Environmental Management Guidelines for 10th of Ramadan City

Volume II: Industry Guidelines

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Prepared for
The Competent Environmental Ministries, Authorities and Agencies of 10th of Ramadan City, and its Industrial Investors

with the assistance of
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Chapter 1
Introduction to Volume II

1 1 New Industrial Cities

It is the policy of the Arab Republic of Egypt (ARE) to concentrate future industrial growth in designated areas New industrial cities have been established to attract industry and help relieve the pollution and congestion in cities along the Nile The ARE has created tax incentives to induce industries to locate in such cities The process is well underway industrial cities such as the 10th of Ramadan and the 6th of October are growing rapidly

The concentration of numerous industries in one area has caused a new set of pollution problems If left unchecked (as in the case of Helwan) these can severely affect public health and the environment The cumulative impact of industrial discharges to the ambient environment can poison the water that is drunk and the air that is breathed by workers and residents of these cities Fortunately industrial discharges can be managed to achieve legal standards and acceptable risk levels These guidelines are designed to assist industry and government in achieving that goal

1 2 Government Guidelines and Industry Guidelines

The guidelines for the environmental management of the 10th of Ramadan are produced in two volumes

- Volume I contains guidelines for government
- Volume II contains guidelines for industry

The two sets of responsibilities are complementary but different

Government The competent ministries are responsible for implementing the environmental policy mandates of the ARE as reflected in its laws and regulations Government is to manage the regulatory programs called for in Law No 4 (Law for the Environment) The law assigns specific government agencies to perform specific program management duties

Industry Industry, on the other hand, is directed by the law to comply with governmental program mandates Each individual facility must manage its discharges to meet the legal standards embodied in its licenses The law directs these facilities to keep records and to report periodically to the competent ministries

Volume II contains only the guidelines for industry It is intended to help industry meet its various environmental management responsibilities in an efficient and cost-effective manner Where the law is silent or unclear, the guidelines will prescribe "best management practices "

Both Volumes I and II are produced in loose-leaf binders so that future changes in laws and programs may be easily incorporated in the guidelines

1.3 Application to 10th of Ramadan City

The application of these guidelines is limited to the 10th of Ramadan City in order to focus attention on operational issues The competent authorities may wish to make changes before extending these guidelines to other cities

Under these guidelines, the 10th of Ramadan Municipal Authority is given administrative responsibility for implementing the environmental program If management responsibility for the municipality is shifted from the Ministry of Housing, Utilities and New Communities to the Sharkia Governorate, the guidelines require that the governorate shall be substituted for the Municipal Authority

1 4 Key Government Actors

In fulfilling its coordinating role under Law 4, the Egyptian Environmental Affairs Agency (EEAA) will regularly cooperate with the 10th of Ramadan Municipal Authority to compile an agenda for action by the competent ministries The agenda will include license applications pollution charge assessments and amendments, reviews of inspection and sampling and analysis reports environmental impact assessment actions and sanction recommendations

The competent ministries include, among others

- Ministry of Housing, Utilities, and New Communities
- Ministry of Industry
- Ministry of Public Works and Water Resources
- Ministry of Health

The Ministry of Environment is represented by the EEAA Other ministries will be invited to participate in agenda deliberations when issues invoking their jurisdiction arise (for example, the Ministry of Labor for indoor air pollution and worker safety)

1 5 Application of Guidelines to Existing Industry and New Industry

Firms proposing to locate or expand in the 10th of Ramadan City must comply with EEAA's Environmental Impact Assessment (EIA) Guidelines (derived from Law 4) The EIA Guidelines have been incorporated into the guidelines presented in this volume For firms that propose to locate or expand in the 10th of Ramadan, the EIA Guidelines are an environmental *planning* exercise in the use of the most effective mitigation techniques and technologies

Once a firm's planned development or expansion is approved by government authorities, the EIA Guidelines cease to apply At that point, the firm becomes subject to the whole body of regulation that governs the activities of existing industry in the 10th of Ramadan and elsewhere in Egypt

1 6 Objective of Volume II

Volume II is designed to help industrial firms in 10th of Ramadan City to comply with Egyptian national environmental regulations Egypt's Law No 4 grants industry three years to make the changes necessary to come into compliance This 'grace period ' expires on March 1, 1998 (although further two-year extensions may be granted by the Cabinet of Ministers upon the recommendation of the environmental ministry following timely application by an industry that has undertaken serious efforts toward compliance) At this writing, the industrial community appears to be well aware that the three-year grace period ends soon This volume should help industry come into compliance with environmental laws by the above deadline and thereafter

Chapter 2 is a comprehensive source of information and guidance on the environmental laws and regulations relevant to industries in the 10th of Ramadan Section 2 1 summarizes the provisions of Egypt's principal environmental laws, and the rest of the chapter presents detailed information on licensing standards, monitoring and recordkeeping, and license fees for the four media programs air, wastewater, hazardous waste, and solid waste Non-compliance procedures are also described, including sanctions imposed for violations and the EIA Guidelines for new and expanding industries are presented

Chapter 3 contains guidelines for pollution prevention as a means to achieve regulatory compliance and reduce the amount of fees paid by the industrial enterprise

Chapter 4 outlines the elements necessary to the development and implementation of an environmental management system for industrial establishments as a comprehensive approach to achieving compliance with current Egyptian environmental laws and improving environmental performance These elements are wholly based on ISO 14001, a non-governmental international standard approved by the International Organization for Standardization (ISO), headquartered in Geneva, Switzerland, in September 1996 The faithful implementation of these ISO 14000 components can lead to certification to the ISO standard by an international auditor upon application by an interested enterprise

While certification may be desired by an exporter who must respond to the imperatives of the international marketplace, other industries in 10th of Ramadan may wish to follow the ISO standard, without certification, as a reliable guide to environmental management and improved environmental performance Thus, the guidance in Chapter 4 is purely voluntary and not required by Egyptian law It is provided to assist those enterprises that need certification because of market pressures or desire it for internal management improvement

Chapter 2
Regulatory Compliance

This chapter provides guidance to the 10th of Ramadan industries on how to comply with the principal requirements of Egyptian environmental laws and regulations Topics discussed herein include

- the Environmental Register (Section 2 1 6)
- the Consolidated Environmental License (Section 2 2)
- regulations governing air quality, wastewater disposal, and hazardous and solid waste management, including license requirements, environmental standards, monitoring and recordkeeping requirements, and pollution fees (Sections 2 3 through 2 6)
- non-compliance procedures (Section 2 7)
- Environmental Impact Assessment requirements (Section 2 8)

Briefly mentioned is the concept of pollution prevention as a means to facilitate regulatory compliance The topic is fully discussed in Chapter 3

2 1 Summary of Regulatory Requirements

Sections 2 1 1 through 2 1 4 outline the provisions of the main Egyptian environmental laws with respect to

- industrial air pollution
- industrial wastewater discharge
- solid waste management
- hazardous waste management

Section 2 1 5 explains the application of the Environmental Impact Assessment (EIA) to new or expanding industrial facilities and Section 2 1 6 describes the requirements for monitoring and recordkeeping

2 1 1 Industrial Air Pollution

Fines of LE 1 000 to LE 20 000 for exceeding permissible emissions limits

Air quality and emissions regulations are contained in the Executive Regulations of the Law for the Environment (Law 4/1994), also known as Prime Minister's Decree 338/1995 Article 36 of Decree 338 states that polluting industries " shall be committed towards avoiding emissions or leakage of air pollutants at or above the maximum limits allowed by current laws and decrees " Annex 5 of the Regulations contains ambient air quality standards for criteria pollutants (sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, particulates, and lead) Annex 6 stipulates emission standards, universal for some pollutants and differentiated by type of industry for others Annex 8 contains maximum limits of air pollutants inside work premises according to industry type The relevant standards are presented in Section 2 3 1, the Air Program Exceeding permissible limits can result in a fine of LE 1,000 to LE 20,000 Inspectors of the EEAA or the municipal authority report violations to the Ministry of Housing, Utilities, and New Communities (MHUNC)

2 1 2 Industrial Wastewater Discharges

Egyptian wastewater discharge regulations are contained in Law 93 of 1962 (Executive Regulations in Minister of Housing and Utilities Decree 649 of 1962) and Law 48 of 1982 (Executive Regulations in Minister of Irrigation [now Public Works] Decree 8 of 1983)

Law 93 generally governs discharges to sewer networks Law 48 generally governs discharges both to open waterways e g , the Nile and its canals, and to groundwater Therefore, the 10th of Ramadan industries, which principally discharge to the sewer network are governed by Law 93 Law 48 jurisdiction can be invoked for industrial discharges whose spills or stored wastes threaten groundwater it can also be invoked against the Municipal Authority itself when its post-treatment discharges to the desert pose a threat to groundwater Direct discharges to open waterways do not currently exist in the 10th of Ramadan

Law 93 of 1962

License required to discharge wastewater to public sewer

Article 7 of Law 93 states that no industrial establishment may discharge wastewater to the public sewage system without a license from the Ministry of Housing and Utilities Chapter 5 of Decree 649/1962 (implementing Law 93) lists the types of industrial establishments that are subject to such a license namely

- food processing industries
- slaughterhouses

- tanneries
- dye houses
- painting workshops
- textile industries
- chemical factories
- iron and steel mills
- factories using radioactive materials

Chapter 6 of the same Decree lists effluent standards for licensed dischargers into public sewers, found herein at Section 2 4 2

Article 9 of Law 93 stipulates the procedure for wastewater discharge monitoring Analysis of wastewater samples from polluting enterprises shall be performed according to a schedule decreed by MHUNC and approved by the Ministry of Health but no less frequently than twice a year If the analysis proves that effluent standards are exceeded, the polluter has six months to determine the appropriate method of treatment, otherwise its license may be canceled

Law 48 of 1982

Untreated wastewater may not be discharged to open waterways or to groundwater

Article 6 of Decree 8/1983 (implementing Law 48) prohibits all untreated industrial wastewater discharges into potable water surfaces and underground water reservoirs (Discharges to groundwater are of particular concern to industries in the 10th of Ramadan City and are subject to Law 48 sanctions) Discharge of treated wastewater into the waterways requires a license from the Ministry of Public Works, described in Article 12 of that Decree Article 5 of Law 48 stipulates that licenses shall be granted for the construction of facilities that will discharge to open waterways or to groundwater only if the facilities will be equipped with appropriate wastewater treatment installations

Section 6 of Decree 8 (implementing Law 48) also sets different types of standards for wastewater discharges

- Article 60 sets ambient water quality standards for potable water sources
- Articles 61 and 62 contain effluent standards for treated industrial wastewater to be discharged into fresh (potable) surface waters and groundwater
- Article 65 describes criteria for drainage water discharged into fresh surface waters
- Articles 66 and 67 set criteria for domestic and industrial wastewater discharges to non-potable surface waters

- Articles 68 and 69 contain ambient water quality standards for non-potable surface waters

Violators to pay for abatement measures may lose license

Under Law 93, violations of wastewater discharge standards (including discharging without a license) carry a penalty of LE 50 to LE 100 The penalty for surface drainage without a license is LE 10 to LE 50 In cases of recurrence of a violation, the penalty is doubled If a violator fails to comply with regulatory requirements within a specified period, the municipal authority is authorized to carry out the necessary abatement measures administratively at the expense of the violator or may cancel the license, or both

Under Decree 8/1983 (Article 24), the Ministry of Health is authorized to take wastewater samples at least once every three months from companies licensed to discharge treated wastewater directly into open waters

2 1 3 Solid Waste Management

Garbage disposal restricted to specified sites

The basic law for solid waste collection, treatment and disposal is Law 38 of 1967 with amendments by Law 31 of 1976 This law regulates collection and disposal of waste from houses, public places, commercial and industrial areas and forbids disposal of garbage in any place not specified by the local council (a requirement later reaffirmed under Law 4, per the next following paragraph) MHUNC is responsible for the implementation of the law and may submit rules for its execution Solid waste management in the 10th of Ramadan City is the responsibility of the municipal authority

Fines of LE 1,000 to LE 20 000 for illegal dumping of waste

Article 37 of Law 4/1994 and Article 38 of Decree 338/1995 prohibit dumping treating or burning of solid waste except in places specially designated for such purposes by a municipal authority Violations can be reported by EEAA inspectors the municipal authority organizations and private citizens Penalties range from LE 1 000 to LE 20 000

2 1 4 Hazardous Waste Management

Ministry of Industry issues hazardous waste licenses

Article 25 of Decree 338/1995 (implementing Law 4/1994) requires a license for handling hazardous substances and wastes ' Handling' includes generation collection and storage, transport treatment, and disposal The Ministry of Industry is the designated authority that issues these licenses to industries such as those located in the 10th of Ramadan Other sectoral ministries issue other hazardous waste licenses, as follows

- Ministry of Agriculture for pesticides and fertilizers

- Ministry of Health for pharmaceutical and laboratory substances and waste and domestic insecticides
- Ministry of Petroleum for petroleum substances and waste
- Ministry of Electricity, Authority for Nuclear Energy for radioactive substances and waste
- Ministry of the Interior for inflammable and explosive substances

Each ministry also works with the Ministry of Health and EEAA to develop the guidelines for managing the hazardous wastes under its jurisdiction

Article 26 of the Decree lays out the procedure for granting a hazardous waste license (see Section 2 5 1 herein) The license is valid for up to five years, and may be reviewed earlier than its expiration date if determined necessary by EEAA

Article 27 allows the licensing authority to cancel a license it has issued against a "cash payment," on the basis of

- falsification of information given in the application
- violation of the license's conditions
- unforeseen dangerous environmental impacts from the activity
- failure to use customary protective or control technologies, or
- a general ban on handling a certain hazardous substance or waste

Article 28 of Decree 338/1995 contains general rules and procedures for generation, collection and storage, transporting and treatment and disposal of hazardous waste

Sanctions for violations of hazardous waste provisions

The sanctions are severe for violations of Law 4 s hazardous substances and waste provisions Handling of regulated hazardous substances or waste without a license or in violation of a license is punished by no less than 5 years in prison and a fine of LE 20 000 to LE 40 000 Failure to maintain accurate hazardous waste registers may result in at least one year in prison and a fine of LE 10 000 to LE 20 000

2 1 5 Environmental Impact Assessment for New or Expanding Industrial Facilities

Article 19 of Law 4 stipulates that certain establishments that require licenses are subject to Environmental Impact Assessment to be conducted by the licensing authority Article 19 of Decree 338/1995 emphasizes that the EIA provision of Law 4 is applicable not only to new establishments

but also to expansions and renewals of existing establishments Annex 2 to Decree 338 lists the types of establishments that require an EIA on the basis of four criteria

- type of industrial activity
- consumption of natural resources
- siting
- type of energy used

The new EIA Guidelines, promulgated by EEAA in 1997, describe the EIA procedure as follows The developer submits to the "competent administrative authority" (CAA) a letter of intent to undertake a specific project Depending upon the type of project and how it is classified the developer will also need to supply other documentation

- Projects on the "white list" need an Environmental Screening Form, but no EIA will be required
- Projects on the "gray list" need an Environmental Screening Form to determine whether a scoped EIA will be needed for certain identified impacts/processes
- Projects on the "black list" need a full EIA to be conducted according to relevant sectoral guidelines

The CAA, whose identity depends on the type of establishment (for most industries, it is the Ministry of Industry), determines whether the proposed activity falls into the category claimed by the developer and submits the documents to EEAA

EEAA provides environmental clearance

EEAA, with the assistance of outside technical experts reviews and evaluates the documents and provides environmental clearance for the facility to the CAA EEAA is also responsible for ensuring that all specified environmental impact mitigation measures are in place prior to the launch of the facility's operation The developer can appeal the decision (but not the classification of the project) to the Permanent Appeals Committee

The detailed EIA Guidelines are contained in Appendix 4

2 1 6 Registry and Inspection Requirements

According to Article 17 of Decree 338/1995, establishments must maintain an Environmental Register to record the extent of their impact on the environment The model register is described in Annex 3 of the Decree and is reproduced in Exhibit 2-1 In the course of these guidelines this model register serves as a basis for media-specific recordkeeping on

forms tailored for each medium, as follows for air emissions (Sec 2 3 2), wastewater discharges (Sec 2 4 3), hazardous waste (Sec 2 5 3 and Appendix 3), and industrial solid waste (Sec 2 6 2) All these forms taken together shall comprise the enterprise's Environmental Register

Exhibit 2-1 Model Environmental Register

1	Establishment's name and address
2	Name of person in charge of recording data in the Register and his job title
3	Time period covered by the current data
4	Type of activities and nature of primary raw materials used, and production volume during the corresponding time period
5	Legislation to which the establishment is subject
6	Special conditions set by the EEAA concerning the establishment
7	Statement of types of emissions, the rates of discharge (per hour/per day/per month/per year), and method of disposal thereof
	7 1 Gaseous Emissions
	7 2 Liquid Discharges
	7 3 Solid Waste Generation
	7 4 Other Emissions
8	Frequencies of tests on all types of emissions from the establishment
	8 1 Random samples for testing
	▸ date, time and place of each sample
	▸ frequency of sample collection
	▸ statement of parameters to be measured (daily/weekly/ monthly)
	8 2 Samples of compound waste
	▸ date and time of sample collection
	▸ locations and percentages of the mixture in the compound sample
	▸ statement of parameters to be measured (daily/weekly/ monthly)
9	Extracted materials after treatment processes
10	Extent of efficiency of treatment method
11	Date and signature of officer in charge

Environmental registers are to be retained for ten years from the date of their review by an EEAA representative The EEAA must be notified immediately of any deviation in the criteria and specifications of discharged pollutants and the respective control procedures

Sanctions for misrepresenting information in Register

EEAA is authorized (by Article 18 of Decree 338) to conduct inspections and to take and test samples to verify the information given in the Register These inspections are conducted annually A facility has 60 days

to correct any violations noted Failure to comply may lead to the following sanctions

- closure of the enterprise
- suspension of the damaging activity
- a lawsuit for compensation for damages resulting from the violation

2 2 Consolidated Environmental License

All industrial establishments, regardless of size or type, are subject to the environmental licensing procedure

(Prior to applying for a Consolidated Environmental License and the establishment has to obtain an Investment License and a Business License (If it is a new or expanding establishment, it must also submit an acceptable Environmental Impact Assessment (EIA) report for the project, as required under the EIA Guidelines set out herein at Section 2 8)

The owner/occupant of the industrial facility initiates the procedure by submitting the Consolidated Environmental License Application Form (see Appendix 1) The application shall be signed by the owner of the facility and the general manager (if known at the time of license application) It shall be submitted directly to the Environment Department of the Municipal Authority

The Consolidated Environmental License Application form shall contain all the information required for media-specific licenses under the applicable environmental laws and decrees governing the applicant's industrial activity and environmental impacts The media-specific license requirements are described in Sections 2 3 through 2 6

The Municipal Authority reviews the application to determine whether the establishment has included all of the information needed to process the application If the application is incomplete the Municipal Authority will return the application (as submitted) with a detailed description of the additional information needed to process the application The Municipal Authority has 15 days to notify the applicant of his need to supply additional information otherwise the application is considered complete

The Municipal Authority evaluates the complete license application to determine what media-specific licenses and approvals are required under environmental laws and decrees, it then forwards the relevant parts of the license application to the competent licensing authorities (keeping copies for itself and the Environmental Advisory Committee) The licensing authorities have 30 days to prepare their respective licenses and/or grant their approval, to formulate any criteria and specifications which are

conditions of the license or approval, and then to return the licenses to the Environmental Advisory Committee After the Committee reviews the file to see that it is complete, the file is forwarded to the Municipal Authority

Media-specific license incorporated in Consolidated Environmental License

The Municipal Authority then prepares the Consolidated Environmental License, incorporating the media-specific licenses and such conditions as may be attached by the competent ministries The Consolidated Environmental License is signed by both the EEAA Chairman or his representative and the Chairman of the 10th of Ramadan Municipal Authority, or his designated representative Appendix 1 contains a sample Consolidated Environmental License

The applicant will receive a notice from the Municipal Authority, acting upon authority of the Environmental Advisory Committee, indicating that the license has been approved and stating the amount of the license fee There are three components to the fee

- Air emission fee (see Section 2 3 4)
- Wastewater discharge fee (see Section 2 4 5)
- Hazardous waste fee (see Section 2 5 4)

The total amount due is the sum of these three components It is payable every year at the time of renewal of the Consolidated Environmental License The license must be signed and the fee paid before it goes into effect

The fee structure provides discounts for industrial establishments that comply with the monitoring, recordkeeping, and reporting requirements The fees also provide for automatic penalties for industrial establishments that are not in compliance with the environmental standards built into the Consolidated Environmental License

Revenues from Environmental License Fees will go into the Environmental Trust Fund (See Appendix 6 for a description of the Fund) Industrial establishments that have paid their fees will be eligible to receive grants from the Environmental Trust Fund for investments to monitor and reduce their discharges

Consolidated Environmental License valid 5 years fees paid annually fees based on information in Register

The entire licensing process from submission of a complete Consolidated Environmental License Application Form to the issuance of the license should take no longer than 60 days

The Consolidated Environmental License is valid for 5 years from the effective date but the license fees are recalculated and paid annually The expiration date is clearly marked on the license The Municipal Authority is responsible for notifying the licensee of the need to renew its license at least forty-five (45) days before the license expires

On each annual fee re-calculation date, the establishment must attach a copy of its Environmental Register which contains information on air emissions, wastewater discharges, and hazardous waste generation Re-calculation of license fees is based on the information provided in the Register All enterprises are encouraged to provide actual monitoring data in order to promote accuracy and equity in the calculation of fees

2.3 Air Program

No new air quality requirements for existing establishments

This section provides guidance to industries in the 10th of Ramadan on how to comply with regulatory requirements of the Egyptian air program The main regulatory requirement of the government's air program is for all existing establishments to comply with emission standards The law requires no separate license for air emissions The Consolidated Environmental License issued to the establishment lists all air pollutants the facility is permitted to emit, subject to the limits of relevant emission standards This section discusses emission standards, monitoring and recordkeeping requirements and emission fees Non-compliance procedures are discussed in Section 2 7

2 3 1 Air Emission and Related Standards

Emission Standards

Annex 6 to Decree 338 of 1995 lists emission standards applicable to all industrial establishments The emission standards are expressed in terms of concentration of pollutants in flue gases The standards are universal for some pollutants and differentiated by type of industry for others Certain emission standards are different for new and for existing facilities (see Exhibit 2-2)

Exhibit 2-2 Air Emission Standards for Industrial Establishments		
Pollutant	**Industry Type**	**Maximum Limit (mg/m^3 in flue gas)**
Total Particulates	Carbon Industry	50
	Coke Industry	50
	Phosphate Industry	50
	Ingots Industry Extraction of Lead Zinc, Copper and other Non-Ferrous Metallurgical Industries	100
	Ferrous Industries	200 (existing) 100 (new)
	Cement Industry	500 (existing) 200 (new)
	Industrial Timber and Fibers	150
	Petroleum Industries/Oil Refining	100
	Other Industries	200
Aldehydes (measured as formaldehyde)	All	20
Antimony	All	20
Carbon Monoxide	All	500 (existing) 250 (new)*
Sulfur Dioxide	Coke/Petroleum Combustion	4000 (existing) 2500 (new)
	Non-ferrous Industries	3000
	Sulfuric Acid Industry	1500
Sulfur trioxide (in addition to sulfuric acid)	All	150
Nitric Acid	Nitric Acid Industry	2000
Hydrogen Chloride	All	100
Hydrogen Fluoride	All	15
Lead	All	20
Mercury	All	15
Arsenic	All	20
Heavy Metals (total)	All	25
Silicon Fluoride	All	10
Fluorine	All	20
Tar	Graphite Electrode Industry	50
Cadmium	All	10
Hydrogen Sulfide	All	10

Exhibit 2-2 Air Emission Standards for Industrial Establishments		
Pollutant	**Industry Type**	**Maximum Limit (mg/m^3 in flue gas)**
Chlorine	All	20
Carbon	Garbage Burning	50
	Electrode Industry	250
Organic Compounds	Burning of Organic Liquids	50
	Oil Refining	0 04% of crude
Copper	All	20
Nickel	All	20
Nitrogen Oxides	Nitric Acid Industry	3000 (existing) 400 (new)
	Other Industries	300

* Article 42 of Decree 338 states the standard for existing and new sources as 4 000 and 2500 mg/m^3 respectively

Ambient Air Quality Standards

The law (Annex 5 of Decree 338) also requires that establishing new facilities will not cause ambient air quality standards to be exceeded Standards are set for a limited number of criteria pollutants (see Exhibit 2-3) This requirement is part of the Environmental Impact Assessment procedure discussed in Section 2 8

Exhibit 2-3 Ambient Air Quality Standards		
Pollutant	**Maximum Limit,** micrograms/m^3, unless otherwise indicated	**Averaging Time**
Sulfur Dioxide	350 150 60	1 hr 24 hrs 1 year
Carbon Monoxide	30 mg/m^3 10 mg/m^3	1 hr 8 hrs
Nitrogen Dioxide	400 150	1 hr 24 hrs
Ozone	200 120	1 hr 8 hrs
Suspended Particulates (measured as black smoke)	150 60	24 hrs 1 year
Total Suspended Particulates	230 90	24 hrs 1 year
Thoracic Particulates (PM 10)	70	24 hrs
Lead	1	1 year

Fuel Combustion Specifications

Article 42 of Decree 338 contains technological specifications for fuel combustion The regulation prohibits uncovered burning of any kind of fuel It requires the use of combustion technologies that minimize emissions (e g those of carbon monoxide) from incomplete combustion of fuels

Coal Use

The use of coal is prohibited in urban areas in general and in residential communities in rural areas Combustion of mazut and other heavy oil fractions as well as crude oil is banned in residential areas The law establishes a sulfur content standard of 1 5% by mass for urban and residential areas The use of high sulfur content fuel in power plants and industries outside urban and residential areas should be contingent on the local atmospheric conditions so that the noxious pollution does not reach residential and agricultural areas and important waterways

Stack Height Specifications

Article 42 of Decree 338 also provides specifications for stack height

- The height of stacks that emit a total of 7-15 tons of air pollutants per hour should be 18-36 meters
- The height of stacks emitting more than 15 tons of air pollutants per hour should be at least 2 5 times higher than surrounding buildings
- In neighborhoods where public buildings such as offices, hotels, or restaurants are located, the stack height should exceed the tallest building by at least 3 meters

Indoor Air Quality Standards

Article 45 of Decree 338 requires that concentrations of air pollutants inside work premises (whether resulting from routine technological operations or from equipment malfunction), not exceed the standards listed in Annex 8 of Decree 338 The indoor air quality standards and specifications for ventilation in work premises are found in Appendix 5

2 3 2 Specifications for Control Technologies

Articles 42 and 43 of Decree 338 require that the most efficient air pollution control technology be used in order to comply with applicable standards

Technology for air pollution control falls into two main categories particulate emissions control and gaseous emissions control Once emissions from a source are characterized, control equipment can be selected sized installed and performance tested

Particulate Emissions Control

- *Cyclones* remove particulates by centrifugal forces generated by providing a path for the carrier gas to be subject to a vortex-like spin Cyclones are very effective at removing coarser fractions of particulate matter The types of cyclones include wet, dry axial flow, and multicyclones
- *Fabric filters* are typically designed with non-disposable filter bags As the dusty airstream flows through the filter medium (typically cotton polypropylene teflon or fiberglass) particulate

matter is collected on the bag surface as a dust cake Different types of fabric filters include shaker type, reverse-air, and pulse jet

- *Wet scrubbers* use a counter-current liquid spray to remove particulates from an airstream Device configurations include plate scrubbers, packed beds, orifice scrubbers, venturi-type scrubbers, and spray towers, individually or in combination

- *Electrostatic precipitators* operate on the principle of imparting an electric charge to particles in the incoming airstream, which are then collected on an oppositely charged plate Different types of systems are field number types, hot-side, and cold-side

Gaseous Emissions Control

- *Adsorption* is a physical-chemical phenomenon when gaseous pollutants are condensed on the surface of a solid or liquid such as activated carbon, silica, Fuller's earth and other clays Subsequently the dissolved gas can be desorbed with hot air or steam, either for recovery or for thermal destruction Adsorption systems can also handle organic vapors and streams

- *Absorption* consists of a mass-transfer process of pollutants from the gas stream to a liquid stream Then these captured pollutants are dissolved, concentrated and removed The process depends upon physical solubility and may include chemical reactions in the liquid phase Common industrial absorbents are water caustic soda sodium carbonate, and nonvolatile hydrocarbon oils Usually absorption takes place in a scrubber device

- *Chemical conversion processes* In this type of process individual pollutants are chemically transformed to benign materials inside a reactor These processes often make use of catalysts *Catalytic oxidation* is predominately used for the destruction of volatile organic compounds (VOCs) and hydrocarbons Incineration methods may be included here as well *Thermal oxidation* operates without the use of catalysts and at temperatures of approximately 800°C or higher The higher temperature greatly increases the chemical conversion processes

Exhibit 2-4 presents a number of control options and methods to manage common pollutants such as dust and particulates hydrogen sulfide, and sulfur dioxide emissions The most important process parameters for selecting air pollution control equipment are flue gas characteristics obtained from emissions sampling and site characterization Typically flue gas characteristics include the gas flow rate, temperature particle size

distribution, resistivity, composition, corrosiveness, moisture and pressure Site characteristics include the reuse/recycling of emissions availability of water, space, power, wastewater (condensate) treatment and frequency of start-up

Generally, no single emissions control technology can solve all air pollution control problems For example, dry and semi-dry scrubbing systems may represent the most efficient acid-gas removal technology, but they must use a particulate removal system to achieve their designed efficiency ratings Also, control systems must be tailored to the air stream under consideration, with enough flexibility to handle expected variations in stream conditions

Exhibit 2-4
Selected Technology Options for Industrial Air Pollution Control

Air Pollutant	Control Option	Comments
Dust Particles	Water sprays	Effective especially with wetting agents in fossil fuel and mineral times
	Cyclone separators	For particles larger than 5 20 microns in diameter efficiencies of 80% achieved
	Scrubbers (such as spray chambers wet cyclones mechanical scrubbers Venturi scrubbers packed towers)	Efficiencies of more than 90% achieved for particles smaller than 5 microns in diameter with simultaneous high pressure losses
	Baghouse filters	Removal efficiencies of 99% achieved for particulates popular in cement and steel plants
	Electrostatic precipitators	Removal efficiencies of 99 9% reported
Hydrogen Sulfide (H_2S)	Stretford process	Absorption process sodium metavanadate in the absorbing fluid gas stream should be pretreated to remove CO and CO
	Selexol process	Absorption process removes sulfur compounds that cannot be processed in a Stretford unit
	Claus process	Feed stream must also contain SO_2 produces elemental sulfur maintenance and downtime potential problems
	Scot process	Catalytic converter, adversely affected by high CO_2 concentrations
	Incineration	Converts hydrogen sulfide to SO_2

Exhibit 2-4
Selected Technology Options for Industrial Air Pollution Control

Air Pollutant	Control Option	Comments
Sulfur dioxide (SO_2)	Wellman-Lord	Produces concentrated SO_2 after a reaction with sodium sulfate, SO then converted to elemental sulfur or sulfuric acid
	Double-alkali process	Uses two regenerable alkaline scrubbing (absorption) solutions, sodium hydroxide and sodium sulfite
	Lime/limestone scrubbing	Produces a nonregenerable sludge that includes gypsum
Nitrogen oxides (NO_x)	Combustion control (low excess air firing staged combustion recirculation of the flue gas water injection reduced air preheat)	Controls oxygen content and temperature in the vicinity of the furnace flame
	Proper unit design (including instrumentation operation and maintenance)	To avoid the incomplete combustion of fuel for boilers furnaces heaters, and diesel equipment
	Tall stacks	Care must be taken in designing tall stacks to take account of conditions of atmospheric inversion which would limit dilution

