East African Network
for Environmental Compliance & Enforcement

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ENVIRONMENTAL INSPECTORS' FIELD SAFETY MANUAL

Contents

ACKNOWLEDGEMENTS..... vi
EXECUTIVE SUMMARY..... ix
PART ONE..... 1
RISK ASSESSMENT IN ENVIRONMENTAL INSPECTIONS..... 1
Introduction..... 1
Purpose of the Manual..... 1
Scope of the Manual..... 1
PART TWO.....
TYPES OF HAZARDS IN ENVIRONMENTAL INSPECTIONS.....
Chemical Hazards..... 9
Fire and Explosion..... 15
Radiological Hazards..... 16
Biological Hazards..... 17
Other Hidden Hazards..... 20

List of Tables

Table 1: Risk Evaluation Matrix..... 5
Table 2: Risk Assessment Form..... 7
Table 3: List of Toxic Chemical Compounds..... 13
Table 4:List of Carcinogenic Chemical Compounds..... 14

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DEFINITION OF KEY TERMS

Exposure: Is the degree of contact with a given hazard, usually estimated from dose.

Hazard: Is the ability, nature or property of a substance or situation which has the potential to cause harm in terms of human injury, ill health or damage to property or the environment. In the context of environmental inspections, a hazard is anything that may cause harm to an Environmental Inspector while discharging his duties.

Risk: Is the likelihood, high or low, that somebody could be harmed if exposed to a hazard, together with an indication of how serious the harm could be.

The statistical notion of risk is often modeled as the expected value of an undesirable outcome. This combines the threat posed by a given event and the corresponding exposure into a single value. The associated formula for calculating risk is given below:

Risk = Hazard × Exposure

Risk Assessment: Is a careful examination of what, in a given work environment, could cause harm to people, so that one can determine whether sufficient precautions have been taken to prevent harm.

Risk Level: Is the numerical categorization of the hazard severity and the likelihood of occurrence. Each hazard is given a rating and this is multiplied by the probability that these hazards will occur, as shown in the following equation.

Risk level = Hazard severity x Likelihood of occurrence

Risk Management: Is the continuing process of identification, analysis, assessment, control and avoidance, minimization or elimination of unacceptable risks.

Risk Probability: Is a measure of the likelihood that the consequences described in the risk statement will actually occur and is expressed as a numerical value. Risk probability must be greater than zero, or the risk does not pose a threat. Likewise, the probability must be less than 100 percent, or the risk is a certainty, in other words, it is a known problem.

Risk Severity: Is the degree of impact, harm or injury should a given risk occur. Severity can be categorized as follows:

- Catastrophic – if the risk occurs the injury will lead to death.
- Critical – severe injury or occupational illness.
- Moderate – minor injury or occupational illness.
- Negligible – less than minor injury or occupational illness.

EXECUTIVE SUMMARY

Environmental Inspectors have the responsibility of monitoring and assuring compliance with environmental requirements as spelt out in existing laws, regulations and standards. To deliver on this role, Environmental Inspectors carry out a number of activities including inspections to collect information that may be used not only to determine the compliance status of given regulated facilities but also as evidence for enforcement actions against facilities that are out of compliance.

Environmental Inspectors may encounter different types of hazards during inspections. These include: chemical, fire and explosion, radiological, biological and physical hazards. In addition, there are other more hidden hazards that are often overlooked such as oxygen deficient areas and confined spaces, fatigue and stress, and loss of peripheral perception. These hazards can expose Inspectors to great risk if sufficient safety measures are not undertaken.

In view of the above hazards and their associated risks, it is very important when planning for an inspection to always carry out a risk assessment so as to eliminate or minimize the dangers that Environmental Inspectors may be exposed to in the field during actual inspection.

This Manual discusses the key steps of the risk assessment process in environmental inspections including: identifying the hazards; evaluating the risks; deciding on precautions and controls; recording the significant findings and implementing them; and reviewing previous risk assessments and updating if necessary.

