis and enable inspectors to make a rapid and transparent assessment of the process. OPRA is therefore based on simple analysis methods using the inspector's knowledge of the process, supported by sampling and judgement. Thus OPA does not require detailed review of all records or discussions with numerous staff, as may occur with an audit. Similarly, PHA does not require the detailed calculations that may accompany a full quantitative risk analysis, such as estimation of frequencies and consequences of individual releases.

The inspector will generally review records and documents, hold discussions with site staff and carry out physical inspections of equipment as a normal part of inspections. In many cases it will not be possible to cover all records, staff and equipment associated with the process. The inspector should decide what proportion of the total should be covered in order to have sufficient confidence to derive the corresponding OPRA scores. Clearly, a greater amount of information may be needed if a particular attribute is considered to be crucial or a concern has been identified. Where it is not possible to review sufficient information, the inspector should note this on the relevant comments section of the OPRA form. It may be appropriate to perform a more detailed review of specific aspects of the process or management systems on subsequent inspections in order to reduce key areas of uncertainty.

APPLICATION OF PROCEDURES

The OPRA methodology involves filling in two worksheets, one each for OPA and PHA. Example forms are shown below. Details of the OPRA (process, date, inspector, etc) should be filled in each time any OPRA score is to be changed. Scores should be assigned to each box, either from the previous appraisal or based on a new evaluation. Spaces are provided in the standard OPA and PHA forms for comments relating to the overall process and each attribute in particular. These should be used to explain the reasoning behind any new scores assigned and where necessary the reason for not giving an alternative score (for example why an OPA was scored at 4 and not 5).

A full OPRA re-evaluation is unlikely to be required following each inspection; in many cases the inspector will simply need to determine whether the OPRA results from the previous evaluation are still applicable or if some updating is required. The emphasis of the OPRA procedure is to ensure that the OPRA score for the process is kept up-to-date. In general the PHA will change only if there has been a major variation to the process; it may additionally require review if new information is obtained on hazards or the environment. OPA may require more regular updating and the inspector should consider if there is the need for changes to any OPA scores at the end of each inspection visit.

Multiple process sites may share common systems, such as maintenance and record keeping systems. Where an inspector is able to establish that these systems are indeed common to several processes, the scores for the corresponding OPRA attributes may be assumed to be the same. However it is important to determine whether the common system is equally appropriate to the different processes. If the common system is more suitable for one process than another, the corresponding OPRA attributes must be scored separately.

As discussed in Section 1, a large or complex process maybe considered as several smaller sub-processes for the purposes of deriving the overall OPA and PHA scores. If necessary, separate worksheets should be filled in for each sub-process. In general however it would be expected that sub-process scores and the overall scores may be shown on a single worksheet.

The role of the operator in deriving OPRA scores is to provide information and allow access to records, site areas, etc as needed, and to answer questions to clarify the scoring process. The operator may draw to the attention of the inspector any issues considered relevant to the scoring. The inspector should discuss the OPRA scores fully with the operator at the time of derivation. It is then a matter for the inspector to consider the relative weights of the OPA and PHA scores and to assign some value of overall risk to the individual installation that will allow him or her to adjust the baseline frequency for inspection and, in the case of setting priorities, to rank the relative risks of all installations. A simple guide as to how to combine the OPA and PHA scores into zones of overall risk level (from 1-5) is shown in graphical form in Figure 1. This does not include any attempt to weight the individual components, which must be a matter of judgement by an experienced inspector with knowledge of all the relevant circumstances of the installation.

OPERATOR PERFORMANCE APPRAISAL WORKSHEET		
Permit No.	Ref.	Date.
Site name.	Address.	Inspector.
General Comments.		
Attribute.	Rating. (1 to 5)	Comments.
1. Recording and use of information.		
2. Knowledge and implementation of permit requirements.		
3. Plant maintenance.		
4. Management and training.		
5. Process operation.		
6. Incidents, complaints, non-compliance, etc.		
7. Recognised EMS.		
POLLUTION HAZARD APPRAISAL WORKSHEET		
Permit No.	Ref.	Date.
Site name.	Address.	Inspector.
General Comments.		

Attribute.	Rating. (1 to 5)	Comments.
1. Presence of hazardous substances.		
2. Scale of hazardous substances.		
3. Frequency/nature of hazardous operations.		
4. Technology for hazard prevention and minimisation.		
5. Technology for hazard abatement.		
6. Location of process.		
7. Offensive characteristics.		

FIGURE 1: OVERALL LEVEL OF RISK FOR INSTALLATION.