Source World Bank Office of Environmental and Health Affairs
Environmental Considerations for the Industrial Development Sector
Washington DC 1987

2 3 3 Monitoring and Recordkeeping for the Air Program

Industrial establishments shall monitor their air emissions and report them to the Municipal Authority Industrial establishments may use either of two methods to assess their emissions

Method 1 ***direct flue gas sampling at the stack, or***
Method 2 ***indirect estimates using emission factors, fuel composition, etc***

If using Method 1 the industrial establishment shall *sample emissions from all stacks on a quarterly basis* (after establishing an initial baseline),

in accordance with the averaging times for the emission standards It shall also determine whether the emissions comply with the standards

Typically, one of the first steps in source emissions sampling is determining the gas flow rate at the vent, exhaust port, or stack to be sampled Additionally, air velocities need to be measured using a standard pitot tube Other instruments to measure flow rates include the rotating vane anemometer, double pitot tube, heated thermometer anemometer, and thermal anemometer

The air sampling for stack emissions monitoring shall be done at specially designed sampling ports using high-volume air samplers The amount of particulate matter is then determined by weighing the filters of the sampler *Extractive gas monitors* shall be used for gaseous emissions monitoring Extractive gas monitors can be based on absorption spectroscopy, luminescence methods, or electroanalysis Non-dispersive infrared analyzers (NDIRs) can monitor sulfur and nitrogen oxides, hydrocarbons, carbon monoxide and dioxide, and other gases that absorb infrared light NDIRs are relatively inexpensive as well as broadly applicable

According to Article 17 of Decree 338, the establishment must notify the EEAA immediately by registered letter with return receipt requested, of any exceedances of the emission standards

If using Method 2, the industrial establishment shall calculate its emissions through emission factors *at least annually*, unless the emission factors change and it has reason to believe that its emissions will increase, in which case a further calculation shall be performed and any exceedances reported

An emission factor is a *representative value* that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant Emission factors are different for each source category and technological process, and can be found in relevant reference materials Emission factors are usually expressed as the weight of pollutant divided by a unit weight volume distance, or duration of the activity emitting the pollutant (e g , kilograms of particulate matter per megagram of coal burned) In most cases these factors are simply averages of all available data of acceptable quality and are generally assumed to be representative of long-term averages for all facilities in the source category

The general equation for emission estimation is

$$E = A \times EF \times (1\text{-}ER/100)$$

where

E = emissions
A = activity rate
EF = emission factor
ER = overall emission reduction efficiency, %

ER is further defined as the product of the control device destruction or removal efficiency, and the capture efficiency of the control system

Once a year the enterprise shall also check the efficiency of its air pollution abatement installations and make necessary adjustments, if these installations were required by the general operation permit obtained through the EIA process

Emissions records to be kept and submitted annually

In order to demonstrate compliance with the emission standards, the establishment has to keep records of its air emission measurements and/or estimates As part of the Environmental Register required by Law 4, establishments must maintain an emissions record for all its regulated emissions and submit it to the 10th of Ramadan Municipal Authority once a year An emissions record shall become part of the establishment's Environmental Register (see Section 2 1 6) Exhibit 2-5 suggests a form to use

Exhibit 2-5 Emissions Record Form

Source	Pollutant	Concentration in Flue Gas, mg/m^3	Method of Measurement or Estimate	Date, Time

The emissions record has to be signed by the enterprise official responsible for environmental monitoring Emissions records should be retained for 10 years along with other components of the establishment's Environmental Register as required by Article 18 of Decree 338

Every industrial establishment is subject to site inspections at least once a year The inspections will be conducted by EEAA inspectors who thereafter inform the 10th of Ramadan Municipal Authority and the competent authority (the Ministry of Industry) of the inspection results and of any violations discovered The inspection may verify the

establishment's self-monitoring air emissions data by taking flue gas samples, checking technical references, and measuring air pollutant concentrations inside the work premises During an inspection, the facility is expected to

- provide the inspectors with access to all the facility's installations related to air pollution
- present a copy of its emissions record that includes all the pollutants identified in the Consolidated Environmental License as well as any other records and documentation relating to air quality
- describe its emissions monitoring practice, including methodology, equipment, monitoring frequency, and substances monitored
- describe the methodology and technical references used to estimate loadings of air pollutants that are not directly measured
- provide technical information on the combustion processes used at the facility, including process characteristics, fuel type and content, etc
- demonstrate efficiency of air pollution abatement equipment installed at the facility by presenting operation and repair records

2 3 4 Air Emission Fee

Emission fee intended to finance monitoring and enforcement

In Phase I of the integrated environmental management program for the 10th of Ramadan the primary objective of the emission fee is to finance ambient air quality monitoring and the monitoring and enforcement of Law 4 standards The second objective in Phase I is to provide incentives for industrial establishments to monitor and report their air emissions in accordance with the regulatory requirements Without this information a more complex fee structure based on actual emissions will not be possible

Since the purpose of the initial emission fee is to pay for ambient air quality monitoring emission monitoring, and enforcement the level of the fee is determined on the basis of the Municipal Authority's costs for these activities It is assumed that LE 1,000,000 per year will cover the Municipal Authority's costs for activities related to air emissions

50% discount on emission fee

To encourage firms to monitor and report their air emissions, a 50% discount on the fee is available for complying with the monitoring, recordkeeping and reporting requirements The discount may be granted

by the Municipal Authority *after* the annual review of the establishment's monitoring, recordkeeping, and reporting practice and results

To generate the required revenue and offer the discount, a fixed air emissions fee of LE 2,000 is assessed on each firm

In Phase II of implementation, the air emissions fee will be revised to reflect the actual emissions of each firm and may increase in magnitude This will provide incentives for emission reductions and generate revenues to finance grants for emission reduction projects

The Finance Department of the Municipal Authority is responsible for calculating the air emissions fees, sending bills to enterprises, and collecting the revenues The revenues will go to the Environmental Trust Fund of the 10th of Ramadan to defray certain administrative expenses connected with data management and ambient monitoring in the city and to subsidize environmental investments by industry

2 4 Wastewater Program

This section concentrates on compliance with regulatory requirements for wastewater discharges It describes the applicable license requirements, discharge standards, monitoring and recordkeeping requirements, and discharge fees Non-compliance procedures are discussed in Section 2 7

2 4 1 Wastewater Discharge Standards

Chapter 6 of Decree 649/1962 (implementing Law 93) lists effluent standards for industries licensed to discharge to public sewers (as shown in Exhibit 2-6)

Exhibit 2-6 Standards for Discharge of Industrial Wastewater to Public Sewers	
Parameter	**Discharge Standard (Maximum Limits)**
Temperature	40°C
pH	6-10
Total dissolved solids	2000 mg/l
Total suspended solids	500 mg/l *
BOD	400 ppm
COD (Micrometeorite)	700 ppm
COD (Permanganate)	350 ppm
Sulfides	10 ppm
Cyanide	0 1 ppm
Phosphate	5 ppm
Nitrate	30 ppm
Fluoridates	1 ppm
Phenol	0 005 ppm
Ammonia	100 ppm**
Free chlorine	10 ppm***
Sulfur dioxide	1 ppm
Formaldehyde	10 ppm (HCHO)
Oil and grease	100 ppm
Total heavy metals (silver mercury brass nickel zinc chrome cadmium and lead)	5 ppm if total discharge exceeds 50 cm /day 10 ppm if total discharge is less than 50 cm^3/day
Total silver and mercury	1 ppm

* As long as precipitated material does not exceed 5 cm^3 per liter per 1 minute and not more 10 cm^3 per liter per 30 minutes

** Estimated on the basis of nitrogen

*** On the basis of CCl_3CHO

In addition to meeting the discharge standards shown in Exhibit 2-5 wastewater discharged to a public sewer should also be free from

- petroleum products
- calcium carbide
- chemical insecticides
- radioactive materials

- organic solvents
- any other substances that the Municipal Authority considers damaging to the sewer facilities or to the treatment process

Inspection Chambers

Industrial establishments must have an "inspection chamber" at the point of discharge to the public sewer network The Municipal Authority shall establish the location of such inspection chambers at the borders of the property, and may connect them to the sewage network at the expense of the landlord These chambers must not be connected to the building walls and shall be at the levels and of the dimensions necessary for drainage They shall be covered with tight covers of cast iron or reinforced concrete having an iron frame These covers shall be provided with handles to facilitate lifting them up The inspection chambers must be plastered with cement mortar and an approved acid resisting material, sufficient to withstand any degradation from the chemicals found in the establishment's liquid wastes

2 4 2 Wastewater Discharge Licenses

New establishments to connect to public sewer within 3 months

All industrial establishments are required to connect to the public sewer network within three (3) months from the date of launching the operations

The owner of the establishment discharging wastewater to the sewer system shall submit an application to the Municipal Authority of the 10th of Ramadan The application must contain the name of the establishment owner, his nationality and place of residence The applicant shall attach the following to his application

- A survey map or a drawing of the industrial site at a scale not less than 1 2 500, on which the location of the establishment is indicated

- Three copies of a drawing showing the floor plan of the ground floor at a scale of 1 200 1 100 or 1 50 on which the inspection chambers gully traps ground stretchers and tanks are indicated

The Municipal Authority will conduct a site inspection in connection with the review of the application Once the application is approved the Municipal Authority will notify the applicant of the conditions and specifications attached to its permission to discharge into the public sewer

The following types of industrial establishments are specifically required to obtain a license from the Municipal Authority before they can discharge to the sewer network

- establishments engaged in washing of wheat, or other grains and cereals
- establishments engaged in the distilling of wines
- macaroni factories
- tile factories
- soap factories
- oil mills
- slaughterhouses
- tanneries
- dye houses
- painting workshops
- drugs and chemical factories
- spinning and weaving factories
- milk pasteurization factories
- iron and steel mills
- factories using radioactive material
- photography and film development laboratories

Temporary shutdown for discharging to public sewer without a license

The Municipal Authority has a right to temporarily shut down enterprises that discharge their wastewater into the public sewer without a license

Under the license, the establishment's wastewater discharges to the public sewer should comply with applicable discharge standards (see the subsection on discharge standards immediately following) These standards are listed in the license

Pursuant to Article 14, Law 93, industrial establishments are prohibited from draining wastewater by surface method (onto land) and discharging them into groundwater If the establishment cannot be connected to the public sewer because it is outside the coverage area, it may apply for a special license to dispose of its wastewater by other means However this exemption is not applicable in the 10th of Ramadan since all industries are covered by the public sewer network

2 4 3 Specifications for Wastewater Treatment Technologies

Industrial wastewaters typically contain numerous pollutants including solids metals, organic and inorganic compounds oil and grease dissolved gases and sludges Technologies available to industry for wastewater management can be divided into three basic categories

- *Physical processes* extract or separate pollutants from effluent waste streams Examples range from settling ponds to activated carbon adsorption, clarification, evaporation processes such as air stripping, and other filtration and separation processes, such as ion exchange and membrane processes Activated carbon is used to remove the toxic substances, such as metals and pesticides, that may be present in wastewaters

- *Biological processes* harness micro-organisms (and sometimes plants) to break down organic pollutants into less harmful components and reduce the overall organic load Biological treatment methods include aerobic and anaerobic digestion, stabilization ponds and aquaculture

- *Chemical treatment* technologies make pollutants less harmful or decompose them altogether Some of the chemical processes used to treat water for a particular use or reuse include chemical oxidation and reduction, coagulation-precipitation processes, neutralization, and ozonation

Industrial wastewater treatment is usually conducted on-site Four of the more common physical-chemical treatment processes are adsorption, filtration coagulation/precipitation, and clarification/flotation Exhibit 2-7 lists 12 classes of pollutants commonly found in industrial wastewater and the various technologies that can be used to treat these pollutants For example, soluble constituents such as organics, pesticides and oils/grease can be removed by activated carbons or solvent extraction Suspended solids on the other hand, can be tackled by filtration flotation or coagulation Inorganics and metals are removed by precipitation, membranes or ion exchange

In cases where a single treatment process may not be adequate to meet discharge standards multiple process systems are used This is most likely when the wastewater pollutants consist of dissolved organic and inorganic constituents and a high concentration of suspended solids Here sedimentation often precedes filtration as a means to reduce the quantity of solids that are to be removed by filtration Physical and chemical processes usually precede or follow biological treatments in order to improve system performance and to make biological processes more efficient

Many industries have unique wastewater characteristics that favor the use of one treatment process over another A plastics manufacturer for example would require adsorption chemical coagulation/precipitation and granular filtration, a steel maker would probably choose between chemical coagulation/precipitation and membrane or a cheaper granular filtration Exhibit 2-8 presents illustrative treatment options for twelve industry segments

Exhibit 2-7
Industrial Wastewater Pollutants and Applicable Treatment Technologies

Treatment Technology	Suspended solids	Colloidal solids	Dissolved inorganic	Metals	Cyanides	Phenols	Aromatic organics	PCB compounds	VOCs	Pesticides	Oxygenated	Oil/grease
Activated carbon adsorption												
Granular						●	●	●	●	●	●	●
Powdered						●	●	●	●	●	●	●
Chemical coagulation, precipitation with sedimentation	●	●		●			●	●		●		●
Filtration												
Granular	●	●		●				●		●		●
Membrane		●		●								
Ultrafiltration				●								
Reverse osmosis			●	●							●	
Electrodialysis			●	●							●	
Air stripping							●		●			
Flotation	●	●		●						●		●
Solvent extraction						●	●	●	●	●		
Chemical oxidation (Cl_2 or H_2O_2)					●	●						
Ultra violet/ozone oxidation					●	●	●		●			
Evaporation			●	●					●			
Crystallization	●	●	●	●								

Source *Pollution Engineering*, September 1992

Exhibit 2-8
Wastewater Treatment Processes for Various Industry Types

	Inorganic chemicals	Inorganic chemical (plastics)	Iron and steel	Electrical/electronic components	Metal finishing	Leather tanning and finishing	Pulp and paper	Rubber processing	Pharmaceuticals	Textile industrial	Dye manufacturing	Electric power plants
Activated carbon adsorption												
Granular		●				●			●		●	
Powdered		●				●			●		●	
Chemical coagulation, precipitation with sedimentation	●	●	● ●	●	●	●	●	●	●	●	●	●
Filtration												
Granular	●	●	●	●	●	●	●	●	●	●	●	●
Membrane			●	●	●							
Ultrafiltration										●		
Reverse osmosis											●	
Electrodialysis												
Air stripping		●							●			
Flotation	●		●			●	●	●				●
Solvent extraction												
Chemical oxidation (Cl_2 or H_2O_2)		●									●	
UV / ozone oxidation		●										
Evaporation									●			
Crystallization												
Catalytic decomposition												

Source *Pollution Engineering* September 1992

2 4 4 Wastewater Monitoring and Recordkeeping

Frequency of wastewater measuring and sampling

Law 93 requires that industrial establishments measure their wastewater discharges Best management practice dictates that certain parameters are monitored on a regular basis as part of an establishment's self-monitoring program These are listed in Exhibit 2-9 The frequency at which these parameters should be measured or tested is also indicated in the table As appropriate, these requirements will be written into each establishment's wastewater discharge license

Exhibit 2-9
Self-Monitoring Requirements for
Industrial Wastewater Discharges

Parameter	Sampling Frequency
Flow	Daily
pH	Daily
Temperature	Daily
Conventionals BOD COD, TSS, TDS, Oil & Grease Sulfides	Quarterly
Nutrients Nitrogen, Phosphorous	Quarterly
Toxics Cyanide, Arsenic Metals Phenols	Quarterly
Calculation of Wastewater Treatment Plant Removal Rates	Anual

BOD = biochemical oxygen demand COD = chemical oxygen demand TSS = total suspended solids TDS = total dissolved solids

Parameters listed in Exhibit 2-9 with a sampling frequency of quarterly are to be tested by the industrial establishment four (4) times per year However if an industrial establishment receives a Notice of Violation these parameters must be measured monthly for six months after which sampling returns to quarterly testing

The following sampling technique shall be used, as specified in Decree 649/1962

- *Volume of sample* The volume of the sample taken must be no less than two liters

- *Receptacles* The samples shall be taken in bottles having lids of semi-transparent glass which can be tightly closed The receptacles, including the caps, must be cleaned well before their use When taking samples of chlorine-treated wastewater, sterilized receptacles shall be used

- *Storage of samples* The sample shall be analyzed promptly after being taken If the analysis is not carried out within three hours of taking the sample, the sample shall be refrigerated

- *Method of taking samples* The sample must be taken at the point of discharge to the public sewer If there are several points of discharge, a separate sample shall be taken at each point of discharge After the receptacle is filled, it shall be sealed with a stamp of a responsible official

- *Statement of authenticity* A form documenting the sampling shall accompany each wastewater sample (see Exhibit 2-10)

Establishments shall also assess the efficiency of their wastewater treatment equipment and analyze the wastewater treatment sludges for hazardous constituents If the sludges are classified as hazardous waste they shall be disposed of in accordance with the requirements and guidelines for hazardous waste handling (see Section 2 5)

All samples shall be sent to a laboratory certified by the Ministry of Health for analysis

According to Article 17 of Decree 338 the establishment must notify the EEAA immediately, by registered letter with return receipt requested, of any exceedances of the discharge standards

Record of all regulated wastewater discharge parameters

In order to demonstrate compliance with the discharge standards the establishment has to keep a record of its wastewater discharge samples As part of the Environmental Register required by Law 4, establishments must maintain a record of all the parameters of its discharge to the public sewer that are regulated by a discharge standard and submit it to the 10th of Ramadan Municipal Authority once a year Exhibit 2-11 suggests a wastewater discharge record form which shall be part of the Environmental Register

Exhibit 2-10 Wastewater Sample Form
Location where sample was taken _____
Date and time of sample _____
Temperature of wastewater at time of taking the sample _____ °C
Name and position of the person taking the sample _____
General description of the sample or any other information useful for analysis _____
_____
_____
Print of the stamp existing on the sample
Signature of responsible official
_____
_____
Printed name

Exhibit 2-11 Wastewater Discharge Record Form

1 Wastewater Flow (m^3/day)
2 Wastewater Characteristics

Date and Time of Sample	Parameter	Concentration in Effluent	Sampling Method

The wastewater discharge record has to be signed by the enterprise official responsible for environmental monitoring The records should be retained for 10 years

Site inspections

The Municipal Authority will collect its own wastewater samples for analysis *semi-annually* as part of the 10th of Ramadan City's compliance monitoring program The inspectors will also conduct a visual inspection of all treatment facilities

The inspectors will verify the industrial establishment's

- compliance with relevant standards
- compliance with conditions set forth in the establishment's wastewater discharge license
- conformity of the establishment's reporting of wastewater discharges with its actual discharges

During an inspection, the facility is expected to

- provide the inspectors with access to all the facility's installations related to wastewater discharges
- present the license to discharge into the public sewer network
- present a copy of its wastewater discharge record that includes all the parameters identified in the license
- describe its wastewater discharge sampling practice including methodology, equipment, monitoring frequency, parameters monitored and laboratories used for sample analysis
- demonstrate efficiency of wastewater pre-treatment installations at the facility (if any) by presenting operation and repair records

2 4 5 Wastewater Discharge Fees

The discharge fees apply to all industrial discharges and are based on pollutant loadings not concentrations Loadings are calculated as the volume discharged multiplied by the pollutant concentrations All industrial facilities are required to measure and record the volumes of wastewater discharged The total wastewater discharge fee is the sum of the discharge fees for individual pollutants in the effluent

The formula for calculating the wastewater discharge fee is described in Appendix 2

The wastewater discharge fee will be implemented in three phases

Calculation of wastewater fee

In Phase I, pollutant loadings are calculated as the *presumed* pollutant concentrations for each industrial sector multiplied by *actual* discharge volumes for each facility Individual companies can opt to have their fees

calculated on the basis of actual pollutant concentrations if they comply with the monitoring, recordkeeping, and reporting requirements

In Phase II, pollutant loadings are calculated as *actual* pollutant concentrations for each facility multiplied by *actual* discharge volumes All industrial dischargers are required to comply with the monitoring, recordkeeping, and reporting requirements A fee will be charged for each "pollutant equivalent" discharged A pollutant equivalent is defined as the pollutant loading multiplied by an equivalency factor The equivalency factors are designed to be an approximate indicator of the relative risks to public health and the environment posed by each pollutant

Phase III refines the fee structure as needed to adjust to changing fiscal and environmental conditions

Revenues from the discharge fees will be collected in the Environmental Trust Fund Grants for wastewater monitoring, pollution prevention, and pretreatment will be available from the Fund (see Appendix 6)

2 5 Hazardous Waste Program

This section contains guidance for the 10th of Ramadan industries on complying with the hazardous waste regulations contained in Law 4 and in the Executive Regulations for this law This section describes the requirements for a license to handle hazardous wastes and outlines regulatory requirements for hazardous waste management monitoring, and recordkeeping Non-compliance procedures are discussed in Section 2 7

2 5 1 Subject of Hazardous Waste Regulations

Pursuant to Article 25, Decree 338, the Ministries of Petroleum Interior Industry Health Agriculture and Electricity are currently preparing definitions of hazardous waste and lists of hazardous substances that are subject to the hazardous waste management provisions of Law 4 The definitions used hereunder shall be considered operational as best management practices" until such time as the competent ministries finalize and promulgate their respective definitions These guidelines highlight definitions that are within the jurisdiction of the Ministry of Industry as most relevant to industries in the 10th of Ramadan These definitions are likely to approximate the definitions finally promulgated by the Ministry of Industry and are, therefore, sound models to enforce

The working definition of hazardous waste subject to the jurisdiction of the Ministry of Industry shall be waste with any of the following properties

- *Explosive* substances and preparations which may explode under the effect of flame or which are more sensitive to shocks or friction than dinitrobenzene
- *Oxidizing* substances and preparations which exhibit highly exothermic reactions when in contact with other substances, particularly flammable substances
- *Flammable* waste having a flash point less than or equal to 55 degrees Celsius
- *Irritant* non-corrosive substances and preparations which, through immediate, prolonged, or repeated contact with the skin or mucus membrane, can cause inflammation
- *Corrosive* substances and preparations which may destroy living tissue on contact
- *Harmful* substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may involve limited health risks
- *Toxic* substances and preparations which if they are inhaled or ingested or if they penetrate the skin, may involve serious acute or chronic health risks, and even death
- *Carcinogenic* substances and preparations which, if they are inhaled or ingested, or if they penetrate the skin, may induce cancer or increase its incidence
- *Teratogenic* substances and preparations which if they are inhaled or ingested or if they penetrate the skin, may induce non-hereditary congenital malformations or increase their incidence
- *Mutagenic* substances and preparations which if they are inhaled or ingested or if they penetrate the skin, may induce hereditary genetic defects or increase their incidence
- *Infectious* substances containing viable micro-organisms or their toxins which are known or reliably believed to cause disease in man or other living organisms
- *Ecotoxic* substances and preparations which present or may present immediate or delayed risks for one or more sectors of the environment
- Substances and preparations which release toxic or very toxic gases in contact with water, air or an acid

- Substances and preparations capable by any means, after disposal, of yielding another substance, e g , leachate, which possesses any of the characteristics listed above

The following general types of wastes are categorized as hazardous under the jurisdiction of the Ministry of Industry

- Oil and grease waste (e g , hydraulic oils, brake fluids, engine oils lubrication oils, insulations, heat transmission oils, bilge oils, oil/water separator solids, sludge)
- Solvent waste, halogenated and unhalogenated (e g , from cleaning, degreasing, machinery maintenance, solvent recovery, textile finishing)
- CFC/solvent waste with CFCs (e g from coolants, foam/aerosol propellants, coolant recovery)
- Waste acidic solutions (e g , sulphuric acid, sulphurous acid, hydrochloric acid phosphoric acid nitric acid and other acids electrolyte from batteries and accumulators)
- Waste alkaline solutions (e g , calcium hydroxide, soda, ammonia and alkaline)
- Catalysts containing hazardous transition metals
- Spent liquid catalysts
- Catalysts contaminated by use
- Spent activated carbon (except spent activated carbon from the treatment of potable water and processes of the food industry and vitamin production)
- Paints varnish and printing inks containing solvents heavy metals or pesticides
- Powder paints not hardened
- Adhesives, glue and sealant containing solvents, pesticides, or PCBs
- Liquid wastes from automobiles
- Laboratory chemicals and other chemicals not specified
- Batteries containing lead cadmium or mercury

- Waste electrical and electronic assemblies or scrap with batteries containing lead, cadmium, or mercury
- Transformers and capacitors containing PCB or PCT
- Waste electrical and electronic assemblies or scrap with transformers and capacitors containing PCB or PCT
- Demolition waste (e g , insulation materials), filters, and other materials containing free asbestos
- Industrial gases in high-pressure cylinders, LPG containers and industrial aerosol containers (including halons)
- Cables consisting of oil and tar
- Saturated or spent ion exchange resins
- Solutions and sludge from regeneration of ion exchanges
- Waste tarry residues (excluding asphalt cements) arising from refining, distillation and any pyrolytic treatment of organic materials
- Waste from transport or storage tank cleaning containing oil or chemicals
- Absorbents wiping cloths, filter materials and protective clothing contaminated with hazardous waste
- Packaging containing residues of hazardous substances

In addition to the general list of hazardous waste categories an industrial sector-specific list which defines hazardous wastes for each major type of industry shall also be subject to the jurisdiction of the Ministry of Industry This list is presented in Exhibit 2-12

Exhibit 2-12 Sector-Specific List of Hazardous Wastes	
Industrial Sector	**Waste Fractions Considered Hazardous Waste**
Mining industry	Mining waste excluding waste belonging to the hazardous waste list of the Ministry of Petroleum and the Ministry of Electricity
Chemical industry	All waste types e g off-dated substances wastewater sludge solvents spent catalysts spent absorptions filter dust
Photographic industry	All waste types e g developer activator solutions offset plate developer solutions fixer solutions bleach solutions silver containing waste from on-site treatment of photographic waste
Wood preservation	Waste containing wood preservatives e g outdated preservatives, spills, contaminated materials sludge (wood treated with wood preservatives is not covered in this entry)
Pulp and paper production and processing	Bleaching sludge from hypochlorite and chlorine processes
Leather industry	Degreasing wastes containing solvents tanning liquor containing chromium sludge containing chromium buffing dust containing chromium
Textile industry	Halogenated wastes from dressing and finishing dye stuff and pigments wastes from waterproofing
Iron and steel industry	Solid wastes from gas treatment sludge from gas treatment other sludge soil/dust from scrap handling storing and cleaning
Aluminum thermal metallurgy	Tars and other carbon containing wastes from anode manufacture skimming primary smelting slags/white drosses spent pot lining salt slags from secondary smelting black drosses from secondary smelting
Lead metallurgy	Slags (first and second smelting) dross and skimming (first and second smelting) calcium arsenate flue gas dust other particles and dust solid waste from gas treatment sludge from gas treatment
Zinc thermal metallurgy	Slags (first and second smelting) dross and skimming (first and second smelting) flue gas dust solid waste from gas treatment sludge from gas treatment
Copper thermal metallurgy	Flue gas dust waste from electrolytic refining solid waste from gas treatment sludge from gas treatment
Wastes from casting of ferrous and non-ferrous pieces	Furnace dust organic binders (off-specification outdated or unfit for its original purpose)

Exhibit 2-12 Sector-Specific List of Hazardous Wastes	
Industrial Sector	**Waste Fractions Considered Hazardous Waste**
Manufacturing of glass and glass products	Flue gas dust
Metal treatment and coating	Spent solutions sludge
Shaping and surface treatment of metals and plastic	Waste machining oil and emulsions synthetic machining oil machining sludge sludge from grinding honing and lapping polishing sludge, degreasing wastes, sludge and liquids
Power production	Oil fly ash
Metal scrap shredding and cutting	Light fraction from shedding (fluff'), filter dust, filter sludge soil/dust from scrap handling storing and cleaning
Metal scrap incineration	Ash from the incineration of insulated copper wire and printed circuit boards
Incineration, pyrolysis and vitrification of waste	Fly ash bottom ash (not slag) boiler dust solid waste sludge and liquid from gas treatment

The foregoing listed general and sector-specific waste types are to be considered hazardous unless the waste producer provides documentation to the competent authority giving evidence that a specific waste is not hazardous

In addition to *wastes* the list of specific hazardous waste *substances* and their classification codes (contained in Appendix 8) shall be considered operational and subject to the jurisdiction of the Ministry of Industry until promulgation of an official final list Similar lists are being prepared for final promulgation by the Ministries of Petroleum Interior Health Agriculture and Electricity

2 5 2 Performance Standards for Hazardous Waste Management

Article 28 of Decree 338 contains the general performance standards for handling hazardous substances and wastes

Generation and Storage of Hazardous Waste

Establishments generating hazardous waste shall be required to

- Pursue waste minimization options through adopting clean technologies and substituting products and raw materials that cause less environmental damage (See Chapter 3)
- Maintain a register of hazardous waste generated (see subsection 2 5 3)
- Establish and operate on-site hazardous waste treatment units, provided the EEAA approves the treatment system and its technical specifications and operational programs If safe on-site treatment and disposal is technically impossible, the company should transport its hazardous waste off-site, to a disposal site determined by the Municipal Authority, the Ministry of Industry, and the EEAA

Storage requirements are as follows

- Designate specific locations for storing hazardous wastes where safety provisions are established to protect human health and the environment The engineering specifications for hazardous waste storage facilities shall be promulgated by decree of the Minister of Housing after consulting the EEAA
- The buildings where hazardous wastes are generated and/or stored shall be equipped with appropriate safety systems and alarms, emergency and first aid equipment as determined by the Minister of Labor after consulting the EEAA the Ministry of Health and the Civil Defense Agency in coordination with the competent administrative body
- Store hazardous wastes in special containers designed to prevent leakage These containers should conform to the EEAA criteria for storing specific types of hazardous waste
- Properly label the hazardous waste containers to indicate their weight and content warn of danger that may result from handling them in an inappropriate manner and give directions for emergency measures should an accident occur
- Ensure that the containers are cleaned after use and not placed in public areas

On site storage

- If hazardous wastes are shipped off-site a time schedule shall be set up for their collection so that the wastes are stored in

containers for only a limited period of time (The best management practices suggest that this time period be no longer than one year)

Until specifications are promulgated for hazardous waste storage, containment, vessels, tanks, and holding ponds, the EEAA and the Municipal Authority shall enforce "best management practices" for such storage and containment as found in Appendix 9

Transporting Hazardous Waste

Hazardous wastes may be shipped off-site either by the waste generator itself or by a licensed commercial transporter The hazardous waste transporter must comply with the following requirements

- Trucks transporting hazardous waste shall be specially equipped for this purpose and marked with clear signs indicating the hazard and principal directions for responding to emergencies The trucks shall be cleaned after each use in accordance with instructions of the Ministry of Health

Transport

- The trucks shall be driven by specially trained drivers Owners of trucks shall certify such training to the satisfaction of EEAA, and this requirement shall be a condition of the license to transport

- Routing of trucks transporting hazardous waste shall be determined and civil defense bodies shall be immediately notified of any changes, so they will be able to act quickly and appropriately in emergencies