The Manual also discusses the various types of hazards that Environmental Inspectors are likely to encounter during inspections, and outlines simple yet important safety measures that may be undertaken to eliminate or minimize risks associated with the hazards.

This Manual applies to all Environmental Inspectors and has to be used in conjunction with other related documents including the *Harmonized Environmental Inspection and Investigation Manual for East Africa* and relevant legislation.

PART ONE
RISK ASSESSMENT IN ENVIRONMENTAL INSPECTIONS

Introduction

Environmental inspection is an essential component of the environmental management cycle. It is a key activity in the implementation and enforcement of environmental requirements and involves a range of supervisory practices whereby Environmental Inspectors appointed by regulatory agencies determine the compliance status of a given activity.

Environmental inspections take place in diverse facilities and environments with many potential hazards that may expose Inspectors to great risk if sufficient safety precautions are not undertaken. Many times Inspectors are oblivious of the hazards in the facilities they inspect and may not be well prepared to handle the situation should the risk occur.

Purpose of the Manual

This manual provides simplified steps for risk assessment in environmental inspections as well as the safety measures that may be undertaken to eliminate or minimize risks associated with the various types of hazards that Environmental Inspectors are likely to encounter in the course of their work.

Scope of the Manual

The scope of this manual is primarily to the activities that may result in significant damage to the environment and public health and which call for the intervention of environmental inspectors from time to time with a view to determining the compliance status of such activities. The manual applies to all Environmental Inspectors and has to be used in conjunction with other related documents including the *Harmonized Environmental Inspection and Investigation Manual for East Africa* and relevant legislation.

The Process of Risk Assessment in Environmental Inspections

Risk assessment is an important element of planning in the pre-inspection phase. A thorough risk assessment can minimize the dangers that Environmental Inspectors may be exposed to in the field during actual inspection. Therefore, risk assessment should constitute a key agenda item in the pre-inspection meeting before going out to inspect any facility.

The team leader of a given inspection team is responsible for all phases and processes of the inspection including the safety of inspectors. As such the team leader must ensure that a comprehensive risk assessment is carried out by the team before going out to the field. All team members should ensure that the agreed control measures are implemented to eliminate or minimize the risks associated with any hazards identified in the risk assessment before venturing into a given facility or site.

The following are the five key steps in the risk assessment process:

Step 1: Identify the hazards

Step 2: Evaluate the risks

Step 3: Decide on precautions and controls

Step 4: Record the significant findings and implement them

Step 5: Review previous risk assessments and update if necessary

These steps are pictorially represented in the following diagram below:

The five steps of the risk assessment process

The steps are discussed in more detail below:

Step 1: Identify the Hazards

The first and most important step of the risk assessment process is to accurately identify the potential hazards during the inspection process. All hazards associated with each activity and all groups of persons who may be exposed to those hazards must be identified. Hazards can arise from the use of materials, substances, equipment and the location that the activity is carried out in.

Accurately identifying the potential hazards is paramount because Environmental Inspectors do not work in the facilities they inspect everyday so they may often be oblivious of the hazards in such places. In yet other instances, Inspectors may have previously visited the same premises and may easily overlook some hazards in the mistaken belief that they are familiar with the facility and all its associated hazards. Therefore, as a general rule, all inspections must be preceded with some risk assessment in the pre-inspection phase.

Hazards can be identified by using a number of different techniques. Below are some tips to help the Environmental Inspector in identifying and noting potential hazards:

- Use common sense! Most hazards will be obvious even to lay persons depending on the facility or environment where the inspection is to be conducted.
- Pay attention to your senses (i.e. sight, smell, hearing, touch/feel and taste)
- Use general or common knowledge regarding the type of facility to be inspected including any previous information about the facility.
- Brainstorm among team members on the potential hazards of a specific facility/site.
- Hold an opening conference with facility representatives and ask what it is about the activities, processes or substances used that could cause injury to or harm the health of the Inspector or others. Ask for assistance, guidance and position of facilities such as emergency exits.
- If already at the facility, for example during emergency responses, look out for what could reasonably be expected to cause harm. Take note of any notices, warning signs, markings or color codes that indicate a hazard.
- Check manufacturers' instructions or material safety data sheets (MSDS) and manuals for chemicals, equipment and machinery.
- Always consider all unlabeled containers hazardous until proven safe.
- Documentation like shipping papers or manifests may help identify hazards.
- Where possible, have a look at the facility's accident and ill-health history and/or records – these often help to identify the less obvious hazards.
- Beware of long-term hazards to health e.g. exposure to high levels of noise or to harmful substances.