- Trucks transporting hazardous waste are prohibited from passing through residential and other populated areas and through city centers during daytime

- The Municipal Authority shall be notified of the address of the garage where these trucks are parked and of the numbers and dates of their permits

Hazardous Waste Treatment

If hazardous wastes are treated on-site the treatment storage and disposal facility (TSDF) shall be subject to the following requirements

- The TSDF shall be located at least three kilometers away from residential areas and be surrounded with brick walls having a minimum height of 2 5 meters

- The TSDF shall have the capacity sufficient to handle all hazardous wastes transported there and shall be adequately equipped

On-site treatment

- The TSDF site shall have a warehouse for temporary storage of hazardous wastes awaiting treatment and disposal It shall be constructed in accordance with the best management practices for hazardous waste storage and containment as set forth in Appendix 9
- The TSDF shall have an installation for sorting hazardous wastes in order to separate the reusable and recyclable materials and an incinerator for burning combustible wastes
- Decree 338 authorizes reuse of certain types of hazardous waste as fuel and the recovery and recycling of organic solvents, ferrous and non-ferrous metals, acids and alkalies, used oils, etc

If hazardous wastes cannot be re-utilized or recycled, the following treatment and disposal methods are authorized

Disposal

- permanent storage, e g , placing hazardous waste containers inside mines or other isolated compounds
- volume reduction through evaporation, sedimentation and other techniques, with subsequent disposal of the sediment
- burial in specially designed landfills
- biological treatment (decomposition by micro-organisms)
- incineration with mitigation measures taken against release of hazardous air pollutants

Because of the wide variation in hazardous wastes no single treatment and disposal technology applies to all wastes The following is a brief description of the commonly used hazardous waste treatment technologies

- *Biological treatment* uses micro-organisms to degrade organic compounds in a waste stream
- *Carbon adsorption* is a process in which substances adhere to the surface of specially treated carbon This method is particularly effective in removing organic compounds from waste liquids

- *Dechlorination* removes chlorine from a substance by chemically replacing it with hydrogen or hydroxide ions This process is used to detoxify chlorinated substances

- *Incineration* destroys or makes waste less hazardous through burning Incineration is frequently used to destroy organic wastes

- *Neutralization* decreases the acidity or alkalinity of a substance by adding to it alkaline or acidic materials, respectively

- *Oxidation* detoxifies a waste constituent by combining it with oxygen This process is used to treat wastes such as cyanides phenols, and organic sulfur compounds

- *Precipitation* removes solids from a liquid waste so that the hazardous solid portion can be disposed of safely

- *Solidification and stabilization* remove wastewater from a waste or change it chemically, thereby making it less permeable and less susceptible to transport by water

The on-site treatment facilities shall be equipped with leachate collection systems (in cases of permanent storage, volume reduction treatment, biological treatment, and landfilling) and air pollution abatement installations (in case of incineration)

Emergency Procedures

Article 31 of Decree 338 requires that every establishment handling hazardous wastes have an emergency (contingency) plan for confronting any possible accidents that may occur during the production storage transport or treatment of these wastes This plan shall be reviewed and sanctioned by the competent ministry after consulting the EEAA and the Civil Defense Agency

The contingency plan must be designed to minimize hazards to human health or the environment from fires explosions or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air soil, or surface water The plan must be carried out immediately whenever there is a fire explosion, or release of hazardous waste or hazardous waste constituents which could threaten human health or the environment

The establishment handling hazardous wastes shall inform its own workers and residents in areas surrounding hazardous waste management sites of the dangers of the hazardous substances being handled at the site and provide them with guidance on how to act in emergency situations

Establishments shall formulate a detailed contingency plans and emergency procedures in accordance with the best management practices contained in Appendix 10 The contingency plan shall be made a condition of the hazardous waste handling license and must be approved by the EEAA and the competent ministry

2 5 3 License to Handle Hazardous Substances and Wastes

Article 25 of Decree 338/1995 (implementing Law 4) requires that industrial establishments intending to handle hazardous substances and wastes obtain a license from the competent ministry (see Section 2 1 4) The Ministries of Petroleum, Interior Industry Health, Agriculture, and Electricity are all currently preparing definitions of hazardous waste and lists of hazardous substances that are under their jurisdiction and subject to a license

An application for a hazardous waste handling license shall be sent to the 10th of Ramadan Municipal Authority as part of the Consolidated Environmental License Application

Appendix 3 contains the Application for General License to Handle Hazardous Substances and Wastes forms along with item-by-item instructions for filling it out

To be granted a hazardous waste handling license an enterprise must

- submit a complete and accurate application
- have personnel who are trained in the handling of hazardous substances and waste (see Section 4 3 2)
- have the technical means and systems necessary for safe handling of hazardous wastes (see Section 4 3 5)
- Have an emergency system available to respond to hazards that may result from accidents occurring during hazardous waste handling operations (see Section 4 3 6)
- Provide any other available evidence to the Municipal Authority to show that the handling of hazardous wastes at the facility will not result in any harmful effects to the environment and public health

Special procedures and personnel for handling hazardous waste

The license applicant may be requested by the Municipal Authority, the EEAA, or the competent ministry to fulfill additional conditions to ensure safe handling of hazardous substances

The establishment applying for this license may not handle hazardous substances and wastes before obtaining the license

License to be renewed annually

The license is issued for up to five (5) years but has to be renewed every year as part of the Consolidated Environmental License The law requires that the license be kept by the person in charge of hazardous waste handling operations at the facility and that it be presented upon request

The license may be revoked (and the establishment's activity suspended) by the Ministry of Industry (or other competent authority) per notification by the Municipal Authority in the following cases

Conditions for revoking license

- if a license was issued based on the submission of incorrect information
- if the establishment has violated the conditions of the license (see the non-compliance procedures in Section 2 7)
- if dangerous environmental impacts that were unforeseen at the time of the license issuance appear to result from the handling of hazardous wastes at the facility
- if a new technology becomes available which may be installed at the establishment and which would lead to greater safety for public health and the environment
- if the EEAA concludes that it is unsafe to handle certain hazardous substances and wastes included in the license

2 5 4 Monitoring and Recordkeeping for the Hazardous Waste Program

Industrial establishments are required to maintain a Uniform Hazardous Substances and Waste Register for On-Site Usage, Treatment, Storage and Disposal If the generator transports hazardous wastes for off site treatment storage and disposal it must use the Uniform Hazardous Waste Register for Wastes Transported Off-Site ' Appendix 3 contains both forms and item-by-item instructions for completing it The Registers have to be submitted to the 10th of Ramadan Municipal Authority as part of the enterprise s Environmental Register (see Section 2 1 6) *once a year* and a copy retained *for 10 years* The Register shall be appended to the annual renewal application for license fee re-calculation The Municipal Authority will notify each firm 90 days prior to the annual expiration date

Enterprises have to conduct internal monitoring to ensure that all requirements of the hazardous waste handling permit are complied with

The measurement frequencies below are based on best management practices

Monitoring requirements

- Record the quantity of every type of hazardous waste generated Enter records on a monthly basis
- Check monthly to be sure that containers are stored in specially designated places only and that they are properly labeled, sealed when waste is not being added, and not leaking
- Record the quantity of each type of hazardous waste shipped off-site at the time of shipment
- If the facility treats its hazardous wastes on-site, monitor the treatment processes on a quarterly basis to ensure that the hazardous waste being treated are completely degraded transformed, or immobilized during the treatment process
- Set up a monitoring system with daily measurements at and around the treatment and storage sites to detect possible leakages of hazardous substances to air or soil Notify the EEAA immediately of any leakages detected

Every industrial establishment is subject to site inspections at least once a year, conducted by the Municipal Authority (and/or EEAA and other competent authorities) The inspectors will verify the information contained in the hazardous waste register During an inspection, the facility is expected to

- provide the inspectors with access to all the hazardous waste generation storage, treatment, and disposal sites
- present the License to Handle Hazardous Substances and Wastes
- present a copy of its hazardous waste register
- describe its monitoring practices for hazardous waste handling including procedures equipment types of wastes and handling operations monitored and monitoring/inspection frequency
- demonstrate safety and efficiency of on-site hazardous waste treatment facilities (if any) by presenting operation and repair records

2 5 5 Hazardous Waste Fee and Other Incentives

Fee intended to finance waste exchange program

Hazardous Waste Fee

The purposes of the hazardous waste fee are to cover the Municipal Authority's administrative costs of handling hazardous waste licenses and to finance a waste exchange program which will assist industrial establishments in reducing, reusing, and recycling their hazardous wastes (See Appendix 7 for a description of the waste exchange program)

The fee structure consists of a rate (R_w) per ton of hazardous waste Industrial establishments that comply with the monitoring, recordkeeping and reporting requirements receive a discount for compliance of 50%

The specific fee formula is

Hazardous Waste Fee for Firm i = $[R_w \times M_i \times Q_i]$

where

R_w = Rate per tonne of hazardous waste generated
M_i = 0 5 if facility i is in compliance with monitoring and reporting requirements and 1 if the facility is not
Q_i = Quantity of hazardous waste generated from facility i (tons/year)

The rate, R_w, is set at 5 LE per ton of waste

All companies that pay a fee will be able to participate in the waste exchange Companies that violate the fee requirements will be excluded from the waste exchange

Deposit-Refund Systems

Additional market-based incentives such as deposit-refund systems may be implemented for wastes deemed to be particularly problematic The 10th of Ramadan Municipal Authority currently does not have sufficient information to design deposit-refund systems for the city However these systems are expected to become part of the environmental management system for the 10th of Ramadan in the future At that time the Municipal Authority will notify industrial establishments of the regulations pertaining to the program

Under a deposit-refund system buyers pay a deposit at the time a product is purchased The deposit is refunded if the buyer returns the waste resulting from the product Deposit-refund systems thereby give buyers an economic incentive to return wastes to a central collection point for reuse,

recycling, or safe disposal By doing so, deposit-refund systems ensure that wastes do not end up as litter or are otherwise managed in an environmentally unsound manner

In some cases, deposit-refund systems can be more effective for waste management than mandatory or voluntary recycling programs, landfill bans and other policy instruments to encourage good waste management practices This is particularly true when it is difficult to specify and enforce the conditions under which it is illegal to dispose of waste

Some of the earliest deposit-refund systems were voluntary systems created by companies to recover valuable non-hazardous solid waste materials, such as glass bottles Since then, governments have imposed mandatory deposit-refund systems on a range of hazardous wastes such as batteries, used oil, pesticide containers appliances and recoverable substances, such as solvents, chlorofluorocarbons (CFCs) and sulfur

2 6 Solid Waste Program

No license or fees for generation of non-hazardous solid waste

This section describes the requirements of Law 4 and Decree 338 for industrial solid waste management and provides guidance on reporting and recordkeeping procedures for industrial solid waste generators Industrial establishments do not need a license to generate non-hazardous solid waste, although they are required to submit information about their volumes of solid waste generation to the Municipal Authority as part of the annual Consolidated Environmental Registration procedure Non-compliance procedures are discussed in Section 2 7

2 6 1 Standards for the Industrial Solid Waste Program

Open burning permitted in designated areas permit required

Article 37 of Law 4 and Article 38 of Decree 338 prohibit land disposal and burning of solid waste other than in areas especially designated by the Municipal Authority in coordination with the EEAA Until March 1 1998 open burning of non-hazardous wastes may be allowed by a special permit from the EEAA and performed under strict supervision from the Municipal Authority

Industrial establishments should arrange for periodic removal of their non-hazardous solid waste off-site They can either deliver it to a Municipal Authority-designated disposal facility (landfill, incinerator) using their own vehicles or contract with a registered solid waste collector (municipal or private) to have it picked up on a regular basis

Before removal solid waste should be stored on-site in specially designated areas in order to protect worker safety

2 6 2 Recordkeeping for the Industrial Solid Waste Program

In compliance with the Environmental Register requirements (see Section 2 1 6) and in accordance with best management practices, industrial establishments shall maintain a log with monthly entries of

- type and quantity of non-hazardous solid waste generated
- volumes and dates of removal by a registered solid waste collector

Exhibit 2-13 presents a proposed form for recording solid waste generation and removal

Exhibit 2-13 Solid Waste Generation and Removal Log

(Month, Year)

Type of Solid Waste	Stored on-site at beginning of month, cub m	Volume generated, cub m	Volume removed, cub m	Removal date	Signature of collector representative	Remaining on site at end of month, cub m
TOTAL						

Industrial establishments are required to submit information about their volumes of solid waste generation to the Municipal Authority as part of their Environmental Register

The Municipal Authority will verify the enterprise's compliance with the reporting requirements for generation and removal of industrial solid waste During annual on-site compliance inspections the inspectors will review the log book for solid waste generation and removal and inspect on-site solid waste storage areas to ensure that they are kept in sanitary condition

2 7 Non-Compliance Procedures

Compliance verified through annual inspection

Industrial establishments are subject to annual inspections by the 10th of Ramadan Municipal Authority under support and guidance from the EEAA The EEAA derives the authority from Article 18 of Decree 338 which authorizes the EEAA to perform annual follow-up inspections and

sampling to determine that actual discharges are consistent with the discharge data reported in the Environmental Register Comparison of the results of the inspection (including analysis of test samples) with the terms of the Environmental License also determines whether the industrial establishment is being operated in compliance with the license

2 7 1 Notice of Violation

Sections 2 7 1 and 2 7 2 explain how the provisions of Article 22 of Law 4 will be implemented

If the establishment is found to have violated one or more of the license conditions, the EEAA will issue a Notice of Violation referencing the relevant conditions and the data/information in the Environmental Register and/or the information gathered through its inspections

Deadline for corrective action

The owner of the industrial establishment will receive the Notice of Violation by registered letter The notice will contain a description of the violation and the requirements for corrective action The corrective action must be performed by a certain date, and the owner of the industrial establishment must document these actions in a Corrective Action Report to be submitted by the stated date

Technical conference

Within thirty (30) days of the issuance of the Notice of Violation, the Municipal Authority invites the owner of the establishment to attend a technical conference with a representative of the particular competent authority that will mandate the corrective action For example the representative of the Ministry of Industry would be present for a technical conference related to a violation of the License to Handle Hazardous Substances and Wastes The technical conference provides the owner of the industrial establishment with an opportunity to explain the circumstances leading to the violation (e g power outage resulting in a stoppage in the operation of its pollution control devices) The owner may also present his own evidence to rebut the findings of the inspection team The technical conference may result in amendments to the Notice of Violation

Failure by the owner of the industrial establishment to attend the technical conference represents a waiver of his right to such a conference The imposition of the Notice of Violation and the requirement to submit the Corrective Action Report proceed according to schedule

2 7 2 Corrective Action Report

The owner of the industrial establishment compiles a report showing the actual (or planned) actions taken to address the violation identified in the

Notice of Violation If the establishment has already completed the action, it must demonstrate that it is no longer in violation If the violation is for exceeding limits for releasing pollutants into the environment (e g , industrial discharge standards), as evidenced by the results of the analysis of a sample, then the owner must attach to the Corrective Action Report the results of an analysis done on samples obtained after the corrective action has been taken

Information requirements for corrective action report

The report should be accompanied by the specifications and process drawings for any new system or apparatus that was installed as part of the corrective action The report should also describe any management practices, such as periodic inspection and monitoring, that have been put in place to ensure the violation will no longer occur

In the event the owner has planned for the corrective action but has not yet undertaken it, the Notice of Violation remains in force until such time as the action is completed and the violation no longer exists The Municipal Authority will obtain input from the EEAA and other concerned authorities and establish a timetable for completing the corrective action

Failure by the owner of the industrial establishment to submit the Corrective Action Report as scheduled or to meet the timetable for taking the corrective action is a violation of Article 22 of Law 4

The Municipal Authority forwards the Corrective Action Report to the Environmental Advisory Committee If the information in the report is incomplete the Municipal Authority, upon authority of the Committee will contact the establishment and request additional information and/or documentation If the owner fails to respond adequately to such a request within 15 days, the Municipal Authority forwards the report to the EEAA and notes it as incomplete The EEAA and the competent authority may then commence the imposition of sanctions as provided in Section 2 7 3

If the Corrective Action Report is complete the Environmental Advisory Committee determines whether the corrective actions are satisfactory If the measures are satisfactory to the Committee the Municipal Authority and EEAA both initial their acceptance of the report and the Municipal Authority upon authority of the Committee notifies the owner or operator of the establishment by registered letter

If the measures do not satisfactorily correct the violation the Committee notifies the EEAA and the appropriate ministry of the industrial establishment s failure to correct the violation The EEAA and the appropriate ministry may then commence the imposition of sanctions as provided in Section 2 7 3

2 7 3 Sanctions

The concerned ministry/agency assesses the nature and severity of the violation to determine the appropriate sanction and then initiates an enforcement action

The EEAA and the competent ministry jointly send an Enforcement Notice to the owner of the industrial establishment by registered mail The notice should explain the nature of the violation, the sanction imposed and the requirements that must be met to prevent further administrative sanctions (e g , suspension of Environmental License closure of the industrial facility) or fines The notice will contain instructions on how to pay any fines imposed

Exhibit 2-14 summarizes the sanctions authorized for different violations by Section 4 of Law 4/1994 In cases of recurrent violations, penalties are doubled

Exhibit 2-14 Summary of Sanctions for Non-compliance

Medium	Nature of Violation	Sanctions
Air	Exceedance of an emission standard	Fine of LE 1 000 to 20 000
Wastewater	Wastewater discharge without a license	Imprisonment for up to 3 months and/or fine of LE 50 to 100
	Surface drainage without a license	Fine of LE 10 to 50
	Discharge of substance not contained in the license	Imprisonment for up to 3 months and/or fine of LE 50 to 100
	Exceedance of a discharge standard	Imprisonment for up to 3 months and/or fine of LE 50 to 100
Hazardous Waste	Handling hazardous waste without a license	Imprisonment for no less than 5 years and fine of LE 20 000 to 40 000
	Violation of the conditions of the license including failure to maintain a hazardous waste register	Imprisonment for no less than 1 year and fine of LE 10 000 to 20 000
Solid Waste	Illegal dumping of industrial solid waste	Fine of LE 1 000 to 20 000
Administrative	Failure to maintain Register or correct a violation failure to respond to a request for further information failure to respond to a lawful order from a competent ministry	Closure of the establishment or Suspension of the violating activity and/or Lawsuit for compensation to remedy the harm

The owner of the industrial establishment has the right to appeal the sanction

Grounds for appeal

The grounds for appeal are as follows

- insufficient amount of time provided to take the corrective action

- independent (third-party) testing results demonstrating that the corrective action was adequate to remedy the violation
- All other reasons including economic hardship and severity of sanction are *not* grounds for an appeal

Written appeal within 10 days

The owner of the industrial establishment has 10 days from date of receipt to appeal the sanctions This appeal is sent in writing to the Municipal Authority as a forwarding agency Failure to appeal within 10 days is interpreted as a waiver of the right of appeal

If the Municipal Authority receives an appeal within 10 days it forwards the appeal to the office of the highest ranking officer in the concerned ministry/agency, with concurrent notice to the EEAA This office shall endeavor to make its decision on the appeal within 30 days

If the appeal is rejected the sanction shall be imposed If directed by the competent ministry, the Municipal Authority shall suspend or revoke the relevant media-specific license (thereby automatically shutting down the establishment) until all the violations are corrected, the terms of all sanctions met, and the industrial establishment has resumed its good standing with the concerned authority

2 8 Environmental Impact Assessment (EIA) Program

EIA procedure to precede initiation of construction

Law 4 states that the environmental impact of certain establishments or projects must be evaluated before any construction works are initiated or any license is issued by the Competent Administrative Authority (CAA sometimes referred to as licensing authority) Article 19 of Decree 338/1995 extends the EIA requirement to cover expansions and renewals of *existing* establishments

Law 4 stipulates that EIA is required for industrial establishments that are subject to the provisions of Law 21/1985 with respect to the organization and encouragement of industry and/or to the provisions of Law 55/1977 with respect to the establishment and operation of thermal machines and steam boilers EIA is also required for all infrastructure projects including stations for sanitary drainage treatment, and reuse of water

White gray and black lists to classify projects

To clarify these provisions EEAA issued EIA Guidelines which establish a screening system for new and expanding projects, dividing them into three classes or ' lists Each list requires a different level of EIA according to the severity of possible environmental impacts

- *White list* for establishments/projects with minor environmental impact
- *Grey list* for establishments/projects which *may* have significant environmental impact
- *Black list* for establishments/projects with substantial environmental impact

2 8 1 Establishments Subject to EIA

Exhibit 2-15 considers the principal the types of establishments that are located in the 10th of Ramadan City and classifies them according to level of EIA each requires Their respective licensing authorities are also identified Where no production capacity limits are mentioned the class or ' list " includes all establishments of that type A full list of establishments and relevant licensing authorities per 1997 Egyptian EIA Guidelines is found in Appendix 4

The classifications may need to be adjusted by the EEAA as it acquires experience administering the system If a project cannot be classified in any of the three categories, the developer must approach the EEAA for advice

Exhibit 2-15 Principal Categories of Establishments Subject to EIA Requirements			
CAA	**White List**	**Gray List**	**Black List**
Ministry of Industry & Mineral Resources	Textile factories situated in approved industrial sites excluding dying units Rubber and plastic factories situated in approved industrial sites Leather and shoe factories situated in approved industrial sites Plants engaged in manufacturing fish products in quantities of 1000 tons/yr or less	Steelworks with capacity of 150 tons/day or less Iron steel and non ferrous metal foundries Manufacture and assembly of motor vehicles Boiler shops and pipelines factories Electrotechnical enterprises including battery plants Cement factories using dry process with a capacity of 100 tons/hr or less (with other processes - 50 tons/hr or less) Glass manufacture Integrated chemical installations such as fertilizer lubricant pharmaceutical paint and detergent factories with capacity of 50 tons/day or less Bottling and packing of chemicals and products situated outside approved industrial sites Synthetic glue (adhesive materials) factories Pulp production with a capacity of 100 tons/day (rice straw) and 500 tons/day (sugarcane) or less Paper/paper board mills Sugar refineries Tanneries with a production of 1 million square ft/year Storage facilities for chemicals (other than oil refinery products) Projects/sites concerned with recycling/reuse of materials	Steelworks with capacity of more than 150 tons/day Electroplating plants with a production of more than 25 tons/day Cement works using dry process with capacity of over 100 tons/hr (with other processes -- 50 tons/hr and above) Integrated chemical installations such as fertilizer pharmaceutical paint, and detergent factories with capacity of more than 50 tons/day Pesticide manufacturing plants - Pulp production with capacity greater than 100 tons/day (rice straw) and 500 tons/day (sugarcane) - Tanneries with a production of more than 1 million square ft/yr Lead smelters Refining/other treatment of vegetable oil
Ministry of Electricity	Expansion of existing electrical transmission lines	Thermal power plant with a capacity of 30 MW or less Electrical transmission lines Wind power plants	Thermal power plant with a capacity greater than 30 MW - Nuclear power plants - Hydropower plants
Ministry of Housing	Small wastewater treatment plants of 1000 PE or less	- Wastewater treatment plants with capacity of 1,000-1 million PE Water supply establishments Potable water stations and distribution systems	- Wastewater treatment plants with capacity of more than 1 million PE
Governorates		Municipal waste landfills and treatment units - Roads and highways in cities (less than 10 000 cars/day)	- Urban development projects - Roads/highways in cities (over 10 000 cars/day) - Hazardous waste treatment and disposal

2 8 2 EIA Procedures

White List Projects

This class includes projects that may be approved based on fundamental information only

Before any construction works are initiated, the developer must

- apply to the CAA with a letter of intent to undertake a certain specific project considered a 'white list' project
- attach a complete Environmental Screening Form "A" (see Appendix 4), which can be obtained at the CAA

No EIA required

The "A" form requires the developer to provide very basic information about the project, including the cost, site location, preliminary construction and operation schedule, capacity, raw materials and energy use information It does not require an assessment of environmental impacts of the project

The CAA registers the submitted documents and checks whether the project belongs on the "white list" and whether the required information has been submitted The CAA may disagree with the developer's classification of the project and ask the developer to provide additional information or to resubmit the documents for a different classification The CAA forwards the documents to the EEAA for review and evaluation

After the EEAA review the CAA sends the developer a registered letter with return requested receipt notifying him of the result of the evaluation The result can be either

- approval of the project on the condition that the developer complies with all specified legal environmental requirements or
- disapproval as a white list' project and instruction to reapply as a gray or black list project

The project could also be disapproved for nonenvironmental reasons

The CAA is responsible for enforcing the decision

Gray List Projects

For this class of projects, the applicant completes Environmental Screening Form ' B" (see Appendix 4) The CAA uses this form to screen

Scoped EIA possible

projects and may decide to require a scoped EIA on certain identified impacts/processes

Before undertaking construction, the developer must

- apply to the CAA with a letter of intent to undertake a specific project considered a ' gray list" project
- attach a completed Environmental Screening Form B, ' which can be obtained at the CAA

The ' B" form requires information on the project's objectives, basic components, raw materials during construction and operation phases In addition, the form requires the following information

- Alternatives considered Information should be provided on alternative sites, technologies or designs that were considered (See subsection "Analysis of Alternatives" under Section 2 8 3, EIA Technical Assistance, for suggestions on how to present the assessment of project alternatives)

Information required

- Brief description of the environment The application should include a description of the most important features of the area surrounding the project site (See subsection "Description of Environmental Setting' under Section 2 8 3 for hints on how to describe the affected environment For ' gray list projects the applicant should use the general EIA guidelines but the information should be much less specific
- Emissions, discharges and wastes The form requires basic information about the main categories of pollutants or types of waste that are expected to be discharged during both construction and operation The form does not require specific emissions quantity data If the project is an expansion of an existing facility the information collected during identification of environmental aspects as part of EMS development should be sufficient to satisfy this requirement
- Preliminary analysis of impacts The developer must indicate whether significant impacts are expected on air quality water quality and soil quality The preliminary assessment should be qualitative and use such methods as checklists and matrices (See subsection Impact Prediction and Assessment' under Section 2 8 3) If any significant environmental impacts are expected a scoped EIA is likely to be requested on the aspects of the proposed project that lead to these significant impacts

- Mitigation measures The form requires a brief description of mitigation measures that could be taken to address the identified environmental impacts The description should be fairly general Should a scoped EIA be required, a detailed analysis of mitigation measures should be set out following the guidelines provided in the subsection entitled 'Mitigation and Monitoring' under Section 2 8 3

The CAA registers the required documents and checks to see that the project is in the right category and whether the correct information has been submitted The CAA may disagree with the developer's classification of the project and ask the developer to provide additional information or to resubmit the documents for a different classification The CAA submits the documents to the EEAA for review and evaluation

After the EEAA review, the CAA sends the developer a registered letter, with return receipt requested, notifying him of the result of the evaluation The result can be

- an approval of the project on the condition that the developer complies with all specified legal environmental requirements
- a disapproval of the project (which may be for either environmental or non-environmental reasons)
- a formal request for the developer to complete a scoped EIA study of certain impacts/processes of the project, in accordance with the Terms of Reference prepared by the EEAA

The CAA is responsible for enforcing the decision

EEAA s Terms of Reference

If the developer is requested to conduct a scoped EIA study he should obtain the EEAA's Terms of Reference from the CAA and use this as guidance The same guidelines should be followed as for the full EIA required for 'black list projects (see below) The completed scoped EIA should be submitted to the CAA

The CAA registers the study and checks whether the information included in the scoped EIA study complies with required information according to the Terms of Reference The CAA submits the scoped EIA to the EEAA for review and evaluation

After the review of the documents by the EEAA the CAA officially notifies the developer by registered letter, with return receipt, and communicates the final result of the evaluation The result can be either

- an approval of the project specifying possible measures to be taken to ensure the protection of the environment, or

- a disapproval of the project

Black List Projects

Full EIA required

Under this class of projects, the developer is required to complete a full EIA due to the potential significant environmental impacts of the project

The developer is required to

- apply to the CAA with a letter of intent to undertake a certain specific project classified as a "black list" project
- attach three copies of the full EIA study in accordance with the relevant "Sectoral Guidelines for Establishments That Need a Full EIA" which are part of the EEAA's EIA Guidelines (see Appendix 4)

The sectoral guidelines stipulate that the study must include the following EIA components (See EIA Technical Assistance, Section 2 8 3, on how to comply with these requirements)

Components of EIA

- Description of the proposed project
- Description of legislative and regulatory considerations
- Subsection ' Scoping the EIA" under Section 2 8 3 discusses these first two requirements
- Description of the environment This should cover physical/ chemical, biological, and sociocultural environments in the proposed project area See subsection "Description of Environmental Setting" under Section 2 8 3 for suggestions on how to determine what environmental items to consider in the description and how to approach data collection
- Determination of potential environmental impacts See subsection Impact Prediction and Assessment under Section 2 8 3 for a description of qualitative and quantitative methods of conducting the assessment and for guidelines on how to assess impacts on air quality water quality, biological environment, and socioeconomic conditions
- Description of alternatives The subsection "Analysis of Alternatives ' under Section 2 8 3 suggests how to describe alternatives and justify the alternative selected to become the proposed action

- Management plan to mitigate negative impacts The subsection "Mitigation and Monitoring' under Section 2 8 3 gives examples of mitigation measures and suggests how to integrate the development of mitigation measures into the entire EIA process It also provides hints on how to develop a mitigation management plan and a monitoring plan

- Monitoring plan The development of a monitoring plan is discussed in connection with the above mitigation management plan

- Description of interagency coordination and public/NGO participation See subsection 'Public Participation" under Section 2 8 3 for hints on how to involve relevant local authorities and local communities in the EIA process

The sectoral guidelines also provide an outline of the EIA report that includes all the above listed components

Upon receiving the letter of intent and the full EIA study the CAA registers the documents and checks whether the information included in the EIA study is complete The CAA submits the documents to the EEAA for review and evaluation

After the EEAA has reviewed the EIA documents and made a substantive judgment, the CAA officially notifies the developer by registered letter, with return receipt and communicates the final result of the evaluation The result can be either

- approval of the project on the condition that the developer complies with all legal environmental requirements specified in the approval or

- disapproval of the project (which may be for either environmental or non-environmental reasons)

Appealing the Decision

No appeal of list designation

The decisions regarding the project itself and the mitigation measures required by the EEAA can both be appealed to the Permanent Appeals Committee within 30 days after receiving the decision The classification of the environmental impacts of the project (white gray or black list) cannot be appealed

The appeal must be presented in writing to the EEAA and sent by registered letter with return receipt requested Reasons for the appeal must

be stated and should include relevant legal and scientific reasons Documents supporting the appeal should be attached

The Permanent Appeals Committee has to make its decision within 60 days of receiving the appeal documents

2 8 3 EIA Technical Assistance

Scoping the EIA

Scoping provides the focus, content and level of detail for the EIA Scoping helps determine the important issues and impact areas that should be examined This process also involves assigning responsibilities and schedules for preparing the EIA, and identifying other related planning decisions, permits and approvals

There are several prerequisites for a proper environmental assessment

Prerequisites for EIA

- *Knowledge of applicable regulations* Since for the project to be approved it has to comply with all applicable regulations, this prerequisite is vital to the EIA process As part of EMS development in your company, you have to learn about relevant legal and other requirements affecting your business See Section 4 2 2 of these Guidelines and refer to them before you start scoping an EIA

- *Detailed knowledge of the project* The proponent must identify the purpose of the project and the project objectives The proponent shall identify the specific problem(s) that the proposed project is intended to overcome and the benefits associated with the proposed project In defining the scope of an EIA you should describe the proposed action in sufficient detail so that its potential impacts can be identified It is necessary to have all the technical documentation on the proposed project at your disposal before you start the EIA process You should also be aware of the possible alternative solutions that would meet the objectives of the proposed project

- *Interdisciplinary team* The team s core members are a physical scientist an engineer and a biologist Many types of projects may require the participation of others as well, such as economists, sociologists, geographers planners, geologists, and other such experts

Description of Environmental Setting

A proper description of the environmental setting can provide baseline information for an assessment of the predicted impacts of various alternatives

A description of the affected environment includes existing physical and human health conditions (e g , land, water quality) of the areas potentially exposed to the proposed action or to the alternatives considered If establishes the boundaries of the study area

No single list of environmental items is appropriate for every environmental assessment A list of environmental items should be developed on a project-by-project basis Only those elements that are relevant to the areas identified for the proposed action and alternatives need to be characterized and evaluated The selection of environmental items to consider may be based on

Sources of information

- *Knowledge of impacts* One of the best approaches for assembling the list of items is to know the types of impacts associated with given types of projects The identification of significant environmental impacts as part of the EMS planning should provide you with this information (see Section 2 3 of these guidelines)

- *Guidelines* Egyptian EIA Guidelines for full EIA contain a tentative list of items to be considered in describing the environmental setting

- *Other EIAs* Great value can be derived from analyzing the EIA work performed by others For example if you have to describe the environmental setting associated with vegetable oil refining it would be of great value to examine descriptions of environmental settings in several vegetable oil refinery EIAs and to develop a master list of items to consider in your EIA

- *Methodologies for impact analysis* Another approach that can be used as a basis for describing the environmental setting is the listing of environmental items included in several developed EIA methodologies Many of the methodologies contain from 50 to 100 different environmental items for which impact prediction and assessment are suggested In order to properly accomplish this assessment environmental setting information must be obtained for each item in the methodology

Quantitative data can be acquired first-hand (e g , through site visits) or from literature and other published material such as existing EIA reports Collecting secondary data is less time-consuming, so primary data

collection should be used only to fill gaps and/or verify questionable data Where quantitative data are not available, qualitative data are often sufficient

Impact Prediction and Assessment

Many types of methods exist for assessing potential impacts to the environment from an existing or proposed project Where possible, impact prediction must be expressed quantitatively A description of the methods and models including assumptions, strengths and weaknesses, and reasons for choice must be provided This information shall be presented in a technical appendix to the Environmental Impact Assessment Report wherever possible Following is a description of several different types of qualitative and quantitative methodologies

Qualitative Methods

- *Checklists* Checklists constitute a more qualitative method, but are simple and easy-to-understand They are often used for initial assessments Prepare a list of all impact categories that will experience or could experience impacts under the proposed action

- *Matrices* A matrix uses different values to determine the relative importance/significance of different impacts during the construction and operational phases Because several experts work on a project the study team should try to reach consensus on the relative significance of each of the impacts

Quantitative Methods

- *Modeling* Most widely used are empirical or mechanistic models Empirical models use actual data to form mathematical algorithms (cause and effect data) Mechanistic models are mathematical descriptions of theoretical principles (no gathered data) Mechanistic models can be used in instances where readily measurable variables are inadequate to provide the basis for predictions

- *Statistical methods* Statistical methods or models derive generalizations by using statistical techniques such as regression analysis or principal components analysis to summarize experimental or observational data Statistical models are used in the EIA for 1) hypothesis testing 2) description, and 3)

extrapolation Statistical models do *not* try to explain variables or parameters in terms of "cause and effect"

- *Mathematical methods* Math functions show cause and effect relationships of a proposed action and combine to yield a mathematical model capable of predicting future environmental conditions Mathematical models vary in complexity Most mathematical models have been adapted for computers Environmental effects that have been modeled mathematically include energy, noise, transportation, air emissions storm water runoff, and pollutant transport in water and in soils

- *Risk assessment* Risk assessment evaluates the likelihood that adverse public health and ecological health effects could occur or are occurring as a result of exposure to one or more environmental stresses" The process involves identifying hazards such as the release of a toxic chemical to potable surface or ground water, and using measurement, testing, and mathematical or statistical models to quantify the relationship between the initiating event and the effects

Comparing impacts

Impact prediction involves projecting the existing environmental setting into the future under an assumption the proposed action will not be taken (The "no action" alternative) as well as predicting the impact that the proposed action and each of the other action alternatives would have if they were implemented Thus the impact on the existing environmental setting is measured not in the present but in the *project target year* (defined as the year the project would be completed if action were taken)

The "no action" alternative serves as the *baseline* for evaluations the impacts of the various action alternatives

Assessment of the environmental impacts is approached in different ways depending on the environmental media The following are suggested approaches for predicting and assessing impacts on air quality water quality biological environment and socioeconomic conditions

Predicting and Assessing Impacts on Air Quality

- Identify air pollutants that will be emitted as a consequence of the proposed action and of all alternatives

- Describe existing air quality levels in the proposed project area Examine concentrations for each gaseous or particulate pollutant that has an ambient air quality standard

- Determine air pollution dispersion potential for the area You can do this by aggregating information on seasonal or monthly variations of inversion heights, wind speeds, high air pollution potential and episode-days Describe historical records of air pollution episodes in the area

- Summarize basic meteorological data for the area For example, collect monthly summaries of precipitation, temperature, wind speed and direction, etc

- Examine ambient air quality standards and emissions standards

- Identify major point sources of air pollution in the area, indicate quantities emitted and location of point sources relative to proposed action site and sites for proposed alternatives

- Determine impact due to both construction and operation of each alternative Calculate estimated annual quantity of air pollutants for each alternative and determine the percentage increase in regional and local emission inventory for each pollutant emitted

- Calculate ground level concentrations of air pollutants from alternatives under different meteorological conditions Compare calculated air quality levels with ambient air quality standards

- If ambient air quality or emissions standards are exceeded consider mitigation or control measures to minimize the impact

Predicting and Assessing Impacts on Water Quality

- Determine types and quantities of water pollutants that will be emitted for all alternatives and for both construction and operational phases

- Determine the existing water quantity and quality levels for surface water in the area

- Note any unique water pollution problems that have occurred or currently exist

- Describe groundwater quantity and quality including depth of ground water table and direction of ground water flow Identify major local uses of ground water

- Examine applicable surface and ground water quality standards Examine effluent standards and necessary treatment technologies

- Summarize organic waste load allocation study for the area Identify known point sources of pollution and other waste load information Also identify water uses in area

- Determine impacts by calculating estimated daily quantities of water pollutants for proposed action and all alternatives during construction and operational phases and compare to existing waste loads in drain area Determine percentage increase in these waste loads

- Determine "micro" impacts by calculating specific downstream concentrations from pollutants, dissolved oxygen concentrations from organic pollutants, and temperatures from thermal discharges Examine for both construction and operational phases Compare with ambient standards and effluent standards

- If any standards are exceeded consider mitigation or control measures

Predicting and Assessing Impacts on the Biological Environment

- Prepare a description of the flora and fauna comprising the biological environmental setting Describe species community types and their geographical distribution

- Identify rare and endangered species inhabiting the area of interest and discuss relevant characteristics of these species

- If appropriate discuss past and current conservation practices in the area as well as special activities associated with protected species

- Predict the impacts of the various alternatives on the biological environment Quantify the impacts where possible and discuss the rest qualitatively

- Summarize the critical impacts associated with various alternatives Describe the general impacts on the entire ecosystem

Predicting and Assessing Impacts on Socioeconomic Conditions

- Describe the environmental setting in terms of socioeconomic factors The assessment should put more or less emphasis on a

particular factor depending upon how much it will be affected by the alternative being considered

- Identify critical socioeconomic concerns e g , loss or increase in jobs, impact on infrastructure, stress on services such as hospital or security services Primary emphasis should be given to any area of concern where society may deem conditions to be marginal or inadequate

- Predict changes in the socioeconomic factors as a function of various alternatives under consideration, including the "no action' alternative Changes should be quantified where possible and qualitatively described as a minimum

Analysis of Alternatives

Alternatives are different means of meeting a general purpose and identified need Identification, description, evaluation and comparison of alternatives increase the *objectivity* of the environmental assessment process

A *no action* alternative means that the project planner does not engage in the proposed action project or program This becomes the baseline against which the proposed action or any other alternatives are compared

Assessment of the "no action ' alternative involves predicting the impacts on the existing environment 30 to 40 years in the future, if the proposed action were not to occur

In discussing alternatives the assessment should

- summarize the process for selecting the alternatives to be acted upon
- explain the reasons for eliminating other alternatives

Wherever practical the impacts of the various alternatives should be presented as a comparison to sharply define the issues and to provide a clear basis for choice

- use tables when appropriate
- set up the analysis so that alternatives can be distinguished from each other
- present enough information to allow the readers to evaluate the differences among the alternatives

Choice of alternative(s) for action

The choice of the alternative that will be acted upon can be based on professional judgment or on some decision-making technique such as the use of weighted rankings

The alternative selected is not required to be the most environmentally benign alternative The EIA is designed to identify all potential impacts of the proposed projects, not just environmental impacts This helps the developer consider a wide range of options For example, he can decide whether to mitigate or to select an alternative site, what types of mitigation measures to implement and, what types of environmental impacts there will be, depending upon his choices The EIA also serves to inform the public of the alternative selected and to inform the public of potentially adverse effects on the environment

Mitigation and Monitoring

Mitigation measures are those taken to avoid, eliminate or reduce undesirable effects of a proposed activity

Ideally, potential impacts of a proposed activity are identified early so that mitigation measures can be incorporated into all of the alternatives If the acceptability of an alternative depends on fulfillment of certain mitigation measures, it is important to specify and consider the mitigation measures when analyzing of alternatives and to ensure that any mitigation measures are incorporated into the final decision

In the EIA practice of many industrial countries, mitigation activities are prioritized as follows

Hierarchy of mitigation measures

- Avoiding the action or that part of the action that creates an impact needing mitigation
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation
- Rectifying the impact by repairing rehabilitating or restoring the affected environment
- Reducing or eliminating the impact over time by taking maintenance steps during the course of the action
- Compensating for environmental damage by creating enhancing or acquiring resources or environments similar to those affected by an action

Compensating for an impact by substituting resources or environments, or donating land or money for a regional programs for habitat creation,

should be used only if the level of undesirable impacts cannot be adequately reduced by implementing the other measures

This hierarchy also serves as a guide to project planning

- During the initial phases, the project can be designed to avoid or minimize environmental impacts through careful site selection and layout
- During the early phases, the developer's estimate of necessary mitigation measures may change as he learns more and especially during scoping when he receives input from the public and other agencies
- During the assessment stage, mitigation measures can be factored into the analysis of alternatives
- To help with decision making, EIA documentation should include mitigation options for each of the alternatives, if mitigation will be necessary

Throughout implementation of the project (construction, operation and abandonment) analysis should periodically be undertaken to evaluate the impacts and the effectiveness of mitigation measures so the project can be modified or additional mitigation measures can be developed in case of unpredicted impacts

The EIA Guidelines require a mitigation management plan The management plan should identify

Components of mitigation plan

- targets quantified to the extent possible for reduction of specific types of impact
- mitigation measures to be undertaken accompanied by brief technology descriptions
- timeframes for each mitigation measure presented as action steps
- method for monitoring the efficiency of the proposed mitigation measures
- roles and responsibilities for implementation and supervision of mitigation measures

A monitoring plan required in the EIA Guidelines may be a separate management tool or may be integrated into the mitigation management plan The monitoring plan should specify

- pollution parameters that need to be monitored
- methods of measurement and the equipment to be used
- recordkeeping procedures
- responsibilities for monitoring and recordkeeping tasks

Public Participation

There are many techniques that can be utilized to satisfy the EIA Guidelines' requirement for interagency coordination and public participation The most widely used public participation technique is the public hearing, which is a formal meeting for which written statements are received and a transcript is kept Other available means include informal community meetings, public information sessions and project workshops The following are some practical ideas and suggestions that can be useful in organizing a public participation program

Getting input from the public

- Develop a list of groups and citizens in the geographic area who have previously expressed interest or potential interest in the project

- Disseminate project information through the local news media and through regular publication of a newsletter The mailing list should include all government agencies concerned as well as local groups and individuals who have participated in previous meetings or shown interest in the project

- Announce the meetings in local newspapers, on advertisement boards, etc and notify the local authorities the CAA, and other government agencies that have interests and responsibilities in the geographic or technical aspects of the project

- At the meetings try to convey the attitude What can we do in this project to assist you with local problems? How can we coordinate with other local planning efforts and projects? What environmental impacts are you mostly concerned with?

- Record all the feedback you receive at the public meetings and keep any written communications

Public participation can be useful in defining project need describing unique features of the environmental setting and identifying environmental impacts Results can also be utilized when deciding on the significance of environmental items to include in a description of the environmental setting and of environmental impacts to assess Most important public participation can help you decide on the most desirable project alternative

Chapter 3
Pollution Prevention

The environmental protection activities of both government regulators and industries have historically focused on the treatment and disposal of pollutants after they have been generated Pollution prevention places the emphasis on the elimination or reduction of undesired byproducts within the production process itself

Industry's investments in pollution prevention are partially offset by savings from

- lower pollution fees resulting from reduced discharges
- increased energy efficiency
- decreased use of and/or substitution of less polluting, raw materials
- recycling and reuse of process materials

Pollution prevention is the most effective method to promote continual improvement the ISO 14001 management imperative that must be met by the exporting industries in the 10th of Ramadan

Technical assistance provided in these guidelines for the 10th of Ramadan consists of advice and information on clean technologies and on recommended management systems and principles Such value added programs as waste exchanges and deposit-refund schemes are also recommended as means of enhancing efficiencies and creating secondary markets for buyers and sellers of waste

3 1 Pollution Prevention Hierarchy

The United States Environmental Protection Agency (US EPA) defines pollution prevention as any practice which

- reduces the amount of any hazardous substance pollutant or contaminant reentering any waste stream or otherwise released into the environment prior to recycling treatment and disposal or

- reduces the hazards to public health and the environment associated with the release of such substances pollutants, or contaminants, or

- reduces or eliminates the creation of pollutants through (1) increased efficiency in the use of raw materials, or (2) protection of natural resources by conservation

Many terms similar to pollution prevention are used to describe these activities In 1989 the United Nations Environment Program coined the term cleaner production Other terms in use include clean technology waste reduction, waste prevention, eco-efficiency, and waste minimization Since there is no consensus on what these terms mean these guidelines will use the US EPA definition of pollution prevention

A variety of strategies can be used to deal with wastes A hierarchy has been developed to prioritize these strategies Strategies that reduce or eliminate the generation of wastes are preferable to those that treat or dispose of wastes This hierarchy is

Prevention The best waste reduction strategy is one that keeps waste from being formed in the first place Waste prevention may in some cases require significant changes in the manufacturing process but it provides the greatest environmental and economic rewards

Recycling If waste generation is unavoidable the next best strategy is to minimize waste through recycling and reuse

Treatment When wastes cannot be prevented or minimized through reuse or recycling strategies to reduce their volume or toxicity can be pursued While end of pipe strategies can sometimes reduce the amount of waste they are not as effective as preventing the waste in the first place

Disposal The last strategy to consider is alternative disposal methods Proper waste disposal is an essential component of an overall environmental management program but it is the least effective technique

Exhibit 3-1 Pollution Prevention Hierarchy			
Priority	**Method**	**Example**	**Applications**
1	Prevention (Source Reduction)	▸ Process Changes ▸ Design of Products that Minimize Environmental Impacts ▸ Source Elimination	▸ Modify Process to Avoid/Reduce Solvent Use ▸ Modify Product to Extend Coating Life
2	Recycling	▸ Reuse ▸ Reclamation	▸ Solvent Recycling ▸ Metal Recovery from a Spent Bath ▸ Volatile Organic Recovery
3	Treatment	▸ Stabilization ▸ Neutralization ▸ Precipitation ▸ Evaporation ▸ Incineration ▸ Scrubbing	▸ Thermal Destruction of Organic Solvents ▸ Precipitation of Heavy Metals from a Spent Plating Bath
4	Disposal	▸ Disposal at Permitted Facility	▸ Land Disposal of Sludge Ash

3 2 Methodology for Pollution Prevention

Chapter 3 describes a methodology for carrying out a pollution prevention assessment The methodology is generic enough to be applicable to a broad spectrum of industry It consists of a pre-assessment phase (Phase 1) a data collection phase to derive a material balance (Phase 2) and a synthesis phase where the findings from the material balance are translated into a waste reduction action plan (Phase 3)

Not all of the assessment steps will be relevant to every situation In other situations additional steps may be required However simple or complex the situation the following approach should form the basis of your investigations

3 2 1 Pre assessment

Step 1 Assessment Focus and Preparation

A thorough preparation is needed for an efficient and cost-effective study It is particularly important to gain the support of top-level management for both the assessment and the implementation of results without this commitment there will be no real action

A pollution prevention assessment team should be appointed The number of people required on the team will depend on the size and complexity of the processes to be investigated The assessment of a small factory may be undertaken by one person with contributions from the employees A more complicated process may require at least 3 or 4 people technical staff production employees, and an environmental specialist It is wise to involve personnel from each stage of the manufacturing operations in order to increase employee awareness of waste reduction and promote input and support for the program

A pollution prevention assessment will probably require external resources, such as laboratory analytical facilities and possibly equipment for sampling and flow measurement You should attempt to identify external resource requirements at the outset of the project

Analytical services and equipment may not be available to a small factory If this is the case, investigate the possibility of forming an association with other factories or industries in order to share the external resource costs

It is important to select the focus of your assessment at the preparation stage You may wish the pollution prevention assessment to cover a complete process or you may want to concentrate on a selection of unit operations within a process You may wish to look at waste minimization as a whole or you may wish to concentrate on particular wastes such as these

- raw material losses
- wastes that cause processing problems
- wastes considered to be hazardous or wastes that are regulated
- wastes tor which pollution fees or disposal costs are high

A good starting point for designing a pollution prevention assessment is to determine the major problems/wastes associated with your particular process or industrial sector The Rapid Assessment of Sources of Air Water and Land Pollution published by the World Health Organization (WHO 1982) is a useful reference for information on the typical quantities of wastes associated with particular industries

All existing documentation and information regarding the process the plant or the regional industrial sector should be collated and reviewed as a preliminary step Regional or plant surveys may have been undertaken that could yield useful information indicating areas for concern and will also show gaps where no data are available Useful documentation may be produced by asking questions such as these

- Is a site plan available?

- Are any process flow diagrams available?
- Have the process wastes ever been monitored? Do you have access to the records?
- Do you have a map of the surrounding area indicating watercourses, hydrology and human settlements?
- Are there any other factories/plants in the area which may have similar processes?

Other general data which may be collated quickly and which are useful orientation material are described below

- What are the obvious wastes associated with your process?
- Where is water used in greatest volume?
- Do you use chemicals that have special instructions for their use and handling?
- Do you pay effluent or emission discharge fees? How much are they?
- Do you have waste treatment and disposal costs? How much are they?
- Where are your discharge points for liquid solid and gaseous emissions?

Plant employees should be informed that the assessment will be taking place and they should be encouraged to take part The support of the staff is imperative for this type of interactive study It is important to undertake the assessment during normal working hours so that the employees and operators can be consulted the equipment can be observed in operation and most importantly wastes can be quantified

Step 2 Listing Unit Operations

An industrial process can be described in terms of unit operations A unit operation is a part of the process or a piece of equipment where materials are input a function occurs and materials are output possibly in a different form state or composition A number of unit operations make up the process For example a process may comprise the following unit operations raw material storage surface treatment rinsing painting drying product storage and waste treatment

As part of its initial site survey the assessment team should walk around the entire manufacturing plant to gain a sound understanding of all the processing operations and their interrelationships This will help them decide how to describe a process in terms of unit operations During this initial overview, it is useful to record visual observations and discussions and to make sketches of process layout, drainage systems, vents, plumbing and other material transfer areas These help to ensure that important factors are not overlooked

The assessment team should consult the production staff regarding normal operating conditions The production or plant staff are likely to know about waste discharge points and unplanned waste generating operations such as spills and washouts, and they can give the assessors a good indication of actual operating procedures Investigations may reveal that night-shift procedures are different from day-shift procedures or that actual material handling practices are different from those set out in written procedures

A long-standing employee could give some insight into recurring process problems In the absence of any recorded monitoring, these observations can be very useful Care should be taken to see that such employee participation does not become an occasion for assigning blame

During the initial survey note any problems that can be corrected easily These need to be addressed before the assessment is complete

The pollution prevention assessment team needs to understand the function and process variables associated with each unit operation All available information on the unit operations and the process in general should be collated possibly in separate files It is useful to tabulate this information as shown in Exhibit 3-2

Exhibit 3-2 Identification of Unit Operations

Unit Operation	Function	File Number
(A) Surface Treatment	Surface treatment of metal products 10 m spray chamber 6 jets 100/min pump	1
(B) Rinsing	Washing metal products before painting	2

It may also be useful to include information on materials handling operations (manual automatic bulk drums etc) for raw materials, transfer practices and products This information will be helpful later when developing a materials balance (see Section 3 2 2)

Step 3 Constructing Process Flow Diagrams

The individual unit operations can be connected in the form of a block diagram to create a process flow diagram For complex processes a general flow diagram should be drawn to illustrate the main process areas and, on separate sheets of paper, detailed flow diagrams should be prepared for each main processing area

Now you must decide on the level of detail that you require to achieve your objectives

It is important to realize that the less detailed or larger scale the assessment becomes the more information is likely to be lost or masked by oversimplification It is very important to establish the correct level of detail and to focus on specific areas at an early stage

Any obvious waste situation which can be easily reduced or prevented should be corrected before you proceed to developing a material balance (Phase 2) The benefits resulting from simple changes made at this early stage will help enlist the participation and stimulate the enthusiasm of employees for the total pollution prevention assessment/reduction program

Pre-Assessment Summary

By the end of the pre-assessment phase the assessment team should be in place and its members fully informed about the objectives of the pollution prevention assessment

Plant personnel should have been informed of the assessment purpose

Any required financial resources should have been secured and external facilities checked out for availability and capability

The team should be aware of the plant's history and local surroundings

The scope and focus of the pollution prevention assessment should have been established, and a rough timetable worked out

The assessment team should be familiar with the layout of the processes within the plant and should have listed the unit operations associated with each process Sources of wastes and their causes should also have been identified

It should be possible to draw process flow diagrams highlighting those areas to be covered in the pollution prevention assessment

Any very obvious waste saving measures which can be introduced easily should be implemented immediately

The findings of the Phase 1 investigations could usefully be presented to the management in the form of a brief report

3 2 2 Material Balance Process Inputs and Outputs

A material balance is a precise account of the inputs and outputs of an operation

Phase 2 of the pollution prevention assessment describes a procedure for the collection and arrangement of input and output data The procedure can be applied to derive the material balance of a plant a process or a unit operation Inputs are discussed in Steps 4 5 and 6 outputs are discussed in Steps 7 8 9 and 10

Step 4 Determining Inputs

Inputs to a process or a unit operation may include

- raw materials
- recycled materials
- water/air
- power
- chemicals

The inputs to the process and to each unit operation need to be quantified

Examine purchasing records as a first step toward quantifying raw material usage This will rapidly give you an idea of the sort of quantities involved

In many situations the greatest raw material losses occur during storage and transfer You should look at these operations in conjunction with the purchasing records to determine the actual net input to the process

Make notes regarding raw material storage and handling practices Consider evaporation losses spillages leaks from underground storage tanks vapor losses through storage tank pressure-relief vents and contamination of raw materials Often these can be rectified very simply

Record raw material purchases and storage and handling losses in a table in order to derive the net input to the process (Exhibit 3-3)

Exhibit 3-3 Raw Material Storage and Handling Losses

Raw Material	Qty of Raw Material	Qty of Raw Material Purchased (per annum)	Type of Storage Used in Production (per annum)	Average Length of Storage	Estimated Annual Raw Material Losses
Raw Material 1 (Surface treatment chemical	100 kg	95 kg	Closed	1 month	5 kg
Raw Material 2					
Raw Material 3					

Once the net input of raw materials to your process has been determined you should proceed to quantify the raw material input to each unit operation

If accurate information about raw material consumption rates for individual unit operations is not available, you will need to take measurements to determine average figures Measurements should be taken for an appropriate length of time For example, if a batch takes one week to run then measurements should be taken over a period of at least three weeks, these figures can be extrapolated for monthly or annual estimates

While investigating the inputs, talking to staff and observing the unit operations in action the team should be thinking about how to improve the efficiency of unit operations Questions such as these should be considered

- Are raw material inventories kept at levels that ensure material-handling losses can be minimized?
- Could losses be reduced by shortening transfer distances between storage and process or between unit operations?
- Do the same tanks store different raw materials depending on the batch product? Is there a risk of cross contamination?
- Are sacks of materials emptied entirely or is some material wasted?
- Is it possible to reduce residual wastage of any viscous raw materials stored in drums?
- Is the raw material storage area secure? Could a building be locked at night or could an area be fenced off to restrict access?
- How could the raw materials be protected from direct sunlight or from heavy downpours?
- Is dust from stockpiles a problem?
- Is the equipment used to pump or transfer materials working efficiently? Is it maintained regularly?
- Could spillages be avoided?
- Is the process adequately manned?
- How could the input of raw materials be monitored?
- Are there any equipment items in obvious need of repair? Are pipelines self-draining?

- Is vacuum pump water recirculated?

The energy input to a unit operation should be considered at this stage Energy use deserves a full assessment of its own, but for our purposes here it is enough to make a note of the energy source and whether waste reduction could reduce energy costs If energy usage is a particularly prominent factor maybe you should recommend that an energy assessment be undertaken

Water is frequently used in the production process for cooling, gas scrubbing, washouts, product rinsing and steam cleaning This water usage needs to be quantified as an input

Some unit operations may receive recycled wastes from other unit operations These also represent an input

Steps 5 and 6 describe how these two factors should be included in your pollution prevention assessment

Input data should be recorded on your process flow diagram or tabulated as shown in Exhibit 3-4

Exhibit 3-4 Input				
Unit Operation	**Raw Material 1 (m^3/annum)**	**Raw Material 2 (tons/annum)**	**Water (m^3/annum)**	**Energy Source**
Surface Treatment (A)				
Rinse (B)				
Painting ©				
Total Raw Material Used in All Unit Operations				

Step 5 Recording Water Usage

The use of water, other than for a process reaction is a factor that should be considered in all pollution prevention assessments The use of water to wash rinse and cool is often overlooked although it represents an area where waste reductions can frequently be achieved simply and cheaply

Consider these points about the water supply for the entire site before assessing the water usage for individual units

- Identify water sources Is water absorbed directly from a borehole river or reservoir? Is water stored on-site in tanks or in a lagoon?
- What is the storage capacity for water on site?
- How is water transferred — by pump by gravity manually?
- Is rainfall a significant factor on site?
- Identify water quality regular softened demineralized etc

For each unit operation consider the following

- What is water used for in each operation? Possible uses include cooling gas scrubbing washing product rinsing dampening stockpiles general maintenance, safety quench etc
- How often does each action take place?
- How much water is used for each action?

It is unlikely that the answers to these questions will be readily available You will need to undertake a monitoring program to assess the use of water in each unit operation Again, the measurements must cover a sufficient period of time to ensure that all actions are monitored Pay particular attention to intermittent actions such as steam cleaning and tank washouts, water use is often indiscriminate during these operations Find out when these actions will be undertaken so that detailed measurements can be made

Tabulate water usage information as shown in Exhibit 3-5 Be sure a time period is indicated for water used in intermittent actions

Exhibit 3-5 Water Usage

	Cleaning	Steam	Cooling	Other
Unit Operation A				
Unit Operation B				
Unit Operation C				

Reducing water consumption may cut costs in several ways Consider the following points while investigating water use

- Tighter control of water use can reduce both the effluent fee and the volume of wastewater requiring treatment In the extreme case it can reduce volumes and increase concentrations to the point of allowing economic recovery of process materials to replace costly wastewater treatment
- Good housekeeping practices often reduce water usage and in turn the amount of wastewater passing to drain
- The cost of storing wastewater for subsequent reuse may be far less than the treatment and disposal costs
- Counter current rinsing and rinse water reuse are highlighted in the case studies as useful tips for reducing water usage

Step 6 Measuring Current Levels of Waste Reuse/Recycling

Some wastes lend themselves to direct reuse in production and may be transferred from one unit to another (e g reuse of the final rinse in a soft-drink bottle washing plant as the initial rinse), others require some modifications before they are suitable for reuse in a process These reused waste streams should be quantified

If reused wastes are not properly documented, double-counting may occur in the material balance particularly at the process or complete plant level, that is, a waste may be quantified as an output from one process and as an input to another

The reuse or recycling of wastes can reduce the amount of fresh water and raw materials required for a process While looking at the inputs to unit operations think about the opportunities for reusing and recycling outputs from other operations

Steps 4, 5 and 6 Summary

By the end of Step 6 you should have quantified all your process inputs

The net input of raw materials and water to the process should have been established with any losses incurred at the storage and transfer stages having been taken into account

Any reused or recycled inputs should have been documented

All observations regarding raw material handling process layout water losses obvious areas where problems exist should be written up and documented for consideration in Phase 3

Step 7 Quantifying Process Outputs

Outputs from unit operations and from the process as a whole must also be quantified

Outputs include

- the product
- by products including wastes for recovery
- gaseous emissions
- wastewater
- liquid wastes for storage and/or off-site disposal
- solid wastes for storage and/or off-site disposal

Note that infrequent outputs (e g , the occasional dumping of an electroplating bath) may be as significant as continuous daily discharges

You may find that a table along the lines of Exhibit 3-6 will help you organize the output information It is important to identify units of measurement

Exhibit 3-6 Process Outputs

Unit Operation	Product	By-Product	Waste to be Reused	Wastewater	Gaseous Emissions	Stored Waste	Liquid/Solid Wastes Off-Site
Unit Operation A							
Unit Operation B							
Unit Operation C							
Total							

A measure of the amount of primary product or useful product is a key factor in the determination of process or unit operation efficiency If the product is sent off-site for sale the amount produced is likely to be documented in company records However if the product is an intermediate to be input to another process or unit operation the output may be less easy to quantify Production rates will have to be measured over a period of time Similarly any byproducts may have to be measured

Suggestions on how to approach the quantification of wastewater gaseous emissions and wastes for off-site removal are given in Steps 8 9 and 10

Step 8 Accounting for Wastewater

On many sites significant quantities of both clean and contaminated water are discharged to a sewer or to a watercourse In many cases this wastewater has environmental implications and incurs treatment costs In addition wastewater may wash out valuable unused raw materials from the process areas

It is therefore extremely important to know how much wastewater is going down the drain and what the wastewater contains The wastewater flows from each unit operation as well as from the process as a whole need to be quantified, sampled and analyzed

Here are some suggestions on how to carry out a thorough survey of wastewater flows on your site

Identify the effluent discharge points, that is determine where wastewater leaves the site Wastewater may go to an effluent treatment plant or directly to a public sewer or watercourse Often there are several discharge points, some of which are easily overlooked It is important to identify the location, type, and size of all discharge flows

Identify where flows from different unit operations or process areas contribute to the overall flow In this way it is possible to piece together the drainage network for your site This can lead to startling discoveries of what goes where!