Step 2: Evaluate the Risk

In evaluating the risk the inspection team needs to examine the likelihood of a hazardous event occurring and the probable degree of harm or injury. Once likelihood has been determined the probable consequence of the hazardous event should be considered. Consequences can be considered in terms of severity of potential injury or harm.

Whereas there are statistical models for evaluating risk and assigning a value to the outcome, this Manual is not intended to engage Environmental Inspectors in such complex statistical calculations. Rather, the Manual provides a very simplified matrix that the inspection team can use to quickly scan the potential hazards and make decisions on the necessary safety measures before venturing into a given facility/site.

Table 1 below provides a simple risk evaluation matrix that can assist the inspection team in decision making.

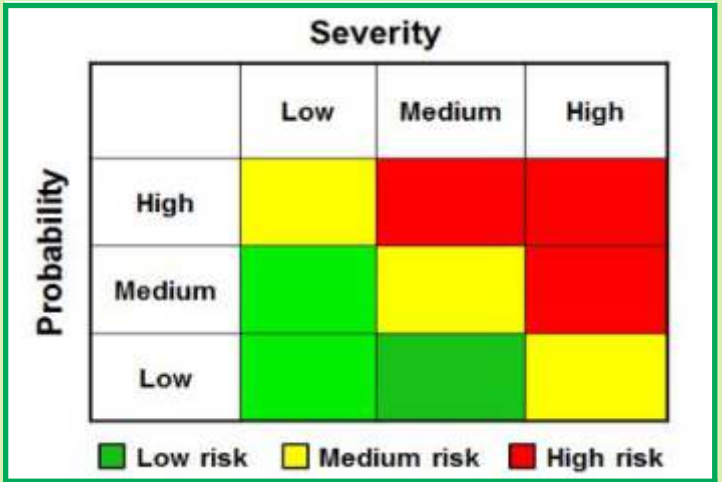

Table 1: Risk Evaluation Matrix

KEY

Severity

High = Catastrophic or critical (death or severe injury)
Medium = Moderate (minor injury or occupational illness)
Low = Negligible (less than minor injury or occupational illness)

Probability

High = almost certain occurrence
Medium = may or may not occur (50:50 chance)
Low = less than medium chance of occurrence

[1]*Cox, L.A. Jr., 'What's Wrong with Risk Matrices?', Risk Analysis, Vol. 28, No. 2, 2008*

Step 3: Decide on Precautions and Controls

Once the level of risk is determined, control measures should be put in place to eliminate the risk or reduce it to an acceptable or tolerable level. The team leader needs to do everything reasonably practicable to protect himself and the team members from harm. This means balancing the level of risk against the measures needed to control the real risk in terms of money, time or trouble. The action taken should be proportional to the level of risk.

The key question to consider when determining control measures is whether the hazard be gotten rid of altogether. If not, how can the risks be controlled so that harm is unlikely? When deciding upon control measures, the Control Hierarchy principles should be applied in the following sequence:

I. **Eliminate the hazard:** This involves getting rid of a hazardous job, tool, process, machine or substance. For example, instead manually moving heavy containers in a facility during an inspection, the team could deploy equipment such as a forklift to move such containers thus eliminating the risks associated with manual handling. Elimination of the hazard is often very difficult to achieve but if achieved it does totally remove the hazard and thereby eliminates the risk of exposure.

ii. **Substitute the hazard:** Substituting the hazard involves replacement of a hazardous job, tool, process, machine or substance with a less risky option. Whereas substitution may not remove all the hazards associated with the process or activity and may in fact introduce different hazards, the overall harm or health effects is usually lessened. For example, if environmental inspectors are to collect water samples from a crocodile infested river regularly, it may be appropriate to install stationery water sampling equipment in the river to reduce the level of exposure.

iii. **Administrative Controls:** These are changes to the way people work and include:

. Isolating the hazard: This is achieved by restricting access to the hazard, for example preventing access to plant, equipment or substances such as

An easy way to record the findings of a quick risk assessment is to use a simple risk assessment form like the one in Table 2 below:

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY
ENVIRONMENTAL INSPECTION RISK ASSESSMENT FORM

Name of Site/ Facility……

Location and Address……..

Type of Operations……...

Hazard	*Likelihood*	*Consequence*	*Severity*	*Risk Level*	*Control Measure and Timeline*	*Responsible*
	High ☐ Medium ☐ Low ☐		Catastrophic ☐ Critical ☐ Moderate ☐ Negligible ☐			
	High ☐ Medium ☐ Low ☐		Catastrophic ☐ Critical ☐ Moderate ☐ Negligible ☐			
	High ☐ Medium ☐ Low ☐		Catastrophic ☐ Critical ☐ Moderate ☐ Negligible ☐			
	High ☐ Medium ☐ Low ☐		Catastrophic ☐ Critical ☐ Moderate ☐ Negligible ☐			

Dated at ……..... this ……day of ……20….....

Team Leader: Name……Signature……

Table2 : Risk Assessment Form

chemicals.

- Implementing a safe system of work: This includes organizing work in such a way that eliminates or minimizes exposure to hazards. For example, adopting standard operating procedures for safety at work; providing appropriate training, instruction or information to reduce the potential for exposure, harm and/or adverse health effects to persons.

iv. **Use appropriate Personal Protective Equipment (PPE):** PPE is usually the last line of defense against workplace hazards and must be used in conjunction with one or more of the other control measures outlined above. PPE include gloves, eye protection glasses, earmuffs, aprons, overalls, reflector jackets, safety footwear, dust masks, gas masks and other wear that are designed to reduce exposure to different types of hazards. It is important to use appropriate PPE for the given type of hazard and to wear such PPE correctly.

Step4: Record your significant findings and implement them

The Team Leader should make a record of all significant findings, that is, the hazards, how people might be harmed by them and what measures have been put in place to control the risks. The record should be simple, short and precise and should effectively communicate the findings to all concerned team members.

Step 5: Review previous risk assessments and update if necessary

Few premises and facilities stay the same. The operators will often bring in new equipment, substances and procedures that could lead to new hazards. It makes sense, therefore, even in repeat inspections, to review previous risk assessments. The important questions to consider here are the following:

- Have there been any changes?
- Are there improvements that need to be made to the previous risk assessment?
- Have the team members spotted a new problem?
- Are there lessons from past accidents or near misses?
- Is there any feedback that should go to management for allocation of resources?

PART TWO
TYPES OF HAZARDS IN ENVIRONMENTAL INSPECTIONS

The following are the main types of hazards that Environmental Inspectors are likely to encounter in the course of their duties:

i. Chemical hazards
ii. Fire and Explosion
iii. Radiological hazards
iv. Biological hazards
v. Physical hazards
vi. Other hidden hazards (oxygen deficient areas, confined spaces, fatigue, stress and loss of peripheral perception)

Chemical Hazards

Chemicals may be solids, liquids or gases (mists, dusts, fumes and vapors) and may occur as single elements or as mixtures. Chemical compounds can enter the body by inhalation, absorption through the skin, ingestion or injection by sharp objects.

Exposure to excessive concentrations of chemicals may exert toxic effects in humans that may be chronic or acute. The reactions may be immediate in some cases while in others such as with carcinogens it may require long periods of time for the reactions to manifest themselves.