Once the drainage system is understood, it is possible to design an appropriate sampling and flow measurement program to monitor the wastewater flows and concentrations from each unit operation

Plan your monitoring program thoroughly and try to take samples over a range of operating conditions such as full production, start-up, shutdown, and washing out In the case of combined storm water and wastewater drainage systems, ensure that sampling and flow measurements are carried out in dry weather

For small or batch wastewater flows a pail and a wristwatch may be the only equipment needed to collect the flow for measurement Larger or continuous wastewater flows will require the use of flow measurement techniques

The sum of the wastewater generated from each unit operation should be approximately the same as that input to the process As with reused wastes (Step 6) care should be taken to avoid double-counting of wastewater that is reused This problem illustrates the importance of understanding your unit operations and their interrelationships

Wastewater flows and concentrations should be tabulated (Exhibit 3 7)

Exhibit 3-7 Wastewater Flows					
	Discharge to Public Sewer	**Stormwater Drain**	**Reuse**	**Storage**	**Total Wastewater Output**
Source of Wastewater	Flow Conc n	Flow Conc n	Flow Conc n	Flow Cone n	Flow Cone n
Unit Operation A					
Unit Operation B					
Unit Operation C					

(Flows in m^3/d concentrations of contaminants of concern in mg/l)

Step 9 Accounting for Gaseous Emissions

A quantification of gaseous emissions associated with your process is a necessary part of the material balance It is important to consider the actual and potential gaseous emissions associated with each unit operation, from raw material storage through to product storage

Gaseous emissions are not always obvious and can be difficult to measure Where quantification is impossible, estimations can be made using stoichiometric information

Tabulate the emission data and indicate which figures are estimates and which are actual measurements

The assessor should also consider and take note of qualitative issues such as

- Are there odors associated with a unit operation?
- Are there certain times when gaseous emissions are more prominent? Are they temperature-related?
- Is any pollution control equipment in place?
- Are gaseous emissions from confined spaces (including fugitive emissions) vented to the outside?
- If gas scrubbing is practiced what is done with the spent scrubber solution? Could it be converted to a useful product?
- Do employees wear protective clothing, such as masks?

Step 10 Accounting for Off-Site Wastes

Your process may produce wastes which cannot be treated on-site These need to be transported off-site for treatment and disposal Wastes of this type are usually non-aqueous liquids, sludges or solids

Transportation and treatment of wastes needing off-site disposal is often costly Minimizing these wastes yields a direct cost benefit

Measure the quantity and note the composition of any wastes associated with your process which need to be sent for off-site disposal Record your results in a table (Exhibit 3-8)

Exhibit 3-8 Wastes for Off-Site Disposal

Unit Operation	Qty	Liquid Composition	Qty	Sludge Composition	Qty	Solid Composition
Unit Operation A						
Unit Operation B						
Unit Operation C						

All measurements in standard units for example m^3/ annum or m^3/day

You should ask several questions during the data collection stage

- Where does the waste originate?
- Could the manufacturing operations be optimized to produce less waste?
- Could alternative raw materials be used which would produce less waste?
- Is there a particular component that renders the whole waste hazardous? Could this component be isolated?
- Does the waste contain valuable materials?

In instances where wastes for off-site disposal need to be stored on-site prior to dispatch these questions should be asked

- Are solvent wastes stored in closed tanks?
- How long are wastes stored on-site?
- Are stockpiles of solid waste secure or are dust storms a regular occurrence?

Steps 7, 8, 9, and 10 Summary

At the end of Step 10 the assessment team should have collated all the information required for evaluating a material balance for each unit operation and for a whole process

All actual and potential wastes should have been quantified Where direct measurement is impossible, estimates based on stoichiometric information should have been made

The data should be arranged in clear tables with standardized units Throughout the data collection phase the assessors should make notes regarding actions procedures and operations that could be improved

Step 11 Assembling Input and Output Information for Unit Operations

Material balance is a basic law of chemical engineering Stated simply, material balance means that the total of what goes into a process must equal the total of what comes out A material balance should be prepared at whatever scale is appropriate to provide the level of detail required in your study A material balance may be needed for each unit operation or it may be sufficient to have just one to account for a whole process These guidelines illustrate the preparation of a material balance for a unit operation

Preparing a material balance will give you a better understanding of the inputs and outputs especially waste, of a unit operation and will help you identify areas where information is inaccurate or lacking Imbalances require further investigation Do not expect a perfect balance your initial balance should be considered a rough assessment to be refined and improved as you learn more

Assemble the input and output information for each unit operation and then decide whether all the inputs and outputs need to be included in the material balance For example it is not essential to include information on cooling water where the cooling water input to a unit operation equals the cooling water output

Standardize units of measurement (liters tons or kilograms) on a per day per year or per batch basis

Summarize the measured values in standard units by reference to your process flow diagram It may have been necessary to modify your process flow diagram following the in-depth study of the plant

Step 12 Deriving a Preliminary Material Balance for Unit Operations

Now it is possible to complete a preliminary material balance For each unit operation utilize the data developed in Steps 1-10 and construct your material balance Display your information clearly Exhibit 3-9 is one way of presenting the material balance information

Exhibit 3-9 Preliminary Material Balance for Each Unit Operation

Inputs	(amount in standard units per annum)
Raw Material 1	
Raw Material 2	
Raw Material 3	
Waste Reuse	
Water	
Total	

↓

Unit Process A

↓

Outputs	(amounts in standard units per annum)
Product	
By-product	
Raw Material Storage and Handling Losses	
Reused Wastes	
Wastewater	
Gaseous Emissions	
Stored Wastes	
Hazardous Liquid Waste Transported Off Site	
Hazardous Waste Transported Off Site	
Non Hazardous Liquid Waste	
Non Hazardous Solid Waste Transported Off Site	
Total	

Note that a material balance will often need to be carried out in weight units since measures of volumes are not always taken and recorded Where volume measurements have to be converted to weight units take account of the density of the liquid gas or solid concerned

Once the material balance for each unit operation has been completed for raw material inputs and waste outputs it might be worthwhile repeating the procedure with respect to each contaminant of concern It is highly desirable to carry out a water balance for all water inputs and outputs to

and from unit operations because water imbalances may indicate serious underlying process problems such as leaks or spills The individual material balances may be summed to give a balance for the whole process a production area, or the entire factory

Step 13 Evaluating the Material Balance

The individual and sum totals making up the material balance should be reviewed to determine information gaps and inaccuracies A significant material imbalance means further investigation is needed If outputs are less than inputs, look for potential losses or waste discharges (such as evaporation) Outputs may appear to be greater than inputs if large measurement or estimating errors have been made or some inputs have been overlooked

At this stage you should take time to re-examine the unit operations to attempt to identify where unnoticed losses may be occurring It may be necessary to repeat some data collection activities

Step 14 Refining the Material Balance

Factors identified in the previous step should be added to the material balance equation Where there are still gaps estimates of unaccountable losses will have to be calculated

In relatively simple manufacturing plants preparation and refinement of a preliminary material balance (Steps 13 and 14) can be done at the same time For more complex pollution prevention assessments it is better to keep the two steps separate

Remember the inputs should ideally equal the outputs but in practice this will rarely be the case and some judgment will be required to determine what level of accuracy is acceptable

In the case of high strength or hazardous wastes accurate measurements are very important since these figures will be used in the design and evaluation of various waste reduction options

Steps 11, 12, 13, and 14 Summary

By the end of Step 14 you should have assembled and refined information covering process inputs and process outputs These data should be organized and presented clearly in the form of material balances tor each unit operation

These data form the basis for the development of an action plan for waste minimization

3 2 3 Synthesis

Phases 1 and 2 described how to plan and implement a pollution prevention assessment resulting in the preparation of a material balance for each unit operation

Phase 3 interprets the findings from the material balance and identifies process areas or components of concern

The material balance focuses the attention of the assessor The arrangement of the input and output data in the form of a material balance facilitates an understanding of how materials flow through a production process

You should use the material balance to identify the major sources of waste to look for deviations from the norm in terms of waste production to identify areas of unexplained losses and to pinpoint operations which contribute to flows that exceed national or site discharge regulations Process efficiency is synonymous with waste minimization

Different waste reduction measures require varying degrees of effort time and financial resources They can be categorized in two groups

- obvious waste reduction measures including improvements in management techniques and house-keeping procedures that can be implemented cheaply and quickly
- long-term waste reduction measures involving process modifications or substitutions

Reuse/recycling programs fall somewhere between the immediate and the more substantial waste reduction measures

Steps 15 16 and 17 describe how to identify waste reduction opportunities

Step 15 Examining Obvious Waste Reduction Measures

It may have been possible to implement some very obvious waste reduction measures at the beginning of the assessment process before you began data collection for the material balance The possibility of making further simple improvements may become apparent now, as you consider

the material balance information in conjunction with visual observations made during the data collection period

Use the information gathered for each unit operation to develop better operating practices for all units

Significant waste reductions can often be achieved simply by improved operation better handling and generally taking more care The following list of waste reduction hints can be implemented immediately at little or no added cost

Specifying and ordering materials

- Do not over-order materials especially if the raw materials or components can spoil or are difficult to store
- Try to purchase raw materials in a form which is easy to handle for example pellets instead of powders
- It is often more efficient and certainly cheaper to buy in bulk

Receiving materials

- Demand quality control from suppliers by refusing damaged, leaking or unlabeled containers Undertake a visual inspection of all materials coming on to the site
- Check that a sack weighs what it should weigh and that the volume supplied is the volume ordered
- Check that composition and quality are correct

Material storage

- Install high level control on bulk tanks to avoid overflows
- Bund tanks to contain spillages
- Use tanks that can be pitched and elevated with rounded edges for ease of draining and rinsing
- Dedicated tanks receiving only one type of material do not need to be washed out as often as tanks receiving a range of materials
- Make sure that drums are stored in a stable arrangement to avoid damaging drums while in storage

- Implement a tank checking procedure, dip tanks regularly and document to avoid discharging a material into the wrong tank

- Evaporation losses are reduced by using covered or closed tanks

Material and water transfer and handling

- Minimize the number of times materials are moved on site Check transfer lines for spills and leaks

- Consider whether the flexible pipework is too long

- Catch drainage from transfer hoses Plug leaks and fit flow restrictions to reduce excess water consumption

Process control

- Provide employees with feedback on how waste reduction is improving the process operators will be more motivated to support these activities if kept informed of why actions are taken and what it is hoped they will achieve

- Design a monitoring program to check the emissions and wastes from each unit operation

- Regular maintenance of all equipment will help to reduce fugitive process losses

Cleaning procedures

- Minimize the amount of water used to wash out and rinse vessels Indiscriminate water use contributes a large amount to wastewater flows Install self-sealing valves to ensure that hoses are not left running

- Investigate how washing water and cleaning solvents can be contained and used again before discharge to drain These can often be used more than once

Where quick and simple adjustments cannot solve the entire waste disposal problem more detailed consideration of waste reduction options will be needed (Steps 16-18)

Step 16 Targeting and Characterizing Problem Wastes

Use the material balance for each unit operation to pinpoint the problem areas associated with your process The material balance exercise may have brought to light the origin of wastes with high treatment costs or may indicate which wastes are causing process problems in which operations The material balance should be used to help you establish your priorities for long-term waste reduction

At this stage, it may be worthwhile considering the underlying causes of waste generation These could include poor technology, lack of maintenance, and non-compliance with company procedures

Additional sampling and analysis of waste materials may be necessary to ascertain the exact concentrations of contaminants

List the wastes in order of priority for reduction actions

Step 17 Segregation

Segregating wastes by type and by strength may not be a proper part of a pollution prevention assessment's step-by-step sequence, being but one of numerous activities that can serve waste reduction purposes It is addressed here because it is the most effective and universal of such activities

Segregation of wastes can enhance opportunities for recycling and reuse which reduce raw material costs Concentrated simple wastes are more likely to be of value than dilute or complex wastes

Mixing wastes can aggravate pollution problems If a highly-concentrated waste is mixed with a large quantity of weak relatively uncontaminated effluent the result is a larger volume of waste requiring treatment Isolating the concentrated waste from the weaker waste can reduce treatment costs The concentrated waste may require physical chemical and biological treatment before it will meet allowable discharge levels whereas the weaker effluent may need only settlement before being discharged

Review your waste collection and storage facilities to determine if waste segregation is possible Adjust your list of priority wastes accordingly

Step 18 Developing Long Term Waste Reduction Options

Waste problems that cannot be solved by simple procedural adjustments or improvements in housekeeping practices may require substantial changes in process or production Changes of this type include

- changes in the production process, e g , continuous versus batch processing
- equipment and installation changes
- changes in process control e g , automation
- changes in process conditions such as retention times temperatures agitation pressure, catalysts
- use of dispersants in place of organic solvents where appropriate
- reduction in the quantity or change in the type of raw materials used
- reuse of wastes as raw materials or the substitution of raw materials that produce less waste or less hazardous waste
- substitution of cleaner technologies

Waste reuse can often be implemented if materials of sufficient purity can be concentrated or purified Technologies such as reverse osmosis ultrafiltration electrodialysis distillation electrolysis and ion exchange may enable materials to be reused so that less waste remains to be treated

Where waste treatment is necessary a variety of technologies should be considered These include physical chemical and biological treatment processes Sometimes a treatment method can recover valuable materials for reuse Sometimes another industry or factory may be able to use or treat a waste that you cannot treat on site The waste exchange that is proposed for the environmental management program in the 10th of Ramadan may at some future time provide for a sharing of treatment and reuse facilities

Finally consider the possibilities for making product improvements and developing new products that have a less harmful impact on the environment

Steps 15,16, 17 and 18 Summary

By the end of Step 18 you should have identified all available waste reduction options

Step 19 Environmental and Economic Evaluation of Waste Reduction Options

Before deciding which options should be included in a waste reduction action plan, you should consider each option in terms of its environmental and economic benefits

Environmental Evaluation It is often taken for granted that reduction of a waste will have environmental benefits This is generally true but there are exceptions to the rule For example, reducing a certain waste may give rise to pH imbalances or may produce another waste which is more difficult to treat

The benefits are often obvious, as when segregation of the polluted material allows for the removal of a toxic element from an aqueous effluent, or when a change in a process prevents waste from being generated In other cases the environmental benefits may be less tangible For example a cleaner and healthier workplace produces more efficiently but this is usually difficult to prove

For each option a series of questions should be asked

- How much effect does the option have on waste volume and degree of contamination?
- Does the option have cross-media effects? For example does the reduction of a gaseous waste produce a liquid waste?
- Does the option change the toxicity degradability or treatability of the wastes?
- Does the option use more or less non-renewable resources?
- Does the option use less energy?

Economic Evaluation A comparative economic analysis of the waste reduction options should be undertaken Where benefits or changes cannot be quantified (e g reduction in future liability worker health and safety costs) a qualitative assessment should be made It may be useful to consult an expert for help with this kind of assessment

An economic evaluation of waste reduction options should compare operating costs to show where cost savings would be made For example a waste reduction measure that reduces the amount of raw material lost to drain would reduce raw material costs Raw material substitution or process changes that reduce the amount of solid waste that has to be transported off-site would reduce transport costs

Current waste treatment costs should be included in the comparison

The various waste reduction options may require significant changes in the treatment processes and/or an increase in the capacity of the treatment plant These costs must be considered in an economic evaluation

To make the evaluation, calculate the annual operating costs for an existing process that uses waste treatment, then estimate how these would be altered by the introduction of each of the various waste reduction options Tabulate the process and waste treatment operating costs for both the existing process and for each of the proposed waste management options Exhibit 3-10 shows the typical cost components Any monetary benefits (e g reduced fuel and/or water consumption, recycled or reused materials or wastes) should be taken into account and subtracted either from the total process costs or from waste treatment costs, whichever is appropriate

Capital costs must also be considered The investment required to implement an option can be assessed by looking at the payback period Payback period is the time it takes for a project to recover its financial outlay It is a simple measure of investment risk (A more detailed investment analysis may involve an assessment of the internal rate of return and net present value of the investment based on discounted cash flows)

The environmental benefits the savings in process and waste treatment operating costs and the payback period are the three pieces of information you need to decide which options you want to act on

Exhibit 3 11 summarizes the key components of an evaluation of pollution prevention actions being considered by an Egyptian textile company For each action the environmental and health benefits are listed along with the implementation costs the expected cost savings and the length of the payback period

Exhibit 3-10 Annual Process and Waste Treatment Operating Costs

Process Operating Costs	Annual Cost
Raw Material 1	
Raw Material 2	
Water	
Energy	
Labor	
Maintenance	
Administration	
Other	
Total	

Waste Treatment Operation Costs	Annual Cost
Raw Material e g Lime	
Raw Material e g Flocculent	
Water	
Energy	
Trade Effluent Discharge Costs	
Transportation	
Off Site Disposal	
Labor	
Maintenance	
Administration	
Other e g violation fines	
Total	

Exhibit 3-11 Summary of Evaluation of Pollution Prevention Actions for an Egyptian Textile Company

Operation	Pollution Prevention Action	Environmental & Health Benefits	Implementation Cost (LE)	Financial Benefits (LE/year)	Payback Period months
Utilities	Tune up boilers	Reduce fuel consumption and air emissions	40 000	218 400	**2**
Utilities	Insulate steam pipes replace steam valves and traps	Reduce fuel consumption and air emissions	92,000	226,200	**5**
Bleaching	Indirect heating in the bleaching process	Reduce fuel water consumption and improve product quality	3 200	306 000	**1**
Bleaching	Eliminate/substitute the chlorine bleach from the bleaching range	Minimize hazardous waste discharge	0	39,300	**immediate**
Printing	Scrap paint mix from used barrel	Minimize hazardous waste discharge and increase operational efficiency	0	72 000	**immediate**
Printing	Substitute less harmful chemicals for cleaning rubber belts and blankets of the printing machine	Minimize hazardous waste discharge and improve workers health and morale	23 000	39 000	**7**
Printing	Prevent overflow spillage at the applicator part of the engraved rollers	Minimize hazardous waste production and discharge improve product quality	0	240 000	**immediate**
Printing	Replace kerosene solvent by aqueous system	Eliminate kerosene emissions and effluent	0	53 000	immediate
TOTAL			**158,200**	**1,193,000**	**2**

gal

Step 20 Developing and Implementing An Action Plan Reducing Wastes and Increasing Production Efficiency

Once you have considered both the easily implemented waste reduction measures identified in Step 15 and the more expensive and longer-term waste reduction measures evaluated in Steps 18 and 19, you are ready to discuss your findings with members of staff and begin to develop an action plan

It is critical to the eventual success of the plan that sufficient attention be given to explaining the rationale for undertaking a pollution prevention assessment waste prevention makes sense It saves production costs and it reduces pollution charges It identifies areas of continual improvement for companies trying to achieve or maintain certification under ISO 14001

These explanations should precede implementation of the waste reduction action plan Those who must work to new procedures will need to be convinced that the shift of emphasis from end-of-pipe treatment to waste prevention does make sense and will improve efficiency

Use posters around the worksite to publicize the benefits of waste reduction including any positive effect upon the health and safety of company personnel

Develop a timetable for implementing the plan Remember that it may take time for the staff to feel comfortable with a new way of thinking It is a good idea to implement waste reduction measures slowly but consistently to allow everyone time to adapt

Set up a monitoring program to run alongside the waste reduction plan so that actual improvements in process efficiency can be measured Relay these results back to the workforce as evidence of the benefits of waste reduction Adopt an internal recordkeeping system for maintaining and managing data to support material balances and waste reduction assessments

It is likely that you will have highlighted significant information gaps or inconsistencies during the pollution prevention assessment investigations You should concentrate on these gaps and explore ways of developing the additional data This may be a time to bring in outside experts

A good way to create waste reduction incentives is to set up an internal waste charging system those processes that create waste in great volume or wastes that are difficult and expensive to handle would have to pay a greater portion of the treatment costs Another method of motivating staff would be to offer financial reward for individual waste-saving efforts, with costs paid out of savings realized from the waste reduction actions

Pollution prevention assessments should be scheduled regularly They should be adapted to your own situation and should be designed to incorporate information on any technological advances that could lead to waste reduction and the development of cleaner products

Process employees need to be trained to undertake material balance exercises This will help to raise awareness and to build support in the workforce Operators are the people who can really make a difference to process performance without their support waste reduction actions will be ineffectual

Step 21 Summary

Commit time to educating senior management about waste reduction so they will support both the assessment and the implementation of your waste reduction action plan Implement the plan slowly to allow the workforce time to adjust

Monitor process efficiency

Relay results back to the workforce to show them the direct benefits

Train personnel to undertake their own pollution prevention assessments

Chapter 4
Establishing an Environmental Management System (EMS)

One of the best approaches for companies trying to achieve and demonstrate sound environmental performance is to develop, implement and maintain an environmental management system (EMS), integrated with overall management activity and addressing all aspects of environmental performance Exporting firms in the 10th of Ramadan may feel special global market pressures to seek certification to an international standard even though Egypt's laws may not require as stringent a standard

4 1 ISO 14000 Standards

4 1 1 What is an Environmental Management System?

The basic components of an EMS are specified in the ISO 14000 series of voluntary standards that have been developed by the International Standards Organization (ISO) ISO 14001 is the standard that details the basic requirements of an effective EMS The ISO 14004 standard provides guidelines systems and supporting techniques for an EMS ISO 14010 14011 and 14012 standards contain guidelines and principles for auditing an EMS and qualifications criteria for EMS auditors

ISO standards are not intended to serve as substitutes for or supplements to national environmental laws and regulations ISO 14000 purposely refrains from establishing specific performance levels and rates of improvement Instead the standard provides a framework that allows individual companies the flexibility to establish their own policies and performance objectives which may go beyond the current regulatory requirements

An EMS is essential to a company that wants to anticipate and meet evolving environmental objectives and to ensure continuous compliance with national and international requirements Since the standard does not specify performance criteria ISO 14000 certification (through either self-declared conformance or third-party registration) does not guarantee that a particular facility has achieved the best possible environmental

performance, only that it has developed an EMS based on the specifications of the standard However, it is expected that improved environmental management will lead to improved environmental performance

4 1 2 What Are the Advantages of the ISO Standard?

In addition to facilitating environmental compliance, the international EMS offers industry a number of advantages An effective EMS can help you to

- assure customers of commitment to environmental management
- maintain good public/community relations
- enhance image and market share
- meet vendor certification criteria
- improve cost control
- conserve input materials and energy
- obtain licenses and authorizations more easily
- improve industry-government relations

ISO 14001 outlines management objectives targets and responsibilities and references management tools such as structure, training communications, document control operational control, and emergency preparedness The enterprise is expected to organize itself to meet its environmental needs in very much the same way that it organizes itself to meet its marketing research financial communications and other business needs The standard is applicable to all types of organizations and is written to accommodate diverse geographical cultural and social conditions It applies to environmental aspects which the organization can control and over which it can be expected to have an influence

4 1 3 What Type of EMS?

The specific design of an EMS depends on a variety of factors — sectoral market environmental and economic to name the most obvious Egyptian industrial establishments especially export-oriented firms should check to see whether ISO 14001 certification is important to their customers Certain industries may find that the benefits of ISO 14001 outweigh the costs while others will find the opposite is true

In industries where customers or suppliers do require environmental protection several alternatives to ISO certification are possible One is to negotiate specific standards and conditions into customer or supplier contracts much like certain multinational corporations do for the disposal of certain hazardous wastes or for worker safety standards and conditions for the safe transfer of chlorine gas

Another approach for certain Egyptian enterprises is to develop their own monitoring and compliance system Thus they would be reasonably well prepared at least in several important respects if called upon to meet specific environmental objectives or even ISO 14001 certification

A firm may want to put an EMS in place for its own management reasons, e g , reductions in waste disposal costs and/or liability insurance or an increase in worker and community satisfaction The EMS should be appropriate to the size and environmental complexity of the firm's operations Executives may need assistance to determine the most appropriate level of volunteerism for such an EMS Smaller firms with links to larger ones can ask for assistance Thus, if a supplier or customer does ask about the firm's environmental practices, clear answers will be available

4 1 4 Self-Examination Is Important

If an Egyptian firm determines that ISO 14001 certification is appropriate it should examine and compare the benefits and limitations of self-certification with those of certification by an accredited international or domestic certifying body In addition, firms should encourage their trade associations to formulate an environmental policy statement so that firms within a given industry can all use the same definition of environmental protection in their EMS

Before beginning the ISO 14000 registration process a firm should understand the magnitude of internal organizational changes that adoption of the standard might require The standard could change the way an entire industry functions as well as its role in the Egyptian industrial economy Industry must understand that the management of its impacts on the environment may require internal re-engineering in order to better address the concomitant economic political social and regulatory challenges

4 2 EMS Development

The first step in designing an EMS is to define an environmental policy for the company and ensure commitment to it (ref Clause 4 2 of ISO 14001) The environmental policy sets the basic principles of environmental responsibility by which the company s performance will be evaluated Section 4 2 1 provides guidance on how to formulate and communicate an environmental policy

After the policy is set, ISO 14001 requires that an implementation plan be developed The planning section of the standard requires a company to

- identify those environmental aspects of the organization's activities, products and services that it can control and influence
- determine which aspects are associated with significant environmental impacts
- identify and maintain access to legal and all other requirements that apply to the environmental aspects of the activities, products and services
- establish objectives and targets
- establish an environmental management program

4 2 1 Environmental Policy

ISO 14001 defines an environmental policy as a statement 'by the organization of its intentions and principles in relation to its overall environmental performance " This policy provides a sense of the organization's direction and commitment to the environment and a framework for setting goals and objectives

ISO 14001 requires that the environmental policy express at least these three commitments

- compliance with relevant environmental legislation and regulations and with other requirements to which the organization voluntarily subscribes
- continual improvement
- prevention of pollution

These elements could be integrated into a policy statement as follows

- Commitment to comply with all environmental regulations and to the extent possible to provide environmental protection beyond the legal requirements
- Commitment to pursue sound environmental management practices which allow for continued improvement within the environmental management system
- Commitment to pollution prevention and the manufacture of products in a manner which reduces releases to the environment

The policy should reflect the reality of the firm's environmental situation For instance, if a company uses large volumes of chemicals and produces large volumes of waste, those particular environmental impacts should be considered in shaping the environmental policy Environmental policy should also consider the company's mission and core values, the requirements of interested parties, and specific local or regional conditions

For companies that don't yet have an environmental policy the most important area to focus on in the development of an EMS is regulatory compliance and the reduction of environmental liabilities The policy can refer to guiding environmental principles that have already been developed by industry associations government, and/or public interest groups To demonstrate its commitment to comply with environmental laws and with the requirements it has set for itself, a firm could develop the following

- a procedure or matrix that specifies applicable environmental legislation and regulations
- a procedure or matrix that specifies applicable voluntary commitments
- plans with target dates, for meeting regulations and commitments
- a procedure for identifying and handling non-compliance
- corrective action plans and completion schedules for non-compliance situations

The second commitment continual improvement is defined in ISO 14001 as the process of enhancing the EMS to bring about improvements in the company s overall environmental performance However there is no obligation in the standard to demonstrate that improvement has occurred Similarly the commitment to pollution prevention means the firm should at least consider ways to prevent pollution but does not specifically obligate the firm to implement pollution prevention measures if they are technically or economically impractical

The following are examples of methods that can be used to demonstrate commitment to pollution prevention

- a procedure for review of new materials to ensure that the least toxic chemicals and raw materials are used whenever economically feasible

- a procedure for identification and evaluation of best available technologies, taking into account technical appropriateness and economic feasibility
- plans and practices for recycling of spent chemicals where practicable
- plans and practices for recycling of metals plastics, paper wood and other recyclable products where practicable
- a method for incorporating concepts of environmentally conscious manufacturing into the manufacturing process

Implementing a sound EMS requires a commitment from all levels of management and all employees Commitment from top management is most critical of all Top management bears the responsibility for setting the company's environmental policy, implementing it and providing input to its formulation and modification

The exact makeup of top management' may be interpreted differently by different organizations It may be the chairman of the board the president, or the CEO or in case of separately managed multiple facilities the general manager of each facility within the firm It is the role of top management to communicate the environmental policy and management s commitment to it to all employees The message must make the point that achieving the policy is the responsibility of every member of the organization To generate support for the policy management may offer rewards for achieving environmental objectives

The organization s environmental policy must also

- be put in writing
- be implemented and maintained
- be communicated to all employees

Documentation can take the form of an environmental policy statement signed by the company s top management Some companies may wish to display such a statement in public areas (e g in the reception area) others may want to distribute it in various forms within the organization

Implementation can be demonstrated by incorporating the policy into the internal documents that guide daily business conduct (e g strategic plan, environmental management program operational procedures manual)

The policy and the reasons for it can be communicated to employees using a variety of mechanisms such as new employee orientation video and audiotapes and written statements

Helpful Hints Formulating an Environmental Policy

- Your company may already have many environmental policies now even if they are not written At the least, you are probably trying to comply with the law and avoid major environmental problems Document these existing commitments and integrate them into your firm's environmental policy

- Keep your policy simple and understandable Ask yourselves what are we trying to achieve? How can we communicate this to the rest of the organization? Can we do what we say we will do? Keep in mind that your policy must be explicit enough to be auditable

- The policy can be a stand-alone document or integrated with your health and safety quality, or other organizational policies

- Make sure that your employees understand the policy Options for communicating your policy internally include posting it around your facility (e g , in lunch rooms offices, conference rooms), using paycheck stuffers incorporating it into training classes and materials and making reference to the policy at staff meetings Test awareness from time to time by asking employees what the policy means to them

- The policy should also be communicated externally Options include business cards neighborhood meetings, stockholder publications newspaper advertisements presentations to public officials annual reports and other means You can choose to communicate the policy proactively or in response to external requests

4 2 2 Legal and Other Requirements for EMS

Clause 4 3 2 of ISO 14001 requires companies to track the legal and other requirements that apply to the environmental aspects of its activities products and services Compliance with legal requirements is one of the three pillars upon which a company s environmental policy should be based (the other two being pollution prevention and continual improvement) Costs of non-compliance in terms of money public image and possible damage to the environment can be very high To maintain regulatory compliance an organization should identify and understand regulatory requirements applicable to its activities products or services

Regulations can exist in several forms

- those specific to the activity (e g , site operating licenses)
- those specific to the organization's products or services

- those specific to the organization's industry
- general environmental laws
- authorizations and licenses

Examples of other requirements to which the company may subscribe are

- industry codes of practice
- agreements with public authorities
- non-regulatory guidelines

The company may also have supplier and contractor requirements or pollution prevention programs it wishes to adhere to Or it may be bound by international agreements, such as environmental treaties or by international guidelines, such as the 16 principles of the International Chamber of Commerce's Business Charter for Sustainable Development

Helpful Hints Identifying Compliance Obligations

To be in compliance with the laws and regulations that apply to your firm you must first know what the rules are and how they affect what you do

An effective EMS will include a process for

- identifying applicable legal and other requirements and
- ensuring that these requirements are factored into the organization's efforts

As legal requirements change you may need to modify your environmental objectives or other elements of your EMS By anticipating new requirements and making the appropriate changes to your operations in advance you can avoid some future compliance problems and their associated costs

Your EMS should include a procedure for identifying and assuring access to the relevant legal and other requirements The process of identifying applicable regulations interpreting them and determining their impacts on you operations can be time-consuming Fortunately there are many sources for information about applicable laws or regulations These include

- commercial services (offered on-line on computer disk and on paper)
- regulatory agencies
- trade groups/associations
- seminars and courses
- newsletters/magazines
- consultants and lawyers