Unsafe storage and disposal of chemicals as depicted in this picture is a common problem in East Africa

The chemicals listed in Table 3 below are considered toxic (poisonous) and may cause serious harm to humans. Environmental Inspectors should therefore take extra precautions when dealing with these chemicals.

[2]***Source:*** *Rees, C.D. (2009), Occupational Health and Safety Management: A Practical Approach, 2nd Ed., CRC Press, London.*

Acetaldehyde
Acetamide
Acetonitrile
Acetophenone
2-Acetylaminofuorene
Acrolein
Acrylamide
Acrylic acid
Acrylonitrile
Allyl chloride
Aminobyphenyl
Aniline
o-Anisidine
Antimony compounds
Arsenic compounds (inorganic including arsine)
Asbestos
Benzene (including benzene from gasoline)
Benzidine
Benzotrichloride
Benzyl chloride
Beryllium compounds
Biphenyl
Bis(2-ethylhexyl)phthalate (DEHP)
Bis(chloromethyl)ether
Bromoform
1,3-Butadiene
Cadmium compounds
Calcium cyanamide
Caprolactam
Captan
Carbaryl
Carbon disulfide
Carbon tetrachloride
Carbonyl sulfide
Catechol
Chloramben
Chlordane
Chlorine
Chloroacetic acid
2-Chloroacetophenone
Chlorobenzene
Chlorobenzilate
Chloroform
Chloromethyl methyl ether
Chloroprene
Cresols/cresylic acid (isomers and mixture)

o-Cresol
m-Cresol
p-Cresol
Cobalt compounds
Coke oven emissions
Cyanide compounds
Cumene
2,4-Dichlorophenoxyacetic acid , salts and esters
Dichlorodiphenyldichloroethylene (DDE)Diazomethane
Dibenzofurans
1,2-Dibromo-3-chloropropane
Dibutylphthalate
1,4-Dichlorobenzene(p)
3,3-Dichlorobenzidene
Dichloroethyl ether (bis(2-chloroethyl)ether)
1,3-Dichloropropene
Dichlorvos
Diethanolamine
N,N-Diethyl aniline *(N,N*-dimethylaniline)
Diethyl sulfate
3,3-Dimethoxybenzidine
Dimethyl aminoazobenzene
3,3-Dimethyl benzidine
Dimethyl carbamoyl chloride
Dimethyl formamide
1,1-Dimethyl hydrazine
Dimethyl phthalateDimethyl sulphate
4,6-Dinitro-o-cresol, and salts
2,4-Dinitrophenol
2,4-Dinitrotoluene
1,4-Dioxane (1,4-Diethyleneoxide)
1,2-Diphenylhydrazine
Epichlorohydrin (l-Chloro-2,3-epoxypropane)
1,2-Epoxybutane
Ethyl acrylate
Ethyl benzene
Ethyl carbamate (urethane)
Ethyl chloride (chloroethane)
Ethylene dibromide (dibromoethane)
Ethylene dichloride (1,2-dichloroethane)
Ethylene glycol
Ethyline imine (aziridine)
Ethylene oxide
Ethylene thiourea
Ethylidene dichloride (1,1-dichloroethane)
Fine mineral fibers
Formaldehyde
Glycol ethers
Heptachlor
Hexachlorobenzene

Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Hexamethylene-1,6-diisocyanate
Hexamethylphosphoramide
Hexane
Hydrazine
Hydrochloric acid
Hydrogen fluoride (hydrofluoric acid)
Hydrogen sulfide
Hydroquinone
Isophorone
Lead compounds
Lindane (all isomers)
Maleic anhydride
Manganese compounds
Mercury compounds
Methanol
Methoxychlor
Methyl bromide (bromoethane)
Methyl chloride (chloromethane)
Methyl chloroform (1,1,1-trichloroethane)
Methyl ethyl ketone (2-butanone)
Methyl hydrazine
Methyl iodide (iodomethane)
Methyl isobutyl ketone (hexone)
Methyl isocyanate
Methyl methacrylate
Methyl tert butyl ether
4,4-Methylenedianiline
Naphthalene
Nickel compounds
Nitrobenzene
4-Nitrobiphenyl
4-Nitrophenol
2-Nitropropane
N-Nitroso-*N*-methylurea
N-Nitrosodimethylamine
N-Nitrosomorpholine
Parathion
Pentachloronitrobenzene (quintobenzene)
Pentachlorophenol