- the Internet
- customers, vendors and other companies

Exhibit 4-1 outlines a simple method for regulatory tracking and analysis which can be used to determine your compliance obligations under Egyptian environmental law

Exhibit 4-1 Methodology for Regulatory Tracking and Analysis

I Purpose

To ensure that the organization identifies has access to and evaluates laws regulations and internal organizational requirements that apply to the environmental aspects of its activities products and services

II Scope

This procedure covers laws regulations and other requirements established at all levels of government that apply to the environmental aspects of the organization s activities services and products The organization takes these requirements into account when setting its environmental objectives

III Definitions

Applicable laws and regulations — Legal requirements promulgated by government authorities that apply to environmental aspects of the organization s products activities or services

IV Procedure

A The environmental manager is responsible for tracking applicable laws and regulations identifying those related to the organization s activities products and services The environmental manager is also responsible for evaluating the potential impacts of these laws and regulations on the organization and its products activities and services

B The environmental manager employs a variety of techniques and information sources to track identify and evaluate applicable laws and regulations These include but are not limited to commercial services/databases information provided by its trade association communications with federal and state regulatory agencies company environmental meetings and periodic environmental refresher training The environmental manager monitors these information sources on a regular basis to ensure that new issues are identified on a timely basis

Exhibit 4-1 Methodology for Regulatory Tracking and Analysis

C If necessary off-site resources (such as consultants and attorneys) may be called upon to assist the environmental manager in evaluating applicable laws and regulations or in developing programs in response to applicable laws and regulations Where off-site resources are used in this manner the organization s environmental manager coordinates such efforts

D The environmental manager disseminates information on applicable laws and regulations (and their potential impacts on the organization s activities products and services) to appropriate personnel The determination of which organization personnel must be informed and the method for providing this information is at the discretion of the environmental manager based on the circumstances of the case

E The environmental manager complies and maintains copies of significant applicable environmental laws and regulations Where copies of such laws and regulations are not maintained at the organization s offices the environmental manager ensures that ready access is available from other sources such as those listed above

F If site audits indicate that additional laws and regulations must be tracked and evaluated the environmental manager ensures that these activities take place

4 2 3 Identification of Environmental Aspects and Impacts

The ISO definition of an environmental aspect is an element of an organization s activity product or service which can have a beneficial or adverse impact on the environment Examples include emissions discharges consumption or reuse of materials or noise Clause 3 3 of ISO 14001 states that a significant environmental aspect is an environmental aspect that has or can have a significant environmental impact Significant environmental aspects are intended to be the focus of the objectives and targets incorporated in the EMS and they are the areas where improved environmental performance should be sought

The ISO 14001 standard requires that the company establish and maintain an up-to-date procedure to identify the environmental aspects of its activities products and services There is a limit to the aspects which the organization can control If a firm does not have control over the environmental impacts caused by customer use for example it would not consider them in its EMS Nevertheless companies should consider

proper handling and disposal mechanisms for their products when this is practical

Consideration is usually given to the following types of environmental aspects

- air emissions
- wastewater discharges
- waste management
- energy use
- water use
- use of raw materials and natural resources

Less frequently occurring but no less important are the environmental aspects associated with planned activities, such as construction, changes in operations, and clean-up projects

Helpful Hints Identifying the Environmental Aspects of Your Firm s Activities

- To understand your environmental aspects, it helps to understand the processes by which you generate products A flow chart of your major processes might help you understand the inputs and outputs of your processes and how materials are used

- Remember to look at services as well as products While the need to examine your on-site operations might be obvious you should also consider the potential impacts of what you do off-site (such as any transportation activities) Similarly the environmental aspects of the products vendors and contractors you use may be less obvious but should still be considered

- There are many readily available sources of information to help you perform your assessment For starters look at your licenses various regulations that apply to your operations audit reports and monitoring records Trade associations regulatory agencies your customers and suppliers also might provide useful information to support your assessment

- Various techniques exist for evaluating environmental impacts The most typical approach to identification of environmental aspects involves examination of individual processes which is often referred to as environmental audit or if it is used to assess compliance with environmental regulations environmental compliance audit Other useful techniques include emission inventory risk assessment process hazard analysis, and pollution prevention audit

- Once you've found a process that works for your company, describe the process in a written procedure A sample procedure for performing the assessment is provided in Exhibit 4-2

- You can start out with a simple process for identifying aspects and then refine the process over time as needed There may be good reasons (such as cost, availability of technology, and scientific uncertainty) for addressing some impacts now and deferring action on others Companies may decide to select certain categories of activities, products, or services and then seek within the category to identify those aspects most likely to have a significant impact It is also possible to identify the environmental aspects you want to focus on by working back from regulatory and legal requirements or legal and business exposure that affects the organization's activities

- Identifying significant environmental aspects is one of the most critical elements of the EMS and can be one of the most challenging Decisions you make doing this task can affect many other system elements (such as setting objectives and targets, establishing operational controls and defining monitoring needs) Careful planning and conduct of this activity will pay dividends in later steps

Exhibit 4-2 outlines a model procedure for environmental aspects identification

Exhibit 4-2 Model Procedure for Environmental Aspects Identification

A	The environmental manager assembles a cross functional team (either internal outside consultant or both) to conduct thorough research analysis and evaluation of the environmental aspects of the company s activity The team should consist of people with knowledge of the target facility(ies) and its processes all applicable environmental regulations and current environmental management practices The specific composition of the team will depend on the size of the company and the nature of its production processes For a small facility the team could be one or two people A larger team may be needed for complex facilities to cover all the environmental aspects The identification of environmental aspects may also require external services such as laboratory facilities or equipment for sampling and flow measurements

Exhibit 4-2 Model Procedure for Environmental Aspects Identification

A successful audit team will benefit not only from the contributions of in house and outside experts but also from the contributions of personnel directly involved in operations Production engineers and line operators are often the best source of data on equipment operation, material usage and maintenance and safety practices This information is critical in identifying environmental aspects

B The team considers each of the stages in the life cycle of the organization s products services and activities including (where appropriate)
- pre-production or service strategy (design procurement etc)
- manufacturing
- production/distribution
- use/service and
- disposal/waste management

C A suitable approach to the identification of environmental aspects may include depending on the nature of the activities
- checklists
- interviews
- direct inspection and measurement and
- results of previous audits or other reviews

D Results of team findings are documented If the team determines that additional information is needed to evaluate a particular product or activity the Team Leader assigns the responsibility for collecting that information to an appropriate team member

E The environmental manager is responsible for working with plant management to ensure that significant environmental aspects identified by the team are considered in setting environmental objectives and targets

The following suggestions will help you identify environmental aspects related to air quality

- Take samples of emissions from all stacks analyze constituents for all regulated parameters Pay special attention to toxic constituents
- Estimate opacity of plume for an indication of whether you have a problem with suspended particulates
- Identify air pollution control technology and determine whether it is efficient

- Sample and measure fugitive emissions around industrial processes and dust outside the facility (roads storage areas), determine whether there is a need for control technology or, if it exists, whether it is efficient
- Determine ambient levels for regulated parameters, if possible
- Determine fuel source for industrial boilers, fuel efficiency, and whether substitutes are feasible

With respect to industrial wastewater discharges the following points are suggested for particular scrutiny

- Sample and analyze effluents from all point sources within a plant determine whether effluent is within standards for all parameters regulated
- Determine whether toxics such as heavy metals are being discharged
- Determine uses of the body of water receiving wastewater discharges
- Determine ambient standards of receiving water body, if possible
- Assess the efficiency of the control technology employed determine appropriate level of control and whether it can or should be upgraded
- Determine whether the supply of chemicals is adequate to precipitate out contaminants
- Examine licenses to determine whether conditions are being met
- Analyze sludges for constituents and to determine appropriate methods of disposal

The following items are suggested for particular attention in identifying the environmental aspects related to hazardous substances and waste management

- Determine categories of hazardous substances
- Determine categories of hazardous waste residuals (the Basel Convention Annex I and III categories can be used)
- Determine volumes of hazardous substances used and wastes generated

- Sample and analyze waste streams to determine hazardous constituents

- Trace path of each waste stream, whether solid or liquid, from generation to disposal

- If disposal is by uncontrolled dumping, identify the existing threats to public health and the environment If disposal is in designated pits, ponds, or lagoons, assess the threat of migration of contaminants to either surface or ground water If co-disposed with other municipal waste, industrial debris and medical waste, assess integrity of dump site to protect against contamination to the air from volatilizing toxics or to surface or ground water by migration of a toxic plume

- Where incineration is used assess the efficiency of the control technology sample and analyze stack gas

- If sludge is composted analyze for presence of toxics, especially heavy metals determine intended use of compost and assess its safety for such use

- Determine whether storage of toxics is protective of human health and the environment, e g , away from workers, designed to prevent migration off-site

The process of identifying environmental aspects should be continual and requires up-to-date information Managers and employees can benefit from exposure to and participation in this process because it will encourage them to learn more about the health and environmental risks associated with the firm s activities This in turn will lead to more informed decision making and more care in daily operations

Once a company has identified its environmental aspects it should determine the impact of each on the environment Impacts are defined in ISO 14001 as any change to the environment whether adverse or beneficial wholly or partially resulting from an organization s activities products and services While aspects are interactions with the environment impacts are the changes in the environment resulting from that interaction The relationship between environmental aspects and impacts is one of cause and effect

Examples of the Link Between Aspects and Impacts	
Aspects	Potential Impacts
Emissions of volatile organic compounds	Increase in ground level ozone
Discharges to stream	Degradation of aquatic habitat and drinking water supply
Spills and leaks	Soil and groundwater contamination
Electricity use	Air pollution global warming
Use of recycled paper	Conservation of natural resources

Typically, an environmental impact is assessed by estimating its

- scale
- severity
- likelihood of occurrence (under normal operation conditions and in emergency situations)
- duration

Quantification of environmental impacts is desirable In the absence of direct data firms can obtain information from a variety of sources including scientific journals reports on regulatory monitoring and trade and professional associations

It is also advisable for companies to consider the business implications of the environmental impacts such as

- potential regulatory and legal exposure
- difficulty of changing the impact
- cost of changing the impact
- effect of change on other activities and processes
- concerns of interested parties
- effect on the public image of the company

4 2 4 Environmental Management System Development

Development of an EMS includes 1) setting objectives and targets based on the identification of environmental aspects and impacts to implement the company s environmental policy, and 2) defining schedules resources and responsibilities for achieving the objectives and targets

Clause 3 7 of ISO 14001 defines an environmental objective as an overall environmental goal arising from the environmental policy that an

organization sets itself to achieve, and which is quantified where practicable " Clause 3 9 defines environmental targets as ' detailed performance requirements, quantified wherever practicable, applicable to the organization or parts thereof, that arise from the environmental objectives and that need to be set and met in order to achieve those objectives "

When establishing environmental its objectives, a company should consider the legal and other requirements pertaining to its activity, its significant environmental aspects, its technological options, and its financial operational, and business requirements The objectives and targets should be consistent with the firms commitment to pollution prevention

Objectives are long-term goals and targets are short-term steps leading to the goal Targets should be specific and measurable and have specific time frames Some examples of paired objectives and targets

Objective reduce use of chemical solvents and substitute biodegradable cleaners
Target by the end of 1997 reduce use of chemical solvents 80% from 1995 levels

Objective reduce waste produced per quantity of finished product
Target by the end of 1998 reduce waste 10% from 1995 levels

Objective increase recycling
Target by the end of 1997 increase the use of recycled material in packaging 50% over levels used in 1995

Objective increase employee training and awareness of environmental issues
Target by the end of 1997 increase the number of environmental training hours per employee 50% over 1995 levels

Helpful Hints Setting Environmental Objectives and Targets

- Objectives and targets should be set by the people in the functional area involved They are the people who will be best positioned to establish plan for and achieve these goals
- Objectives should be consistent with your overall business mission and plan and with the key commitments of your ISO 14001 environmental policy (pollution prevention continual improvement and compliance)
- Be flexible about how your objectives should be achieved Define a desired result and let the people responsible determine how to achieve the result

- Keep your objectives simple at the beginning, gain some early successes and then build on them

- Communicate objectives and targets (as well as your progress in achieving them) across the organization Consider issuing a regular progress report at staff meetings

- To obtain the views of interested parties, consider holding an open house or establishing a focus group with people in the community Take these views into account when establishing objectives and setting targets

- Make sure your objectives and targets are realistic They should reflect the constraints of current technology, capital and available skills Determine how you will measure progress

- Objectives and targets can be applied across the organization or on a site-specific or activity-specific basis Company-wide objectives can be linked to specific targets for every level of the organization An overall objective of a 50% reduction in wastewater may translate into specific reduction targets for each operation or each plant Objectives and targets should be periodically reviewed and revised

- Review your objectives and targets periodically

The following is a sample step-by step procedure on setting objectives and targets

Step 1 Assemble a cross functional team to set objectives and targets List individuals who need to be involved

Step 2 Think about what information your team will need Pull together information sources such as process maps site maps emission and waste data compliance audit reports description of identified environmental aspects communications from interested parties etc

Step 3 Is there other information that might be helpful to the team? Identify and obtain the sources of such information

Step 4 List the significant environmental impacts (you identified these earlier) Categorize these impacts by type air impacts water impacts waste impacts etc List possible objectives and targets

Step 5 Look at processes (such as plating or assembly) and activities (such as shipping or purchasing) Are there are any other issues the team should consider in addition to those listed above as

significant impacts? (For example, you might want to establish an objective to reduce spills of hazardous materials at the loading dock, even if this was not identified as a potentially significant environmental impact) List possible objectives and targets

Step 6 List all regulatory requirements that affect the facility (or other regulations for which the need for additional actions has been identified) List possible objectives and targets

Step 7 List communications with interested parties Is there need for additional objectives because of concerns expressed by neighbors, community groups or other parties?

Step 8 Look at the lists of possible objectives developed in Steps 4-7 Brainstorm with the team on whether these objectives are

- reasonable
- technologically feasible
- consistent with the business plan
- affordable

List preliminary objectives and targets based on this exercise

Step 9 Determine how you will measure each of the selected preliminary objectives (If you cannot establish an effective way to measure it, put that objective ' on-hold for later consideration)

Step 10 For each objective you selected determine who is going to develop the action plan List these names

Exhibit 4-3 lays out responsibilities in setting and tracking environmental objectives and targets

Exhibit 4-3 Responsibilities for Setting and Tracking Environmental Objectives and Targets

1	The organization s top management is responsible for establishing environmental objectives on an annual basis To initiate the process the Plant Manager holds a meeting of all staff members to discuss the development of environmental objectives
2	Each plant area or functional manager is responsible for providing input from his/her own function (Finance Engineering etc) or shop area (Fabrication Assembly Shipping/Receiving etc) The organization s environmental manager is responsible for providing input on applicable laws and regulations significant site environmental impacts and the views of interested parties

Exhibit 4-3 Responsibilities for Setting and Tracking Environmental Objectives and Targets	
3	As a starting point the organization s management evaluates its performance against environmental objectives for the current year As part of this effort management examines the results of its environmental performance evaluations
4	Preliminary environmental objectives are developed for further discussion and evaluation Each manager is responsible for evaluating the potential impacts within his/her functional or shop area (if any) of the proposed environmental objectives The organization s environmental manager reviews proposed objectives to ensure consistency with the overall environmental policy
5	Environmental objectives are finalized based on review comments from site managers and employees Each manager identifies the impacts of the objectives in his/her function or shop area establishes targets to achieve the objectives and develops appropriate measures to track progress towards meeting the objectives and targets
6	Each manager is responsible for communicating objectives and targets (and the means for achieving them) to others in his/her part of the organization
7	Progress towards the objectives and targets is reviewed on a regular basis at management meetings The progress is also communicated to plant employees via bulletin boards and other similar means
8	At the end of each calendar year the organization s management reviews its performance with regard to achieving the objectives and targets This information is used as input to setting objectives and targets for the succeeding year

The EMS incorporates a company s objectives and targets It contains all the planning and logistics that enable a company to achieve the targets it has set for itself According to Clause 4 3 4 of the ISO 14001 standard an EMS must also

- designate responsibility for achieving objectives and targets for each relevant function and level
- provide the means of fulfilling the objectives and targets
- designate a time frame within which they will be achieved

The EMS should list the action steps in order of their priority to the organization These actions may deal with individual processes projects products services sites or facilities within a site

Helpful Hints Developing the EMS Action Plan

- Involve your employees early in establishing and carrying out the program
- Clearly communicate the expectations and responsibilities laid out in the program to those who need to know
- Build on the plans and programs you have now for environmental compliance health & safety, and/or quality management purposes
- Re-evaluate your action plan when you are considering significant changes to your products, processes, facilities, or materials Make this re-evaluation part of your change management process
- Keep the action plan simple and focus on continual improvement of the program over time

Exhibit 4-4 shows a sample format for an EMS action plan

Exhibit 4-4 Sample Format for EMS Action Plan

Objective/Target # ___ _____

Action Items	Priority	Responsi-bilities	Schedule	Resources Needed	Measures to Track Progress

Some companies will integrate the EMS with other planning efforts, such as strategic planning Others will find it easier to maintain the EMS as a separate initiative

Whether an integrated or independent approach is used an effective action plan should describe the critical activities required to achieve the stated objectives and targets and assign departmental and individual responsibility for the implementation of those activities, for providing the resources, and for meeting the timetable The program should also identify the measures that will be used to track progress in achieving the targets

4 3 EMS Implementation

Clause 4 4 of ISO 14001 deals with the implementation of objectives and targets It addresses implementation in seven components

- structure and responsibility
- training, awareness and competence
- communications
- EMS documentation
- document control
- operational control
- emergency preparedness and response

This section provides guidance on all of these components (EMS documentation and document control are discussed jointly)

4 3 1 Structure and Responsibility

The ISO 14001 standard requires the organization to

- define document and communicate roles responsibilities and authorities to implement the EMS
- provide human financial and technical resources necessary to do so

The standard also requires management to appoint a specific management representative(s) irrespective of other responsibilities to ensure that the program is maintained and implemented Further this individual is responsible for reporting on the performance of the EMS to top management The selection of this individual is flexible

- In large organizations there can be several designated representatives

- In smaller organizations, there may be only one and that person may be the owner
- The representative can be the chief environmental officer or an environmental committee that includes managers from across all corporate functions

The primary responsibility of the representative should be overseeing the EMS The management representative should have sufficient authority, responsibility and resources to make sure the EMS is implemented effectively

Helpful Hints Determining the Appropriate Organizational Structure

The following questions can help you determine the right organizational structure for environmental management

- Look at the scope of your EMS What capabilities do we need? Who needs to be involved to make the system effective? What training or other resources will they need?
- Look at your significant environmental impacts What operations/activities need to be controlled? Who needs to be involved to ensure that controls are implemented?
- Look at the results of previous audits or other assessments What does this information tell you about the effectiveness of your company s organizational structure? How could it be improved?
- Look at the current responsibilities for environmental management How can you gain the support and commitment of people throughout the organization? How can other business functions support the EMS?
- Look at your quality management and/or other existing management systems What roles and responsibilities exist in these management systems? Where are the opportunities for integration?
- Consider flow charting your organization s activities relating to environmental management activities This can help you understand how processes work and the final product can be a great communication and training tool Flow charts might be useful for looking at processes such as chemical purchasing and distribution employee training and preventive maintenance among others

It is important to note that environmental performance is not solely the environmental manager s responsibility, the entire organization is

involved There are several helpful approaches to the subject of environmental responsibility

- Distribute environmental responsibility to managers across the organization and to employees whose work is relevant to the environmental objectives

- Provide regular feedback to management and employees on the company s conformance to the EMS requirements and on progress in achieving objectives and targets, including milestones and problem areas This ' open book" management approach will help to engage employees and encourage broad-based support for environmental initiatives

- Consider ways to broaden traditional roles to include environmental responsibilities e g include plant managers in corporate environmental facility reviews This does two things it adds the plant manager's viewpoint to the review process and it broadens the plant manager's knowledge of environmental requirements and opportunities Exhibit 4-5 provides examples of how various existing functions within the organizations can be augmented in order to provide support to the EMS

- Communicate to people what their roles are (as well as the roles of others) All employees must understand their role in achieving the targeted environmental performance and become aware of the potential environmental aspects of their jobs One tool for communicating responsibilities is a responsibility matrix A sample responsibility matrix is presented in Exhibit 4-6

- Build flexibility into your organization s EMS Recognize that environmental (and other) management needs will change over time

Exhibit 4-5 How Various Functions Can Support Your EMS	
Functions	▸ How They Can Help (Possible Roles)
Purchasing	▸ Develop and implement controls for chemical/other material purchases
Human Resources	▸ Define competency requirements and job descriptions for various EMS roles ▸ Integrate environmental management into reward discipline and appraisal systems
Maintenance	▸ Implement preventive maintenance program for key equipment
Finance	▸ Track data on environmental management costs ▸ Prepare budgets of environmental management program ▸ Evaluate economic feasibility of environmental projects
Engineering	▸ Consider environmental impacts of new or modified products and processes ▸ Identify pollution prevention opportunities
Top Management	▸ Communicate importance of EMS throughout organization ▸ Provide necessary resources ▸ Track and review EMS performance
Line Works	▸ Provide first hand knowledge of environmental aspects of their operations ▸ Support training for new employees

Exhibit 4-6 Sample Responsibility Matrix				
	Position			
EMS Implementation Function	**Plant Manager**	**EHS Manager**	**EMS Management Representative**	**Other**
Communicate importance of environmental management				
Establish environmental objectives and targets				
Track/analyze new regulations (and maintain library)				
Obtain licenses and develop compliance plans				
Prepare reports required by regulations				
Coordinate communications with interested parties				
Train employees				
Monitor key processes				
Coordinate emergency response efforts				
Maintain EMS records				
Coordinate auditing efforts				
Other (specify)				

4 3 2 Training

Clause 4 4 2 of ISO 14001 requires that the organization develop procedures to identify training needs and ensure that all personnel whose work may create a significant impact upon the environment receive appropriate training The EMS requires employee competence as well as employee commitment

In order to have an effective training program organizations need to

- identify training needs
- develop a training program and verify that it conforms to regulatory and other requirements
- provide the training
- document the training
- improve the training program

Personnel whose work can cause significant environmental impacts must be competent in performing their tasks The identification of training needs is directly related to identification of the company's environmental aspects and significant environmental impacts ISO 14001 specifies two types of training to be provided 1) training for general environmental awareness for all employees of the firm and 2) training for competence in performing a given assignment for respective system operators

In addition training programs may be needed to increase understanding and build support for energy and environmental issues among technical managers and senior managers at the plant level Managers will need to understand the rationale for changing technical and managerial practices and investing in new technologies It may be advisable to have a leadership training module for managers, to include topics such as decision making taking responsibility evaluating and comparing projects and programs motivating subordinates to make decisions, and implementing change

Training may also be needed for contractors and suppliers performing work that could have environmental impacts Examples include contractors performing work on the company s premises and suppliers performing work on their own premises that must conform to the company s specifications or that involves materials supplied by the organization

Helpful Hints Developing the EMS Training Program

Training Needs

Environmental awareness training must make employees at all relevant levels aware of

- their roles and responsibilities within the context of the EMS
- significant environmental impacts actual or potential of their work activities
- importance of conforming with environmental policies, procedures and EMS requirements

- environmental benefits of improved personal performance
- consequences of violating procedures

Awareness training should be required for employees at all levels, from senior management down to the most junior members of the organization In addition to operators and line managers, employees in business units such as finance marketing, sales, and procurement should receive training

System operators' training should ensure that operators can perform their duties with minimum impact on the environment

Training Program

After determining the need for a specific course, the next step in developing a training program is to select the key topics and a training format The selection of key topics depends on the training needs described above and is largely driven by the ISO 14001 requirements

The courses should generally be three days to one week in length The courses should be interactive, and include not only lectures but also round table discussions case studies and role playing

For environmental awareness training classroom training might include

- an overview of both the company's environmental policy and EMS and ISO 14001 standard
- a step-by step review of operational procedures that apply to environmental issues
- a video showing recommended environmental management practices such as pollution prevention source reduction and recycling
- a panel discussion with managers describing environmental objectives and targets for their areas
- a review of the emergency plan and safety procedures
- written exercises and discussions about the individual employee s role in environmental management

Field training might include

- emergency drills

- hands-on demonstrations of alarms, shutdown devices, bypasses, and other emergency equipment
- demonstrations of environmental aspects of running an operation

For system operators training, classroom training might include

- a video about environmental problems caused by operational errors
- a review of operating procedures
- a review of troubleshooting techniques and corrective actions for nonconformance situations

Field instruction might include

- hands-on operations demonstrations of operations
- field review of alarms, monitoring equipment calibration procedures bypasses, overflows and redundant equipment
- mock drills for handling equipment malfunctions

Training Delivery

The success of a training session depends to a great extent on the technical knowledge and training skills of the instructor Well designed engaging and job-relevant training materials are also very important

Training Documentation

As for most elements required in ISO 14001 documentation is key Adequate documentation including who was trained the training content and the date of training helps ensure ISO 14000 registration A sample training log is presented in Exhibit 4-7

Exhibit 4-7 Sample EMS Training Log						
Training Topic	**Attendees**	**Frequency**	**Course Length**	**Course Method**	**Date Completed**	**Comments**
EMS Awareness						
Supervisor EHS Training						
Hazardous Substances and Waste Management Overview						
Spill Prevention/ Response						
Chemical Management						
Emergency Response						
Accident Investigation						
Personal Protective Equip						
Job Specific Training (list)						
Other						

4 3 3 Communication

Clause 4 4 3 of ISO 14001 requires that the organization establish procedures to

- communicate internally between the various levels and functions of the organization and
- receive document and respond to relevant communication from external interested parties on environmental aspects and the EMS

Open internal communication is critical to an effective EMS Information to be communicated can include the results of EMS monitoring audits and management reviews Internal communication motivates employees helps solve problems and raises awareness

External communication requires greater caution The broad and open disclosure that helps to uncover and solve environmental problems may produce information that companies do not want to disclose externally This is especially true of companies that operate in a strict regulatory environment The standard requires that the communication be relevant" and that it responds to "interested parties " The implication is that an organization decides what is relevant, it need not respond to each and every request for information

Communication with external interested parties should be reactive and passive If an outsider requests relevant information the firm must respond Sometimes external communication can generate a useful dialogue with interested parties, allowing companies to communicate information about environmental impacts associated with their operations External communications include the required communications with public authorities on issues such as emergency planning and hazardous waste transport

The United Kingdom's 7750 standard and the European Union's EMAS standard require that companies publish a register of their significant environmental effects (Some countries require different types of impact reporting in regulations) ISO 14001 is different in this regard it does not prescribe such requirements However, many companies do publish environmental annual reports' which often contain detailed information about environmental policies objectives and performance Some companies have established other methods of communication such as company newsletters and open houses for the surrounding community and public officials The objective of external reporting is to demonstrate management commitment to environmental protection to provide a forum for addressing questions and concerns and to encourage acceptance of the company s environmental policies

Helpful Hints Developing Your Communications Strategy

- Determine how proactive your external communications strategy will be Select an approach that fits your organization s culture and strategy For example will reporting on environmental performance and progress give you an edge over the competition?