Phenol
p-Phenylenediamine
Phosgene
Phosphine
Phosphorous
Phthalic anhydride
Polycyclic organic matter
Polychlorinated biphenyls (Aroclors)
1,3-Propane sultone
beta-Propiolactone
Propionaldehyde
Propoxur (Baygon)
Propylene dichloride (1,2-dichloropropane)
Propylene oxide
1,2-Propylenimine (2-methyl aziridine)
Quinoline
Quinone
Radionuclides (including radon)
Selenium compounds
Styrene
Styrene oxide
2,3,7,8-Tetrachlorodibenzo-*p*-dioxin
1,1,2,2-Tetrachloroethane
Tetrachloroethylene (perchloroethylene)
Titanium tetrachloride
Toluene
2,4-Toluene diamine
2,4-Toluene diisocyanate
o-Toluidine
Toxaphene (chlorinated camphene)
1,2,4_trichlorobenzene
1,1,2-Trichloroethane
Trichloroethylene
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
Triethylamine
Trifluralin
2,2,4-Trimethylpentane
Vinyl acetate
Vinyl bromide
Vinyl chloride
Vinylidene chloride (1,1-dichloroethylene)
Xylenes (isomers and mixture)
o-Xylenes
m-Xylenes
p-Xylenes

Table 3: List of Toxic Chemical Compound

A number of chemical compounds from the above list have been scientifically identified as carcinogens, that is, they cause cancer. Table 4 below outlines the list of chemical compounds that are known carcinogens. However, there is no scientifically known safe level of exposure to these cancer causing substances. Therefore zero exposure to these chemical compounds should be the goal in any work environment including during environmental inspections.

4-Nitorbiphenyl
α-Naphthylamine
Methyl chloromethyl ether
3,3'-Dichlorobenzidine (and its salts)
β-Naphthylamine
bis-Chloromethyl ether
Benzidine
4-Aminoddiphenyl
Ethyleneimine
β-Propiolactone
2-Acetylaminofluorene
4-Dimethylaminoazo-benzene
N-Nitrosodimethylamine
Vinyl Chloride
Inorganic arsenic
Cadmium
Benzene
Coke oven emissions
1,2-Dibromo-3-chloropropane
Acrylonitrile
Ethylene oxide
Formaldehyde
Methylledianiline
1,3 Butadiene
Ethyline chloride

Table 4:List of Carcinogenic Chemical Compounds

[3] ***Source:*** *Rees, C.D. (2009), Occupational Health and Safety Management: A Practical Approach, 2nd Ed., CRC Press, London.*

Heeding warning signs like this one can prevent exposure to chemicals hazards

The following are important safety tips during inspections in facilities with chemical hazards:

- Avoid direct contact with chemical compounds as much as possible;
- Include relevant experts in the inspection team;
- Obey signage, warnings and notices;
- Read and take note of labels, tags and markings about the identity of the material and hazard warnings.

These can be found on the container labels, Material Safety Data Sheets (MSDS) and the list of chemicals in the facility;

- Use appropriate PPE correctly;
- Decontaminate by washing hands/body, clothing and PPE after inspections.
- In case of accidental contact with any chemical wash thoroughly with a lot of water and s
- Seek medical attention as soon as possible.

Appropriate PPE should be used correctly

Fire and Explosion

For fire and/or explosion to occur there must be a source of ignition, fuel and oxygen. These three things are known as the fire triangle. If all three are present and in close proximity then the risk of fire or explosion increases. The typical ambient atmosphere has sufficient oxygen for combustion. In this case, all that is needed is an ignition source and fuel.

Potential sources of ignition include:

- Naked flames: cigarettes, matches, pilot lights, gas/oil heaters, gas welding, cookers etc.
- Hot surfaces: heaters, engines, boilers, machinery, lighting (for example, halogen lamps), electrical and electronic equipment including cameras and cell phones, etc.
- Hot work: welding, grinding, flame cutting.
- Friction: drive belts, worn bearings etc.
- Sparks: static electricity, metal impact, grinding, electrical contacts/switches etc.

Anything that burns is a potential source of fuel. Examples include:

- Solids: textiles, wood, paper, card, plastics, rubber, PU foam, furniture, fixtures/fittings, packaging, waste materials etc.
- Liquids: solvents (petrol, white spirit, methylated spirits, paraffin, thinners etc), paints, varnish, adhesives etc.
- Gases: LPG, acetylene.

Always obey fire/explosion warning signage like this one

The following are important safety tips when carrying out inspections in settings that could portend fire risks:

- Obey signage, warnings and notices. For example, do not smoke or use flashlights, cellular phones and cameras in restricted areas.
- Always declare items that may ignite fire e.g. cameras, flash lights, cellular phones, matches, cigarette lighters, etc
- Use appropriate Personal Protective Equipment correctly.
- In case of a fire break out shout 'Fire!!'
- Call Emergency Line and ask for Fire Brigade (999 or 112)
- Use appropriate fire extinguishing agent d depending on the source of fire
- Take note of emergency exits and fire assembly points and follow fire evacuation instructions.

Radiological Hazards

Radiation is divided into two major categories, that is, ionizing and non-ionizing radiation based on its effect on living tissue. Ionizing radiation has the ability to change or destroy the atomic structure of cells, whereas non-ionizing radiation does not.

Some common sources of ionizing radiation include nuclear reactors, X-ray equipment and radioactive wastes from medical facilities. For non-ionizing radiation the common sources include microwaves, radio and radar broadcast equipment, sun, vinyl and high frequency welders, induction heaters, flow solder machines, sputtering equipment, glue curing equipment, power amplifiers, metrology equipment, electrical arcs, lasers and plastic sealers.

Although non-ionizing radiation is not as hazardous as ionizing radiation, an intolerable rise in body temperature as well as localized damage to specific body organs may result from exposure to sufficient intensity and over a prolonged time.

Containers with the radiation hazard symbol

Radiation exposure may be internal or external, and can be acquired through various exposure pathways. Internal exposure to ionizing radiation occurs when a radionuclide is inhaled, ingested or otherwise enters into the bloodstream (e.g. through injection, wounds). External contamination on the other hand occurs when airborne radioactive material (dust, liquid, aerosols) is deposited on skin or clothes. Exposure to ionizing radiation can also result from external irradiation (e.g. medical radiation exposure to X-rays).

The following safety measures are important when conducting inspections in facilities and sites with potentially radiological hazards:

- Involve the relevant lead agency i.e. Radiation Protection Board in all inspections in facilities with potential radiological hazards;
- Heed the safety controls in nuclear facilities including warnings, notices, signs, hazard identification markers and labels;
- Do not venture into areas with radioactive material unless cleared by radiation experts;
- In the event of accidental entry, evacuate the area immediately as soon as you become aware of the existence of radioactive material and seek treatment immediately;
- Use appropriate Personal Protective Equipment correctly.

Always use appropriate PPE in environments with potential radiation hazards

Biological Hazards

Biological hazards emanate from micro and macro biological sources. Micro-biological sources include fungi, viruses and bacteria. Macro-biological sources on the other hand include things that may cause harm through bites or stings and include domestic and wild animals, vermin, insects, parasites, snakes, etc. In addition, biological hazards include botanical sources such as poisonous plants and plant material that can cause allergic reactions e.g. pollen. Biological hazards may be transmitted to a person through inhalation, injection, ingestion or physical contact.