  While a proactive external communications program may require more resources some organizations have found that a proactive strategy can be quite beneficial Weigh the costs and benefits for yourself but keep in mind that there might be many interested audiences

- In communicating with employees, it is helpful to explain not only what they need to do but why they need to do it For example when describing a requirement based on a regulation simply saying the regulations require it is not sufficient

explanation Try to explain the purpose behind the rule and why it is important Also make a clear connection between the requirement and how it applies to each person's job

- Keep the message simple All communications should be clear, concise, and accurate

- Managing responses to external inquiries does not have to be a burdensome task Use a simple method such as stapling an inquiry to its written response and then filing them together The key is to be able to demonstrate that the organization has a system for responding to external inquiries

Exhibit 4-8 outlines sample EMS procedures for internal and external communications

Exhibit 4-8 Sample EMS Procedure for Internal and External Communications

Internal Communications

1 The Plant Manager is responsible for communicating the organization s environmental policies and procedures to all employees The Plant Manager is also responsible for communicating roles and responsibilities for environmental management

2 Area and functional managers are responsible for communicating environmental targets (and performance vs objectives and targets) to employees in their areas or functions as well as to the management team

3 Area and functional leaders are responsible for communicating environmental procedures (and any changes to the procedures) results of accident and near miss investigations in their areas and other significant environmentally related information (such as upcoming training classes)

4 The selection of the most appropriate mechanism(s) used for internal communication is left to the discretion of the responsible manager Mechanisms that are used for various types of communications include but are not limited to

- all employee meetings
- area environmental meetings
- workstations procedures
- bulletin boards and posters
- memoranda and employee letters
- newsletters

Exhibit 4-8 Sample EMS Procedure for Internal and External Communications

External Communications

A Management of Communications from External Parties

1 Inquiries and other communications from external parties concerning the organization s EMS or environmental performance may be received by a number of the organization s representatives including the Plant Manager the environmental manager and the human resources manager among others All such communications are reviewed by the Plant Manager or his/her designee to determine the appropriate response

2 Communication with representatives of regulatory agencies is delegated to the organization s environmental manager who maintains records of all such communications (both incoming and outgoing)

3 Copies of all other written communications on environmental matters are maintained by the human resources manager

B Outreach to Interested Parties

On an as needed basis the organization solicits the views of interested parties on its environmental management system its environmental performance and other related matters In particular such outreach is conducted when significant changes at the facility are being considered such as facility expansion or other actions that might affect the actual or potential environmental impacts of the organization s products activities or services

4 3 4 EMS Documentation and Document Control

Clause 4 4 4 of ISO 14001 requires that the organization establish and maintain information in paper or electronic form that describes the basic elements of the EMS and their interaction and provides a directory for related documentation

This information system should make it easy for users to find information such as the following

- internal operating procedures
- internal standards
- process information
- work instructions

- site emergency plans
- records

This system can be integrated and shared with other information systems within the organization It is common for organizations to create an EMS manual that provides the basics, such as the environmental policies, objectives targets key roles, and major responsibilities The manual also references related documentation and other aspects of the organization s management system

ISO 9000 (the international quality control standard) establishes a documentation hierarchy consisting of four levels Each level requires a greater degree of detail about company operations and methods than the previous one

- *environmental manual* contains the basic policies objectives and targets and other general information about the EMS program
- *company operating procedures* describes the overall flow of activities
- *work instructions* specifies detailed activity guidelines
- *records* includes all documentation needed to demonstrate compliance with the EMS and its requirements

ISO 9000 has been criticized for the massive amounts of seemingly useless documentation it requires ISO 14001 requires only that an organization document those aspects of its operations that demonstrate to an auditor that the system is in place and functioning effectively The Annex to ISO 14001 emphasizes that the primary focus of the standard is effective implementation rather than detailed documentation

Some organizations may be able to put all relevant information into a binder and keep it in a central location Establishments that have a computer network can organize and distribute up to-date information via that means Paper copy distribution can also work as long as obsolete documents are regularly removed from service

Clause 4 4 5 requires the organization to set up clear procedures for handling and maintaining all documents required by the ISO 14001 standard The procedure must produce documents that

- can be located
- are legible identifiable dated and maintained in an orderly manner

- are periodically reviewed, revised and checked for adequacy
- are updated and made available to everyone who needs them, at all essential locations
- are maintained for a specified period and removed from use when obsolete
- if obsolete, but being retained for legal and/or accounting reasons, are identified as such

ISO 14001 distinguishes between procedures that have to be documented and those that do not Only three types of procedures must be documented

- operating procedures for activities associated with significant environmental impacts
- monitoring and measurement of activities that can have a significant environmental impact
- periodic evaluation of regulatory compliance

Egyptian companies are also required to maintain an Environmental Register that records its environmental impacts Decree 338/1995 stipulates that such registers contain the monitoring data, technical specifications of environmental controls at the facility, and regulatory inspection results The Register must be retained for ten years

Eleven other elements of the EMS must also be documented according to ISO 14001

1 environmental policy
2 environmental objectives and targets
3 roles responsibilities and authorities
4 communication from external parties
5 decision regarding external communication about significant environmental aspects
6 EMS documentation
7 calibration and maintenance of monitoring equipment
8 changes in any documented procedures
9 training
10 results of audits and reviews
11 management review of the EMS

ISO 14001 also requires that the company establish and maintain 11 additional procedures that do *not* need to be documented These are

1 identification of environmental aspects
2 identification of significant environmental aspects of good and services used by the organization
3 identification of legal and other requirements and ways to access these
4 identification of training needs
5 internal communication
6 methods of receiving, documenting, and responding to relevant communication from external interested parties
7 document control
8 identification of the potential for and response to accidents and emergencies
9 defining responsibility and authority for addressing nonconformance and corrective/preventive action
10 identification, maintenance, and disposition of environmental records
11 EMS audits

Some companies will demonstrate the existence and implementation of these procedures through means other than formal documentation For example in the absence of written documentation, personal observation coupled with employee interviews that provide consistent, clear descriptions about specific procedures is one means of verifying that required procedures are in place While it is not required for ISO 14001 certification many companies are choosing to document these 11 procedures Formal documentation minimizes the risk of departure from established practices simplifies training and facilitates internal audits and management review of the EMS

Whether a company limits itself to the mandated documented procedures or creates additional documents it must establish a procedure for managing those documents Excessive bureaucratization should be avoided since the company s primary focus should be effective implementation of its EMS not a complex documentation control system

Helpful Hints
EMS
Documentation

- Keep your EMS documentation simple and choose the format that works best for your organization The documentation does not need to describe every detail of your EMS or how your organization conforms to the ISO 14001 standard (or other EMS criteria) Instead consider providing references to other documents or procedures

- All documentation should be clear usable and informative

- The usefulness of your EMS documentation can be improved by including the organization s mission statement, vision guiding principles and annual objectives (if these exist) These will help

readers understand the organizational context and how the EMS supports overall business goals

- An EMS manual can be a useful tool for explaining your EMS to new employees, customers, or others
- Prepare a document control index that shows all of your EMS documents and the history of their revision Put this index in your manual Also, if multiple copies of documents are available at the facility prepare a distribution list, showing who has each copy and where the copies are located
- EMS documentation should be updated as needed, based on any system improvements you put in place As your procedures or other documents are revised highlight the changes (by underlining, boldface etc) This will make it easier for the reader to find the changes

4 3 5 Operational Control

Clause 4 4 6 of ISO 14001 requires that organizations identify and plan the activities and operations "associated with the identified significant environmental aspects in line with its policy objectives and targets "

In conjunction with identifying its significant environmental aspects, an organization must identify the operations associated with those aspects, and the activities undertaken to reduce the negative environmental impacts resulting from these objectives To achieve its abatement targets a company must understand the process parameters of the pollution abatement equipment it uses

The objective of operation control is to ensure that environmental objectives and targets are met To achieve operational control organizations are required to

- prepare documented procedures for the activities and operations to ensure that they do not deviate from policies objectives and targets
- specify operating criteria
- establish and communicate relevant procedures to suppliers and contractors that relate to the significant environmental aspects of goods and services used by the organization

The company must see that its suppliers and contractors understand its requirements so that they do not involuntarily cause the company to

compromise its own EMS This involves communicating requirements for raw materials, procedures for proper disposal of waste products storage procedures and similar activities However, there is no intent in the standard to impose the organization's EMS on suppliers It is not necessary for purposes of ISO 14001, for a company to

- request information from the supplier or contractor about actual or potential environmental aspects and impacts of their activities
- impose its own EMS on suppliers and contractors or demand that they have an EMS of their own
- visit a supplier site to ensure that applicable legal requirements are being met

However, the standard does not prohibit an organization from going beyond what is required and attempt to extend its influence in environmental matters Some countries may require these kinds of activities, in Egypt an organization wanting to undertake these activities could incorporate them into its voluntary commitments

Helpful Hints Developing Operational Control Procedures

- Start by looking at the environmental aspects and potentially significant impacts which you identified earlier Identify the processes from which these significant impacts arise and consider what types of controls might be needed to prevent or manage these impacts If you have flow charts of these processes identify the points in each process where some type of control may be appropriate
- Some of your identified environmental aspects may be related to the chemicals raw materials or other goods and services you obtain from vendors/suppliers Likewise the activities of your contractors can affect your environmental performance Communicate your expectations to these business partners
- Look at procedures you already have in place to comply with environmental and health and safety regulations Some of these may be adequate to control significant impacts (or could be modified to do so) Develop a chart like the one below to keep track of what is needed

Procedure needed (none exists)	Procedure exists but is not documented	Procedure exists and is documented	No procedure needed
▸ ▸ ▸ ▸			

- Prepare draft procedures and review them with the people who will need to implement them This will help to ensure that the procedures are accurate and realistic
- Make the procedures easy to understand and to use
- Decide beforehand how they will be distributed for use
- Provide training and motivation to those responsible for carrying out the procedures
- Create a systematic way for reviewing the procedures to keep them current and relevant to the users

4 3 6 Emergency Preparedness and Response

Clause 4 4 7 of ISO 14001 requires the organization to establish and maintain procedures to identify the potential for and the response to accidents and emergency situations The organization must also be prepared to prevent and mitigate environmental impacts which result from spills accidents or other emergencies In addition the organization must review and revise its emergency preparedness procedures and test where practical

Decree 338 requires an emergency response plan for hazardous substances and waste handling In particular Article 31 declares that

> An emergency plan for confronting any likely accidents that may occur during the production storage transport or handling of these substances [hazardous substances and waste] shall be made available This plan shall be reviewed and sanctioned by the body granting permits [Ministry of Industry] after consulting the EEAA and Civil Defense Body '
>
> Establishments producing and handling these hazardous substances shall compensate injured citizens in the areas

surrounding production or storage sites for the injuries resulting from accidents of these activities, or from the dangerous emissions or leakage from them "

Preparing for an emergency is a critical part of any EMS If an emergency occurs, an organized, competent response will help minimize any damage to human health or the environment Because a comprehensive assessment of environmental aspects addresses the likelihood of environmental impact under abnormal operating conditions and emergency situations many companies find it practical to link that procedure with the requirement of emergency preparedness and response

The ISO 14004 guidance says that emergency plans should include

- assigning authority and responsibility
- developing procedures for providing emergency services
- methods to react to different types of emergencies
- information on hazardous materials
- internal and external emergency communication
- training for emergency preparedness and response

In addition to planning for emergency response the organization might want to model potential releases from the plant site For this purpose, source emission models might be used to evaluate the effects of gas jet releases, liquid jet releases, and liquid pool evaporation Transport and dispersion models may be used to evaluate short-term and long-term effects of a chemical release

The company needs to ensure that it documents the most effective release mitigation techniques for its operations Examples of these techniques include pre-release controls and protection equipment safety systems and procedures and management activities

Helpful Hints Developing an Emergency Plan

One area where additional work is often needed is on identifying the potential for accidents and emergencies A team of site personnel (from engineering maintenance and Environmental Health & Safety for example) can identify most potential emergencies by asking a series of what if" questions related to hazardous materials activities and processes employed at the site In addition to normal operations the team should consider start-up and shutdown of process equipment and other abnormal operating conditions Useful information includes

- material safety data sheets (typically provided by the chemical manufacturer)
- plant drawings
- process flow diagrams
- piping and instrumentation diagrams

- design codes and standards
- specifications on safety systems (alarms, sprinklers, etc)

Communicate with local officials (fire department, hospital, etc) about potential emergencies at your site and how they can support your response efforts

Examples of elements to include in an emergency plan include

Planning Elements

- identification and description of areas on site that store use, or otherwise manage hazardous substances
- identification of neighborhoods, schools, hospitals, parks, wildlife habitats and other sensitive areas around the facility that might be affected by a release of hazardous substances
- documentation of methods used on site for determining that a release of hazardous substances has occurred

Operations, Direction, and Control Elements

- designation of a site emergency coordinator who will determine when to implement the site emergency plan
- designation of other key individuals such as trained incident commander(s) trained emergency response personnel hazardous materials specialists medical personnel security personnel and communication liaison
- description of procedures to be followed by operations personnel in the event of release of hazardous substance
- description of evacuation plans from buildings and from the site
- descriptions of major methods for cleanup
- information identifying outside assistance such as local hazardous materials emergency response team fire department police and medical assistance

Resource Management Elements

- description of emergency equipment on site and auxiliary equipment in the community
- list of personnel resources available for emergency response

- description of the training program for site personnel

Mock drills can be an excellent way to reinforce training and get feedback on the effectiveness of your plans/procedures

4 4 EMS Review and Improvement

The final step in establishing an EMS is to check and monitor the system discover problems and correct them ISO 14001 divides this component into a) checking and corrective action and b) management review Clause 4 5 describes four aspects of the checking and corrective action process

- Measure monitor and evaluate environmental performance
- If problems occur apply corrective and preventive action
- Maintain environmental records to demonstrate conformance of the EMS to ISO 14001 requirements
- Audit the environmental management system

Management review is vital to the success of an organization's EMS It provides the nexus for the company's environmental policy long-term goals environmental results and continual improvement

4 4 1 EMS Monitoring and Recordkeeping

The notion that you can manage only what you can measure is critical to environmental performance evaluation Clause 4 5 1 of ISO 14001 requires documented procedures for

- monitoring and measuring on a regular basis key characteristics of operations and activities that can have a significant impact on the environment
- recording information to track performance operational controls and conformance with environmental objectives and targets
- calibrating and maintaining monitoring equipment such as instruments test equipment software and hardware sampling to ensure reliability and maintaining calibration and maintenance records
- periodically evaluating compliance with relevant environmental legislation and regulations

Although ISO 14001 is not an environmental performance standard it requires that companies compare their actual environmental performance with the performance levels designated by objectives and targets Such comparisons are intended to determine whether the organization is achieving the goals embodied in its environmental policy and addressed through its environmental management program

The most important and challenging elements in monitoring and measurement are, first, selecting the key characteristics and, second, defining the methods of measurement In short, the organization must determine what to monitor and how Country laws, voluntary commitments existing license requirements, impacts on the environment available monitoring, contract laboratory costs, and other factors must be assessed when making decisions about characteristics to include and measurement techniques to employ

Helpful Hints
EMS Monitoring and Measurement

- Monitoring and measuring can be resource intensive One of the most important steps you can take is to clearly define your needs While collecting information is clearly important resist the urge to collect data for the sake of collecting data '
- Review the kinds of monitoring you do now for regulatory compliance and other purposes (such as quality or health and safety management) How well does this serve your EMS purposes? What additional monitoring or measuring might be needed?
- You can start with a relatively simple monitoring and measurement system then build on it as you gain experience
- Monitor key process characteristics Many management theorists endorse the concept of the vital few i e only a limited number of factors need to be measured to determine the outcome of a process The key is to figure out what those factors are and how to measure them Root cause analysis is one way to identify what those factors might be Exhibit 4-9 presents examples of key characteristics and measurement methods that can be part of the monitoring and measurement program
- Most effective environmental measurement systems use a combination of process and outcome measures Outcome measures look at results of a process or activity (such as the amount of waste generated or the number of spills that took place) Process measures on the other hand look at upstream factors such as the amount of paint used per unit of product or other number of employees trained A combination of process and outcome measures may be right for your organization

- Equipment calibration Identify process equipment and activities that truly affect your environmental performance As a starting point look at the key process characteristics you identified earlier Some companies choose to put key monitoring equipment under a special calibration and preventive maintenance program This can help to ensure accurate monitoring and lets employees know which instruments are most critical for environmental monitoring purposes In some cases it may be more cost-effective to subcontract calibration and maintenance of monitoring equipment than to perform these functions internally

Exhibit 4-9 Examples of Key Process Characteristics and Measurement Methods

	Key Characteristics	Measurement Methods
Air Emissions	Parameters of applicable emission standards per Decree 338/1995	- on line measurement systems - periodic stack sampling using a sampling train
Wastewater Discharges	Parameters of licenses per Decree 649/1962 and Decree 8/1983	- periodic grab or composite sampling of outfalls for specified parameters - on-line monitoring of certain parameters such as pH screening sampling for batch treatment or process observation
Hazardous Waste	Hazardous wastes specified in the license per Decree 338/1995	amount generated per activity per time period number of waste shipments per time period storage time frames
Treatment Efficiencies	Treatment efficiencies specified in the organization s licenses such as efficiencies in wastewater treatment air pollution abatement incineration and other prescribed technology efficiencies	mass balance analytical comparisons of treatment inputs and outputs manufacturer s literature estimates other data
Energy Use	Amount of energy consumed	- electric bills based on activity index per time period

Exhibit 4-9 Examples of Key Process Characteristics and Measurement Methods		
Water Use	Amount of water consumed (potable and non potable)	-- trends of use as related to activity index, based on water meters and water bills per time period

The standard requires that the organization *maintain appropriate records* to demonstrate conformance The organization must develop procedures for identifying, maintaining, and disposing of environmental records According to Clause 4 5 3, environmental records include training records and the results of audits and reviews "

The company's environmental records may include

- legislative and regulatory requirements
- process and product information
- contractor and supplier information
- monitoring records
- incident and complaint reports
- reports of environmental audits and reviews
- agency inspection records
- training records
- inspection maintenance and calibration records
- emergency response procedures and records

At a minimum the information required by law should be recorded and maintained According to Article 17 of Decree 338/1995 establishments must maintain a register to record the extent of their impact on the environment (See Section 2 16 for the model Environmental Register) The Environmental Register requires recording of the following types of information

- discharges (emissions or effluents) from the facility
- specifications of discharges after the treatment process and the efficiency of utilized treatment units
- environmental control and safety procedures
- periodical tests and measurements and their results

According to ISO 14001 companies are free to determine how long the records will be maintained However *the Egyptian law requires that registers be retained for ten years from the date of their review by an environmental agency representative*

The standard also specifies that environmental records must be ' legible identifiable traceable readily retrievable and protected against damage

deterioration, or loss " The Annex to ISO 14001 notes that companies should take into account confidential business information in the records management process

Helpful Hints
EMS
Recordkeeping

- Focus on records that add value Avoid bureaucracy If records have no value, then don't collect them The records that are kept should be accurate and complete

- You may need to generate certain forms in addition to the legally required form presented in Section 2 1 6 In the course of these Guidelines, the model Environmental Register serves as a basis for media-specific recordkeeping on forms tailored for each medium, as follows for air emissions (Sec 2 3 2), wastewater discharges (Sec 2 4 3) hazardous waste (Sec 2 5 3 and Appendix 3) and industrial solid waste (Sec 2 6 2) All these forms taken together shall comprise the enterprise's Environmental Register

- Establish a records retention policy and stick to it Make sure that your policy takes into account records retention requirements specified in applicable environmental regulations (10 years for the Environmental Register required by Decree 338)

- In designing your records management system be sure to consider

  - who needs access?
  - to what records?
  - in what circumstances?

- Consider using an electronic EMS records management system Maintaining records electronically can provide an excellent means for rapid retrieval of records as well as controlling access to sensitive records

- Think about which records might require additional security Do you need to restrict access to certain records? Should a back-up copy of critical records be maintained at another location?

ISO 14001 requires that companies *evaluate compliance with relevant environmental laws and regulations* Elements of a compliance evaluation procedure might include a list or matrix of Egyptian laws and regulations a list or matrix of licenses and methods for evaluating compliance The following are examples of methods that may be used to evaluate compliance

- Review of hazardous waste documentation, including licenses and registrations required agency reports, required plans, training

records, container and tank inspection logs, records of noncompliance release reporting, waste minimization records, documentation of incidents where the contingency plan was invoked, groundwater monitoring data and reports, and other reports

- Review of air emissions documentation, including construction and operation licenses, emission monitoring data and reports, hours of operation records of control system efficiency, chemical consumption tracking logs, fuel consumption tracking logs, emission inventory and other documents, as required

- Review of wastewater/stormwater discharge documentation, including wastewater discharge monitoring data and reports, spill prevention control and countermeasure plan, pretreatment compliance reports, stormwater monitoring data and reports, stormwater pollution prevention plan, whole effluent toxicity test data and reports records of noncompliance reporting and other documents, as required

- Field inspection to ensure proper handling, labeling, and storage of waste containers proper posting of hazardous waste and other warning signs existence of necessary procedures, inspection logs, and other documentation, proper maintenance of pollution control equipment proper calibration of monitoring equipment and other field items as selected

The requirements do not specify that periodic evaluation of compliance must be made through a compliance audit There are other acceptable methods for meeting this requirement besides a compliance audit

ISO 14001 does not demand that the company be in full compliance with all laws and the specification does not prohibit a company from becoming registered to the ISO 14000 standard even if it does not meet some applicable laws As long as a good-faith evaluation procedure is documented and followed it will be adequate evidence of conformance to this section of the standard

4 4 2 Corrective and Preventive Action under EMS

The focus for correcting and preventing problems is on root cause analysis assessing the disease not just the symptoms The idea is to understand why a problem occurred and to change the system so that it does not recur Clause 4 5 2 of ISO 14001 requires that the organization establish procedures for

- defining responsibility and authority for handling and investigating nonconformances
- acting to mitigate the resulting impacts on the environment
- initiating and completing corrective and preventive action
- implementing and recording changes to documented procedures that result from corrective and preventive action

According to the standard the corrective or preventive action taken to eliminate the causes of actual and potential nonconformances shall be appropriate to the magnitude of problems and commensurate with the environmental impact encountered ' This leaves great flexibility in the scope and complexity of procedures

Nonconformance refers to deviations from the EMS and from requirements of ISO 14001 and should not be confused with noncompliance Regulatory noncompliance is addressed only to the extent that procedures for identifying legal requirements have not been established or appropriately maintained

Helpful Hints
EMS Corrective and Preventive Action

- If your organization has an ISO 9000 management system you should already have a corrective/preventive action process for quality purposes You can use this as a model (or integrate with it) for EMS purposes
- The management system for handling nonconformance would typically include the following key steps
  - identify the problem
  - identify the cause (investigate)
  - come up with solution
  - implement solution
  - document solution
  - communicate solution
- The amount of planning and documentation needed for corrective/preventive actions can vary with the severity of the problem (and its potential environmental impacts) Don t go overboard with bureaucracy simple methods often work best
- Once you document a problem the organization must be committed to resolving it Corrective actions should be implemented as quickly as possible Be sure that your corrective/preventive action process specifies responsibilities and schedules Review your progress regularly and follow up on any deficiencies

- Make sure you collect the right data/information to make good decisions While many corrective actions may be ' common sense," you need to look below the surface to determine why a problem has occurred

- Initially most EMS problems may be identified by your auditors Over the long run, most problems and good ideas may come from the people in the shop doing the work This should be encouraged Find ways to get employees involved in the system improvement process (for example, via suggestion boxes, contests and incentive programs)

Exhibit 4-10 illustrates a sample Corrective Action Notice for the identification of problems and causes and documentation of corrective action

4 4 3 EMS Audit

As emphasized in the introduction to these guidelines, not every establishment may wish to be formally certified to conformance to the ISO 14001 standard Some may opt for designing their own monitoring and compliance systems

For those firms that decide that they need ISO 14001 certification, Clause 4 5 4 of the standard requires that an audit of the EMS be conducted The objectives of the audit are

- to ensure that the EMS conforms to planned arrangements for environmental management including the requirements of this standard and has been properly implemented and maintained

- to provide information on its results to management

The audit program procedures should specify the frequency of the audits the audit scope audit methodologies and responsibilities for conducting the audits and for reporting the results

The EMS audit does not evaluate compliance with regulatory requirements It evaluates the *procedure* to evaluate compliance with laws and regulations Thus an EMS audit would

Exhibit 4-10 Sample Corrective Action Notice (CAN)

CAN Number _____ **Issue Date** _____ **Solution Due Date** _____

	Name	**Location**	**Phone**
Requested by			
Issued to			

Problem Statement (completed by ISO Management Representative)

Most Likely Causes (completed by ISO Management Representative)

Implemented Solutions (completed by recipient — include dates as applicable)

Results (confirming effectiveness)

Closed by _____ **Closing Date** _____

- evaluate management's commitment to regulatory compliance
- evaluate the implementation of the regulatory compliance procedure
- determine whether there is a review process that validates or revises the procedure as necessary

ISO 9000 may be a guide to the acceptable frequency of EMS audits ISO 9000 certification requires a full audit every three years and surveillance audits every six months An ISO 14000 audit program could follow the same schedule Full audits could be conducted every two or three years, and surveillance audits (e g , every six months) would target only areas of nonconformance For an EMS with no nonconformances, different elements could be addressed during surveillance audits, so that all elements are audited at least once during the interval between full audits

The audit provides a snapshot in time of the effectiveness of the company's EMS The audit process should be designed so that both qualitative and quantitative evidence is gathered and used to verify that audit criteria are met The following are examples of methods of collecting such evidence

- interviews with personnel
- examination of documents
- observation of activities
- test and monitoring data
- other records

Audit procedures should assign responsibility for communicating audit findings and designate those individuals to whom these findings are to be conveyed At a minimum audit findings must be communicated to top management as required by ISO 14001 However companies may deem it appropriate to share the results with others in the firm

Helpful Hints
EMS Audits

How frequently do we need to audit? The standard emphasizes that the audit program and its scheduled frequency be based on the environmental importance of the activity concerned and the results of previous audits In determining the frequency of your EMS audits some issues to consider are

- the nature of your operations
- the significant environmental aspects/impacts (which you identified earlier)
- the results of your monitoring program
- the results of previous audits

As a rule of thumb all parts of the EMS should be audited *at least annually* You can audit the entire EMS at one time or break it down into discrete elements for more frequent audits (There may be advantages to more frequent audits but the decision is up to you)

Who will perform the audits? The audit can be conducted by personnel within the organization or by a third party audit team EMS auditors should be trained in auditing techniques and management system

concepts Internal auditors are likely to have a better understanding of the company's legal obligations and operating processes than external consultants do The risk of conflicts of interest can be minimized by ensuring that internal auditors are independent of the business units they are auditing

On the other hand external auditors often are better able to view company activities objectively Their experience in auditing other companies may also provide a more realistic interpretation of ISO 14001 requirements A combination of internal and external auditors is also a viable option

Before you start an audit, be sure to communicate the audit scope, schedule and other pertinent information with the people in the affected area(s) This will help avoid confusion and will facilitate the audit process

Your EMS audits should focus on objective evidence of conformance (If you cannot tell whether or not a particular procedure has been followed then you should consider revising the procedure) During the actual audit auditors should resist the temptation to evaluate why a procedure was not followed That step comes later

During the course of the audit, auditors should discuss identified deficiencies with the people who work in the area This will help the auditors verify that their understanding is correct It can also serve as refresher training (on EMS requirements) for employees

Consider linking your EMS audit program to your regulatory compliance audit process But keep in mind that these audit programs have different purposes and while you might want to communicate the results of EMS audits widely within your organization, the results of compliance audits might need to be communicated in a more limited fashion (in order to maintain attorney client or attorney-work product privilege for example)

There may be a written report of the EMS audit although this is not required under the ISO specification If a written report is requested the distribution list should be determined in advance The audit report and related audit findings typically are managed as confidential The following are examples of items to include in an EMS audit report

Organization and Personnel

- company name (auditee)
- company structure
- names of personnel and managers participating in the audit as auditees

- organization name of third-party auditor (if applicable)
- names of audit team members

Audit Protocol

- scope, objectives, and plan of audit
- agreed criteria of audit (include a list of reference documents against which the audit is to be conducted)
- audit period
- distribution list for the audit report

Audit Findings

- identification of the confidentialities associated with the audit contents
- summary of audit process
- audit findings and conclusions about EMS conformance to the EMS audit criteria
- audit findings and conclusions about whether the system is properly implemented and maintained
- audit findings and conclusions about whether the internal review process is able to ensure the continuing suitability and effectiveness of the EMS

4 4 4 EMS Management Review

The final step in the cycle is to review the EMS Clause 4 6 of ISO 14001 requires that top management review the EMS whenever it thinks it appropriate to ensure its continuing suitability adequacy and effectiveness Management must collect the information necessary for a comprehensive evaluation and document the review The review accomplishes the following

- examination of EMS audit results
- consideration of changing circumstances
- assessment of the organization s commitment to continual improvement

- identification of possible changes in policy objectives and other EMS elements

The Annex to ISO 14001 specifies that not all EMS components need to be reviewed at one time In addition, reviews of policies, objectives and procedures should be carried out by the level of management that defined them Changing circumstances" can include

- changes in legislation
- varying expectations of interested parties
- changes in the organization's products or activities
- technological advances
- marketing information
- feedback from environmental incidents

Further management should plan corrective and preventive action to improve the EMS and should ensure that recommended actions were taken and were effective The results of the management review may drive changes in policy which can cause changes in the EMS Information obtained through communication strategies monitoring and measurement, corrective action and results of EMS audits may be of particular value in determining where improvements can be realized

Management reviews should reflect the organization's culture and style as well as the preferences of the individuals involved There are many approaches for structuring reviews Most involve a combination of formal and informal methods Formal methods include

- regular update and review of a given set of program and process measurements
- in depth review of program and process elements such as requirements procedures measurements control points etc
- review of nonconformances
- review of environmental policy EMS and strategy for continual improvement

Senior management may also use informal methods to stay in touch with the EMS operation For instance by interacting with employees in their work area executives can observe environmental management practices first hand and can seek employee suggestions about how to improve the EMS Another useful means of getting informal input is to engage in discussions with peer executives managing similar operations or issues Finally unscheduled reviews can take place as problems arise that need to be resolved immediately

The management review and the EMS audit are different If management requests, he EMS audit can include conclusions about improving the EMS but it is not the auditor's job to review the EMS specifically Top management is responsible for making decisions on the EMS improvement

Helpful Hints Management Review of the EMS

- There are two kinds of people who should be involved in the management review process
  - people who have the right information/knowledge
  - people who can make decisions
- Determine the frequency for management reviews that will work best for your company Some organizations combine these reviews with other meetings (such as directors' meetings) while other organizations hold ' stand-alone" reviews For ISO 9000 purposes management reviews are typically held once or twice per year
- Make sure that someone takes notes on what issues were discussed what decisions were arrived at and what action items were selected Management reviews should be documented
- Once you have documented the action items arising from your management review be sure that someone follows up Progress on these items should be tracked
- As you evaluate potential changes to your EMS be sure to consider your other organizational plans and goals Environmental decision-making should be integrated into your overall management and strategy

Appendix 1
Consolidated Environmental License Forms and Instructions

EGYPTIAN ENVIRONMENTAL AFFAIRS AGENCY (official seal)

APPLICATION FOR CONSOLIDATED ENVIRONMENTAL LICENSE

OFFICIAL USE ONLY

EEAA Reviewer (print name) TITLE SIGNATURE

APPROVED (date) | REJECTED (state principal reasons)

ADDITIONAL INFORMATION NEEDED

SECTION I APPLICANT INFORMATION

Name and Mailing Address of Legal Entity (Person or Business) Applying for License

Telephone Number

Fax Number

2 Applicant s Business License Number

3 Name and Mailing Address of Establishment to be Licensed (if different from Number 1 above)

Telephone Number

Fax Number

4 Basic Description of Establishment

Kompass Code _____

SIC Code _____

Type of Industry _____

Date established _____

Primary products produced

1 _____

2 _____

3 _____

4 _____

Annual production of each type

_____

_____

_____

_____

Number of full time employees _____

Number of part time employees _____

Number of production shifts per week ___

5 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) INFORMATION

Establishment subject to EIA requirement (check box)?