Appropriately labelled packages of biohazards

Environmental Inspectors need to take sufficient precaution when carrying out inspections in the following facilities which are major sources of biological hazards:

- Hospitals, medical clinics and laboratories
- Medical research facilities
- Morgues
- Gene banks
- Animal production and research facilities
- Veterinary clinics
- Abattoirs and slaughter houses
- Waste disposal facilities
- Forests, game parks and reserves, wildlife conservancies, zoos, wetlands, and other protected areas.

NEMA-Kenya Inspectors at an abattoir/slaughter house in Nairobi's Dagoretti area. Unlike the case in this photo, it is important to wear appropriate PPE to guard against biological hazards that may be present in such environments.

The following precautionary measures are important when dealing with biological hazards:

- Avoid direct contact with potentially hazardous living organisms and materials as much as possible;
- Obey signage, warnings and notices;
- Practice good hygiene during and after inspections;
- Involve relevant lead agencies e.g. KWS when carrying out inspections in game parks;
- Vaccination
- Use appropriate Personal Protective Equipment correctly

Physical Hazards

Physical hazards are those types of hazards that can cause harm to an individual from an external source and include:

- objects that can cut or crush (sharp and blunt objects)
- things that one might trip over, fall into or slip on
- falling objects
- moving objects and equipment
- wind
- floods
- dust
- extremes of temperature and pressure
- dry or humid atmospheres
- poor lighting
- excessive noise and vibration
- high voltage from electrical and electronic sources
- inappropriate and/or inappropriately worn PPE
- hostile individuals and groups within regulated facilities

An example of a signage for a physical hazard

The following safety measures are important in eliminating and/or minimizing risks associated with physical hazards:

- Isolate the hazard where possible;
- Do not venture into places with obvious physical hazards;
- Obey signage, notices and warnings;
- Implement a safe system of work. For example, time the inspection appropriately; use spotlights in poorly lit places; call in experts such as electricians, etc.
- Use appropriate PPE correctly;
- In the case of hostile individuals and groups, the Team Leader should determine when to retreat or call for armed back-up.

Other Hidden Hazards

In addition to chemical, fire, radiological, biological and physical hazards, there are some additional hazards that are usually more hidden hence often overlooked. These include:

- Oxygen deficient areas and confined spaces
- Fatigue and Stress
- Loss of peripheral perception.

Oxygen Deficient Areas and Confined Spaces

Oxygen deficient areas may exist in confined spaces, depressions, caves, wells and under water. Oxygen can be displaced by other gasses or be consumed by chemical reaction. Confined spaces can also contain pockets of trapped gasses. For example, alleys between buildings, ditches and depressions may contain denser gasses and trapped fumes such as methane, carbon monoxide or hydrogen sulfide.

Always heed warnings like this one

The following safety precautions are important when carrying out inspections in oxygen deficient areas and confined spaces.

- Retreat if not properly equipped for the situation;
- Call in experts if necessary;
- Use safe methods to collect samples, e.g. monitoring wells;
- Use appropriate PPE including oxygen supply equipment correctly.

Fatigue and Stress

Fatigue and stress reduces sound judgment. Fatigue and stress may also alter behavior and create tensions among team members. During field assignments Environmental Inspectors should avoid excessive stresses of all kinds.

To avoid fatigue, it is important to observe the following simple measures:

- Allow adequate rest periods;
- Schedule inspections for proper advance planning (except in emergency situations);
- Ensure team work;

Loss of Peripheral Perception

Loss of peripheral perception occurs when someone focuses his concentration too closely to a given situation so much that he gets distracted from the obvious hazards around him. An overzealous

and/or overenthusiastic Environmental Inspector may get carried away by the situation in a given facility to an extent that he may easily overlook even the most obvious hazards around him.

The following measures are important in avoiding risks that may result from loss of peripheral perception:

- Always be calm and collected. Avoid being carried away by any situation on the ground;
- In assigning roles to the inspection team, it is important to have some sentries watching out for the others;
- Use the "buddy system" to work in teams and let team members watch out for each other.

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