Yes ☐ No ☐

If yes check box

White list ☐

Gray list ☐

Black list ☐

List all EIA approvals granted for the Licensed establishment (including approvals for expansion or rehabilitation projects)

EIA Title and Registration Number	Approved by (Competent Administrative Authority)	Date Approved

6 SITE SUITABILITY WITH RESPECT TO AIR POLLUTION Per Articles 34 and 35 of Decree Number 338 of 1995 it is mandatory that sites where establishments are to be set up shall be suitable for the establishment s activities so as to fit with the environment of the area and with the land use plan as determined by the Ministry of Housing Utilities and New Communities In siting the establishment due consideration must be given to the site suitability including its distance from residential areas site topography and wind dispersion characteristics Site suitability is assessed during the EIA procedures but explicit approval must be given by this License for site suitability with respect to air pollution

SECTION II CERTIFICATIONS

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents and that based on my inquiry of the individuals immediately responsible for obtaining the information I believe that the submitted information is true accurate and complete I am aware that there are penalties for submitting false information

Signature of Officer in Charge	Name and Official Title (print or type)	Date signed

Signature of Environmental Management Officer	Name and Official Title (print or type)	Date signed

SECTION III FACILITY LAYOUT AND BASIC PROCESS DESCRIPTION Attach facility site plan blueprints or basic drawings of layout of primary production facility(ies) auxiliary work spaces and supporting facilities Attach basic flow diagram for each major production process

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SECTION IV WATER USAGE AND WASTEWATER MANAGEMENT

1 DAILY WATER USAGE (based on operation at full capacity)

SOURCE	DAILY VOLUME DRAWN (m^3)	PURPOSE/ACTIVITY	DAILYVOLUME USED (m^3)
Deep well	_____ (m^3/day)	Process	_____ (m^3/day)
Municipal supply	_____ (m^3/day)	Potable/drinking	_____ (m^3/day)
Other (specify)		Sanitary	_____ (m^3/day)
_____	_____ (m^3/day)	Cooling	_____ (m^3/day)
		Other (specify)	
		_____	_____ (m^3/day)

2 WASTEWATER MANAGEMENT Identify volume and type of wastewater generated by each process or activity that generates a liquid discharge Be sure to include activities related to production cleaning and maintenance on site sanitation and drainage storm water collection and drainage and cooling systems Proposed point of discharge must be marked on the basic drawings of layout and site plan (see Section III above) *A PERMIT IS REQUIRED FOR ALL DISCHARGES OF LIQUID WASTES TO WATER LAND OR THE PUBLIC SEWER SYSTEMS*

	SOURCE/ACTIVITY	PRIMARY CONSTITUENTS OF LIQUID WASTE STREAM	DAILY VOLUME GENERATED (m^3)	POINT OF DISCHARGE
1	_____	_____	_____ (m^3/day)	_____
2	_____	_____	_____ (m^3/day)	_____
3	_____	_____	_____ (m^3/day)	_____
4	_____	_____	_____ (m^3/day)	_____
5	_____	_____	_____ (m^3/day)	_____
6	_____	_____	_____ (m^3/day)	_____
7	_____	_____	_____ (m^3/day)	_____
8	_____	_____	_____ (m^3/day)	_____
9	_____	_____	_____ (m^3/day)	_____
10	_____	_____	_____ (m^3/day)	_____
11	_____	_____	_____ (m^3/day)	_____
12	_____	_____	_____ (m^3/day)	_____
13	_____	_____	_____ (m^3/day)	_____
14	_____	_____	_____ (m^3/day)	_____
15	_____	_____	_____ (m^3/day)	_____

3 INFORMATION REQUIRED FOR APPROVAL TO CONNECT TO PUBLIC SEWER NETWORK Explicit approval for connecting to the sewer network must be given by the Department of Housing and Utilities in the 10th of Ramadan City Please attach the following documents to this application form

a) A survey map or a drawing of the establishment and its immediate location at a scale not less than 1 2 500
b) Three copies of a drawing showing the ground plan of the ground floor of the establishment at a scale of 1 200 1 100 or 1 50 on which wastewater inspection chambers gully traps ground stretchers and tanks are indicated

OFFICIAL USE ONLY

(CIRCLE IF APPLICABLE) LICENSE/APPROVAL	COMPETENT AUTHORITY	DATE	APPLICATION FORWARDED TO COMPETENT AUTHORITY SIGNATURE OF EEAA OFFICIAL	RECEIVED BY (SIGN AND DATE)
APPROVAL FOR CONNECTING TO THE PUBLIC SEWER NETWORK	*10TH OF RAMADAN MUNICIPAL AUTHORITY*	_____	_____	_____
LICENSE FOR DRAINAGE OF INDUSTRIAL WASTEWATER INTO THE PUBLIC SEWER NETWORK	*10TH OF RAMADAN MUNICIPAL AUTHORITY*	_____	_____	_____

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SECTION V HANDLING OF HAZARDOUS SUBSTANCES AND WASTES

APPLICABILITY The handling of hazardous industrial substances and wastes at the Licensed establishment is prohibited unless a Hazardous Substances and Wastes Handling License has been issued to the Licensee by the Ministry of Industry

Does/will the establishment handle any of the compounds listed in the following references?	YES	NO
a) *Table of Controlled Hazardous Substances* (Table 2)	☐	☐
b) *Table of Hazardous Wastes* (Table 3)	☐	☐

If you answered Yes to any of the above you will be required to attach a completed Application for License to Handle Hazardous Substances and Wastes A copy of this application form is attached If applicable submit completed application form with this Application for Consolidated Environmental License

OFFICIAL USE ONLY

APPLICATION FOR LICENSE TO HANDLE HAZARDOUS SUBSTANCES AND WASTES FORWARDED TO MINISTRY OF INDUSTRY

DATE	SIGNATURE OF EEAA OFFICIAL	RECEIVED FOR MINISTRY OF INDUSTRY (print name and title)	SIGNATURE	DATE RECEIVED

SECTION VI AIR EMISSIONS

APPLICABILITY The emissions of air pollutants does not require a separate license The following section should be completed to best of the applicant s knowledge based on facility and process design emissions testing or other reference method In case a reference method is used a copy of the calculation and full citation must accompany this application List each stack and fugitive emission source separately below

	Emissions source	Constituents	Chimney Height (m)	Emission Rate (mg/m^3)	Control Technology	Removal efficiency (%)
1						
2						
3						
6						

If applicant stores volatile liquids of solid material (with fine particles)that can cause fugitive emissions each must be listed separately below In most cases covering the volatile liquid or solid storage container is sufficient However if stored material requires periodic venting this must be noted

	Fugitive emission source	Method of control	Needs venting No	Needs venting Yes	Frequency (times per year)
1					
3					
5					

SOLID WASTES

All solid wastes produced by the applicant should be listed separately below together with the method of treatment and disposal (as applicable)

	Type of waste	Quantity Generated (tons/year)	Method of Treatment	Place of Final Disposal
1				
4				
6				

Appendix 2
Wastewater Discharge Fee Calculation

Conventional pollutants are assigned an equivalency factor of one Because wastewater effluent is eventually reused as irrigation water and nutrients are likely to be beneficial in that context, nutrients are assigned a lower equivalency factor of 0 5 Toxic metals and substances are assigned the highest equivalency factor of 3 to reflect the relatively high risk they pose to public health and the environment Settleable solids, temperature and pH are controlled under Law 93, but are not assigned equivalency factors Temperature and pH appear in the fee structure without equivalency factors Settleable solids are not included as a separate item in the fee structure, but are closely related to some of the parameters that are assessed a fee

Thus, the wastewater fee paid by each firm is based on a four-part equation as follows

Total Annual Fee for Facility i = $[R_1 \times V_i]$ +
$[R_2 \times M_i \times \sum_{j=1}^{n}(L_{ij} \times E_j \times D_{ij})]$

+

$[R_3 \times M_i \times$ (each °C above 43)] +
$[R_4 \times M_i \times$ (each S U (pH) unit more or less than 6-10)]

where

R_1 = Rate per m^3 of wastewater discharge
V_i = Volume of wastewater from facility i (m^3/year)
R = Rate per pollutant equivalent
M_i = 0 5 if facility i is in compliance with monitoring recordkeeping and reporting requirements and 1 if the facility is not
n = Number of pollutants (20) with equivalency factors
E_j = Equivalency factor for pollutant j
D_{ij} = 1 if facility i is in compliance with Law 93 standards for pollutant j and 1 5 if the facility is not in compliance for pollutant j
L_{ij} = Loading (kg/yr) of pollutant j from facility i

The loading of pollutant j will be calculated as

$L_{ij} = (C_{ij} \times V_i \times 10^3)/10^6$

where

C_{ij} = Concentration of pollutant j at facility i (mg/l)
10^3 = liters per m^3
10^6 = mg per kg

The first part of the equation (R_1 x V_i) is the fixed fee that is based on volume discharged, not pollutant loadings R_1 is the rate per m^3 of wastewater The last three parts of the equation together comprise the variable fee Different rates apply to different characteristics of the wastewater R_2 for all pollutant loadings assigned an equivalency factor R_3 for each °C that the wastewater is above the Law 93 standard of 43°C, and R_4 for each unit deviation (either above or below) from the Law 93 standard on pH

During Phase I pollutant concentrations (C_{ij}) are presumed for each sector and facilities will report wastewater quantities (V_i) only Facilities will have the option of reporting both C_{ij} and V_i if they wish and having them used in the calculation of their fee In Phase II, facilities are required to report both C_{ij} and V_i The rate for discharge volume (R_1) fixed fee is set to generate 2 500 000 L E to help cover the costs of the Municipal Authority's responsibilities in implementing the Environmental Management System This level of revenue is calculated on the basis of estimates of current discharge volumes

Appendix 3
Hazardous Waste Handling License and Registers: Forms and Instructions

MINISTRY OF INDUSTRY AND METALLURGICAL RESOURCES (official seal)

APPLICATION FOR GENERAL PERMIT TO HANDLE HAZARDOUS SUBSTANCES AND WASTES

EGYPTIAN ENVIRONMENTAL AFFAIRS AGENCY (official seal)

SECTION I APPLICANT INFORMATION

1 Name of Establishment	2 Telephone Number	3 Fax Number	4 Tax Identification Number

5 Address of Establishment	6 Establishment Contact (Person to be contacted regarding waste activities)
	7 Address of Establishment Contact (if different from #5)

8 Contour Map attach to permit application contour map(s) of establishment location	9 Report of Subterranean Water Levels attach to permit application map(s) or other certification of underground water resources within ___ km radius of establishment location

10 Previous Experience Handling Hazardous Substances and/or Waste

☐ No previous experience ☐ Previous experience (attach copies of certifications of previous experience)

SECTION II WORKER SAFETY AND INSURANCE PROVISIONS

11 Number of Workers to be Handling and/or Exposed to HazardousSubstances/Wastes	12 Medical and Accident Insurance (attach copy of policy)		13 Frequency of Employee Medical Checkups	14 Employee Safety Training
	Insurance Company(ies)	Number of workers insured		(Attach copy of training program)

15 Emergency Plan attach copy of the detailed Emergency Plan including safety equipment and procedures

SECTION III COMMUNITY HAZARD NOTIFICATION AND COMPENSATION CERTIFICATION

15 Community Hazard Notification Attach copy of Community Hazard Notification and Emergency Warning Procedures	16 Community Already Notified? ☐ Yes ☐ No (if no projected date of official notification _____)

17 COMPENSATION CERTIFICATION I understand that it is my legal duty to compensate citizens in the areas surrounding my establishment for the treatment of any injuries which may potentially result from accidents leakages or other improper handling of hazardous substances and wastes at my establishment

Signature of Officer in Charge	Name and Official Title (print or type)	Date signed

SECTION IV HAZARDOUS SUBSTANCE ACTIVITIES (Mark X in the appropriate boxes Refer to instructions)

18 MANUFACTURE HAZARDOUS SUBSTANCES	19 USE HAZARDOUS SUBSTANCES IN PRODUCTION OR ASSOCIATED PROCESSES
O BE COMPLETED	TO BE COMPLETED

SECTION V HAZARDOUS WASTE ACTIVITIES

20 GENERATE HAZARDOUS WASTES	21 TREATMENT STORAGE OR DISPOSAL OF HAZARDOUS WASTES	22 TRANSPORT HAZARDOUS WASTES (Indicate mode in boxes a-e)
☐ 1 More than 1000kg per month	☐ 1 For own waste only	☐ 1 For own waste only
☐ 2 100 1 000kg per month	☐ 2 For commercial purposes	☐ 2 For commercial purposes
TO BE COMPLETED	TO BE COMPLETED	Mode of Transportation ☐ Road ☐ Rail ☐ Air ☐ Water ☐ Other specify _____ TO BE COMPLETED

SECTION VI CERTIFICATION AND COMMITMENTS (To be signed by authorized representative of Applicant)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents and that based on my query of those individuals immediately responsible for obtaining the information I believe that the submitted information is true accurate and complete I am aware that there are significant penalties for submitting false information including the possibility of fines and imprisonment.

I also understand that by submitting this application I hereby commit to the following

a) Not to mix hazardous substances and waste with other types of wastes that may result from social and productive activities

b) To maintain registers (including comprehensive statements of hazardous substances and waste quantities types sources frequencies and periods of their collection and storage means of their transportation and treatment) to provide these information on request and not to destroy these registers for a period of five years from the date of starting them

c) To undertake all procedures that ensure the proper packaging of hazardous substances and wastes during the collection transportation and storage phases

Last I commit to ensuring that no harmful effects shall result to public health and/or the environment from the activity for which I am applying for a permit

Signature of Applicant's Authorized Representative	Print Name and Title	Date

SECTION VII COMMENTS (Please include any additional comments you feel are necessary to complete this application)

MINISTRY OF INDUSTRY AND METALLURGICAL RESOURCES (official seal)	**APPLICATION FOR GENERAL PERMIT TO HANDLE HAZARDOUS SUBSTANCES AND WASTES**	EGYPTIAN ENVIRONMENTAL AFFAIRS AGENCY (official seal)

Instructions for Completing the Form

The Ministry of Industry and Metallurgical Resources and the Egyptian Environmental Affairs Agency require generators and transporters of hazardous waste and owners or operators of hazardous waste treatment, storage and disposal facilities to complete the following information

SECTION I APPLICANT INFORMATION

Item 1 Establishment Name Enter the establishment's full name Name should match that registered with the Ministry of Industry and Metallurgical Resources (MIMR)

Item 2 Telephone Number Enter the establishment s telephone number

Item 3 Fax Number Enter the establishment s fax number

Item 4 Tax Identification Number Enter the establishment's tax identification number

Item 5 Address Enter the full mailing address of the establishment

Item 6 Establishment Contact Enter the name and title of the person to be contacted regarding waste activities

Item 7 Address of Establishment Contact Enter the full mailing address of the establishment contact (if different from the address in Item 5

Item 8 Contour Map Attach contour map(s) of the establishment location to the permit application

Item 9 Report of Subterranean Water Levels Attach map(s) or other certification of underground water resources with _____ kilometer radius of establishment location

Item 10 Previous Experience Handling Hazardous Substances and/or Waste If you have previous experience with handling hazardous substances and/or waste, check "Yes" and attach copies of certificates of previous experience If you have no previous experience with handling hazardous substances and/or waste, check ' No '

SECTION II WORKER SAFETY AND INSURANCE PROVISIONS

Item 11 Number of Workers to be Handling and/or Exposed to Hazardous Substances/Wastes Enter the number of workers who have handled or have been exposed to the waste specified The establishment shall be responsible for informing the workers who handle these substances of their dangers and the necessary precautions to be taken when handling them to ensure their full awareness of all this information and that they have received adequate training

Item 12 Medical and Accident Insurance Enter name of insurance company (or companies) and the number of workers insured under the policy or (policies) Attach a copy (or copies) of the policy to the application Establishments producing these dangerous substances shall insure their workers for amounts to be determined by decree from the Minister of Manpower in coordination with the Ministry of Insurance and Social Affairs after consulting the EEAA and the Ministry of Health Due considerations shall be given to determining the insurance amounts for the degree and extent of danger to which each category of worker is exposed to in each productive unit

Item 13 Frequency of Employee Medical Checkups Indicate the frequency of periodic employee medical checkups The staff of these establishments shall be subject to periodic medical checkups and shall be treated for occupational diseases at the expense of their employers

Item 14 Employee Safety Training Enter any employee safety training that workers have received and attach a copy of the training program to the application

MINISTRY OF INDUSTRY AND METALLURGICAL RESOURCES (official seal)	**APPLICATION FOR GENERAL PERMIT TO HANDLE HAZARDOUS SUBSTANCES AND WASTES**	EGYPTIAN ENVIRONMENTAL AFFAIRS AGENCY (official seal)

SECTION III COMMUNITY HAZARD NOTIFICATION AND COMPENSATION CERTIFICATION

Item 16 Community Hazard Notification Attach copy of Community Hazard Notification and Emergency Warning Procedures to the application It is the responsibility of the establishment to inform residents of regions surrounding production sites where dangerous wastes are handled of likely and possible dangers and hazards from these substances and the method for facing them, along with ensuring that they have become aware of the warning and alarm systems whenever an accident occurs and how to act in case of the occurrence of accidents

Item 17 Community Notification If the community has already been notified, check "Yes" If the community has not already been notified, check "No" and enter projected date of official notification

Item 18 Compensation Certification Read and enter an original signature of the Officer-in -Charge, and enter the name and official title of the Officer-in-Charge, and enter the date signed Establishments producing and handling these hazardous substances shall compensate injured citizens in the areas surrounding production or storage sites for the injuries resulting from (text ends- no next page)

SECTION IV HAZARDOUS SUBSTANCE ACTIVITIES
Item 19 Manufacture Hazardous Substances
Item 20 Use Hazardous Substances in Production or Associated Processes

SECTION V HAZARDOUS WASTE ACTIVITIES
Item 21 Generate Hazardous Wastes
Item 22 Treatment, Storage, or Disposal of Hazardous Wastes
Item 23 Transport Hazardous Wastes

SECTION VI CERTIFICATION AND COMMITMENTS (To be signed by authorized representative of Applicant)
Read and enter an original signature of the Applicant s Authorized Representative Enter the name and title of representative and the date signed

SECTION VII COMMENTS

MINISTRY OF INDUSTRY AND METALLURGICAL RESOURCES (official seal)

UNIFORM HAZARDOUS SUBSTANCES AND WASTE REGISTER FOR ON-SITE USAGE, TREATMENT, STORAGE AND DISPOSAL

EGYPTIAN ENVIRONMENTAL AFFAIRS AGENCY (official seal)

SECTION I ESTABLISHMENT INFORMATION

1 Establishment Name and Mailing Address

Telephone Number

2 Establishment s MIMR Hazardous Substances and Waste Handling (HSWH) Permit Number

SpecialPermit Conditions

3 Register Number

Time period covered

SECTION II SITE INFORMATION

4a Is the Site Address the same as the address entered in Item 1?

☐ Yes (go to Section III)

☐ No (complete Items 4b and 4c)

4b Site Address

4c Site Telephone Number

Site Fax Number

5 Name title and telephone number of the person who should be contacted if questions arise regarding this report

Print/Type Name and Title	Signature	Telephone and Fax Numbers

SECTION III HAZARDOUS WASTE GENERATOR STATUS

6 Are you classified as a large quantity generator? (see instructions)

☐ Yes (you must complete Section IV) ☐ No (go to Section V)

SECTION IV WASTE MINIMIZATION ACTIVITIES DURING TIME PERIOD COVERED (as stated in Item 3)

7 Did this site undertake source reduction activities during the time period covered? (see instructions)

☐ Yes ☐ No

8 Did this site undertake recycling activities during the time period covered? (see instructions)

☐ Yes ☐ No

9 Did this site evaluate opportunities for source reduction and recycling during the time period covered?

☐ Yes ☐ No

10 Did any of the factors below delay or limit this site s ability to initiate new or additional source reduction activities during the time period covered? (check yes or no for each item)

YES	NO	
☐	☐	a Insufficient capital to install new source reduction equipment or implement new source reduction practices
☐	☐	b Lack of technical information on source reduction techniques applicable to this site s specific production processes
☐	☐	c Source reduction is not economically feasible cost savings in waste management will not recover the capital investment
☐	☐	d Concern that product quality might decline as a result of source reduction
☐	☐	e Technical limitations of the production process
☐	☐	f Source reduction previously implemented additional reduction does not appear to be technically feasible
☐	☐	g Source reduction previously implemented additional reduction does not appear to be economically feasible
☐	☐	h Other reasons (specify comments in box below)

11 Did any of the factors below delay or limit this site s ability to initiate new or additional recycling activities during the time period covered? (check yes or no for each item)

YES	NO	
☐	☐	a Insufficient capital to install new recycling equipment or implement recycling practices
☐	☐	b Lack of technical information on recycling techniques applicable to this site s specific production processes
☐	☐	c Recycling is not economically feasible cost savings in waste management will not recover the capital investment
☐	☐	d Concern that product quality might decline as a result of recycling
☐	☐	e Requirements for off site registers inhibit shipments off site for recycling
☐	☐	f Technical limitations of the production process inhibit shipments off site for recycling
☐	☐	g Financial liability provisions inhibit shipments off site for recycling
☐	☐	h Lack of permitted off site recycling facilities
☐	☐	i Technical limitations of the production process inhibit on site recycling
☐	☐	j Unable to identify a market for recyclable materials
☐	☐	k Recycling previously implemented additional reduction does not appear to be technically feasible
☐	☐	l Recycling previously implemented additional reduction does not appear to be economically feasible
☐	☐	m Other reasons (specify comments in box below)

12 Comments

13 CERTIFICATION I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents and that based on my inquiry of those individuals immediately responsible for obtaining the information I believe that the submitted information is true accurate and complete I am aware that there are significant penalties for submitting false information including the possibility of fines and imprisonment.

gnature of Officer in Charge | Name and Official Title (print or type) | Date signed

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Section V DESCRIPTION OF HAZARDOUS SUBSTANCES USED/STORED ON SITE (fill in the following information for each waste category see instructions)

14a Description of Hazardous Substances					14b Hazardous Substance Weight/Volume Used				14c Storage Containers				14d Worker Safety	
					Used in Manufacturing Process									
Category Number	Category Description (what classification to use?)	Name of Manufacturer	Country of Origin	MSDS or equivalent (yes/no)?	Enclosed	Controlled Release	Open	Released to Environment	Number	Type	Weight/ Volume	Containers Labelled? (yes/no)	Number of Workers Handling/ Exposed	Workers Trained During This Time Period?(yes/no)

Section VI DESCRIPTION OF HAZARDOUS WASTES GENERATED AND MANAGED ON SITE (fill in the following information for each waste category see instructions)

15a Description of Hazardous Waste Generated			15b On Site Temporary Storage							15c On-Site Treatment System		15d On Site Disposal		15e Worker Safety	
			Containers												
Category Number	Category Description	Total Quantity Generated	Number	Type	Weight/ Volume	Containers Labelled? (yes/no)	Date Into Temporary Storage	Date Out of Temporary Storage	Weight/ Volume Shipped Off Site	Treatment Technology	Destruction Efficiency	Disposal System Registration Number	Weight/ Volume Disposed On Site	Number of Workers Handling/ Exposed	Workers Trained During This Time Period? (yes/no)

1/5

MINISTRY OF INDUSTRY AND METALLURGICAL RESOURCES (official seal)	**UNIFORM HAZARDOUS SUBSTANCES AND WASTE REGISTER FOR ON-SITE USAGE, TREATMENT, STORAGE AND DISPOSAL**	EGYPTIAN ENVIRONMENTAL AFFAIRS AGENCY (official seal)

Instructions for Completing the Form

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Item 8 Contour Map Attach contour map(s) of the establishment location to the permit application

Item 9 Report of Subterranean Water Levels Attach map(s) or other certification of underground water resources with _____ kilometer radius of establishment location

Item 10 Previous Experience Handling Hazardous Substances and/or Waste If you have previous experience with handling hazardous substances and/or waste, check "Yes" and attach copies of certificates of previous experience If you have no previous experience with handling hazardous substances and/or waste, check "No "

SECTION II WORKER SAFETY AND INSURANCE PROVISIONS

Item 11 Number of Workers to be Handling and/or Exposed to Hazardous Substances/Wastes Enter the number of workers who have handled or have been exposed to the waste specified The establishment shall be responsible for informing the workers who handle these substances of their dangers and the necessary precautions to be taken when handling them to ensure their full awareness of all this information and that they have received adequate training

Item 12 Medical and Accident Insurance Enter name of insurance company (or companies) and the number of workers insured under the policy or (policies) Attach a copy (or copies) of the policy to the application Establishments producing these dangerous substances shall insure their workers for amounts to be determined by decree from the Minister of Manpower in coordination with the Ministry of Insurance and Social Affairs after consulting the EEAA and the Ministry of Health Due considerations shall be given to determining the insurance amounts for the degree and extent of danger to which each category of worker is exposed to in each productive unit

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Item 14 Employee Safety Training Enter any employee safety training that workers have received and attach a copy of the training program to the application

MINISTRY OF INDUSTRY AND METALLURGICAL RESOURCES (official seal)	UNIFORM HAZARDOUS SUBSTANCES AND WASTE REGISTER FOR ON-SITE USAGE, TREATMENT, STORAGE AND DISPOSAL	EGYPTIAN ENVIRONMENTAL AFFAIRS AGENCY (official seal)

SECTION III COMMUNITY HAZARD NOTIFICATION AND COMPENSATION CERTIFICATION

Item 16 Community Hazard Notification Attach copy of Community Hazard Notification and Emergency Warning Procedures to the application It is the responsibility of the establishment to inform residents of regions surrounding production sites where dangerous wastes are handled of likely and possible dangers and hazards from these substances and the method for facing them along with ensuring that they have become aware of the warning and alarm systems whenever an accident occurs, and how to act in case of the occurrence of accidents

Item 17 Community Notification If the community has already been notified, check "Yes" If the community has not already been notified, check "No' and enter projected date of official notification

Item 18 Compensation Certification Read and enter an original signature of the Officer-in -Charge, and enter the name and official title of the Officer-in-Charge, and enter the date signed Establishments producing and handling these hazardous substances shall compensate injured citizens in the areas surrounding production or storage sites for the injuries resulting from (text ends- no next page)

SECTION IV HAZARDOUS SUBSTANCE ACTIVITIES

Item 19 Manufacture Hazardous Substances

Item 20 Use Hazardous Substances in Production or Associated Processes

SECTION V HAZARDOUS WASTE ACTIVITIES

Item 21 Generate Hazardous Wastes

Item 22 Treatment, Storage or Disposal of Hazardous Wastes

Item 23 Transport Hazardous Wastes

SECTION VI CERTIFICATION AND COMMITMENTS (To be signed by authorized representative of Applicant)

Read and enter an original signature of the Applicant's Authorized Representative Enter the name and title of representative and the date signed

SECTION VII COMMENTS

MINISTRY OF INDUSTRY AND METALLURGICAL RESOURCES (official seal)

UNIFORM HAZARDOUS WASTE REGISTER FOR WASTES TRANSPORTED OFF SITE

EGYPTIAN ENVIRONMENTAL AFFAIRS AGENCY (official seal)

1 Generator's Name and Mailing Address Telephone Number	2 Generator's MIMR Hazardous Substances and Waste Handling (HSWH) Permit Number SpecialPermit Conditions	3 Register Number Time period covered

4a Transporter 1 Company Name Telephone Number	4b Transporter 1 MIMR HSWH Permit Number	4c Generator Transporter Contract Reference Number
5a Transporter 2 Company Name Telephone Number	5b Transporter 2 MIMR HSWH Permit Number	5c Generator Transporter Contract Reference Number
6a Transporter 3 Company Name Telephone Number	6b Transporter 3 MIMR HSWH Permit Number	6c Generator Transporter Contract Reference Number
7a Designated Facility for Final Treatment and Disposal (include name and address) Telephone Number	7b Final Treatmentand Disposal Facility MIMR HSWH Permit Number	7c Generator Disposer Contract Reference Number

8 Description of Waste (use Basel Convention Annex I and III categories)		9 Containers				10 Total Quantity of Waste	11 Projected Method of Final Treatment and Disposal
8a Category Number	8b Category Description	9a Number	9b Type	9c Weight/ Volume	9d Containers Labelled? (yes/no)		

12 Continuation Sheets (use attached continuation sheets for additional wastes) Continuation sheets attached? ____ No ____ Yes (number of sheets ___)

13 Special Handling Instructions and Additional Information

14 GENERATOR S CERTIFICATION I hereby declare that the contents of this consignment are fully and accurately described above and are classified packed marked and labeled and are in all respects in proper condition for transport by highway according to applicable national and international regulations

If I am a large quantity generator I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage or disposal currently available to me which minimizes the present and future threat to human health and the environment OR if I am a small quantity generator I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford

Printed/Typed Name and Title	Signature	Date

15 Acknowledgement of Receipt of Materials Transporter 1 _____ (company name)

Received by (print name and title)	Signature	Date Received

16 Acknowledgement of Receipt of Materials Transporter 2 _____ (company name)

Received by (print name and title)	Signature	Date Received

17 Acknowledgement of Receipt of Materials Transporter 3 _____ (company name)

Received by (print name and title)	Signature	Date Received

18 Discrepancy Indication Space (note any differences in waste quantities types and/or containers from that reported in Item 8 11)

19 Facility Owner or Operator Certification of Receipt of Hazardous Materials Covered by this Register Except as Noted in Item 18

Received by (print name and title)	Signature	Date Received

MINISTRY OF INDUSTRY AND METALLURGICAL RESOURCES (official seal)	**UNIFORM HAZARDOUS WASTE REGISTER FOR WASTES TRANSPORTED OFF SITE (*CONTINUATION SHEET*)**	EGYPTIAN ENVIRONMENTAL AFFAIRS AGENCY (official seal)

GENERATOR

20 Generator's Name	21 Generator's Hazardous Substances and Waste Handling Permit Number	22 Register Number Continuation Sheet Number ____ of ____

23 Addtional Wastes		24 Containers				25 Total Quantity of Waste	26 Projected Method of Final Treatment and Disposal
23a Category Number	23b Category Description	24a Number	24b Type	24c Weight/ Volume	24d Containers Labelled? (yes/no)		

27 Special Handling Instructions and Additional Information

TRANSPORTER

28 Acknowledgement of Receipt of Materials Transporter _____ (company name)

Received by (print name and title)	Signature	Date Received

29 Acknowledgement of Receipt of Materials Transporter _____ (company name)

Received by (print name and title)	Signature	Date Received

FACILITY

30 Discrepancy Indication Space (note any differences in waste quantities types and/or containers from that reported in Items 23 26)

Appendix 4
EIA Forms and Guidelines

This appendix contains two forms

- Environmental Screening Form ' A"
- Environmental Screening Form B"

and

- Guidelines for Complete Environmental Impact Assessment for Industrial establishments

Environmental Screening Form "A"

General Information

Project title

Type of project (Residential Commercial, Tourism, Industrial, other)

Project developer/applicant

Name of owner & contact person

Address

Telephone No Fax No

Estimated capital investment LE

Competent licensing authority

New project or extension of existing project

Project Phases and Expected Starting Date

Construction
Operation
Future expansion

Brief Project Description

Production capacity
Raw materials
Sources of energy

Project Site Location

Address
Total project area m

Any Additional Information

Certification

I hereby certify that the information given is accurate and true to the best of my knowledge and in case of any consequent changes prompt notification will be made to the EEAA

Certified by

I D No /Passport No

Reference **Date**

Environmental Screening Form "B"

Information to be Completed by EEAA Officials	
Receipt Date	Date of Application
Serial Number	

General Information

Project title

Type of project (Residential Commercial, Tourism Industrial, other)

Investor/applicant

Project developer/applicant

Reference

Address

Telephone No Fax No

Estimated capital investment LE

Competent licensing authority and address

New project or extension of existing project

Project Phases and Expected Starting Dates

Construction

Operation

Future expansion

Brief Project Description

Project s basic features

Objectives

Justification

Basic components

Technology systems (accompanied as much as possible with layout and operational charts and diagrams showing inputs & outputs, including wastes)

Alternatives Considered

Sites

Technologies

Designs

Materials

Are there available studies of similar projects? (indicate source)

Project Location and Site

Address

Total area m

Please attach a detailed map with a suitable scale to indicate clearly the site transportation routes and pipelines its boundaries and neighboring uses

Brief Description of the Construction Phases and Basic Construction Methods

Inputs During Construction and Operation

In case of industrial projects raw materials for other projects state type of resources see Table 1

Table 1
Inputs During Construction and Operation Phases

Operation phase	Construction phase	Inputs
		Water - sanitary
		Water - process
		Water - other uses
		Energy/electricity
		Energy/renewable sources
		Manpower
		Other

Outputs During Construction and Operation Phases

End products (for industrial projects) or other outputs (for all projects) see Table 2

Table 2
Outputs During Construction and Operation

Operation phase	Construction phase	Emissions, discharges and wastes	Type of output
		Sulphur dioxide	Air
		Particulate matter	Air
		Smoke	Air
		Odor	Air
		Noise	Air
		Others	Air
		Sewage	Water
		Industrial waste	Water
		Domestic waste	Solid waste
		Industrial waste	Solid waste
		Hazardous waste	Solid waste

Other information deemed important, particularly with regard to safeguarding personnel and environment e g , safety and firefighting facilities

Brief Description of the Environment (Baseline Information)

General area description and most important features

Present infrastructure and services

Fragile or sensitive ecosystems (critical or high-valued ecosystems) that are present

Description of archeological & historical areas

Description of protected areas

Description of recreational and tourism areas

Preliminary Analysis of Impacts

Air Quality (potential effects on air quality)

Construction phase

Operation phase

Site

Neighboring area

Transboundary

Clarify whether projects or sites that are considered sensitive exist nearby the project sites (as hospitals schools residential areas etc)

Water Quality

Will the activity cause a significant change to the water availability use hydrology drainage temperature or quality?

Are there existing hazard probabilities? Explain the type quantity and impact

Will the activity affect surface water use?

Fisheries

Tourism and recreation

Soil Quality

Would the activity provoke a significant change on land use, landscape, fertility, vegetation cover biodiversity, or quality?

Please identify the impact of changes of soil quality on different activities

Please explain if there are any other potential or significant impacts resulting from this activity

Mitigation Measures

Air Emissions

Wastewater

Solid and Hazardous Waste

Other Mitigation Measures

Inter-institutional and Public Involvement

Is there any contact with public authorities or others concerning the project?

Certification

I hereby certify that the information given is accurate and true to the best of my knowledge and in case of any consequent changes prompt notification will be made to the EEAA

Certified by

I D No /Passport No

Reference **Date**

Guidelines for Complete Environmental Impact Assessment for Industrial Establishments

Introduction

The present guidelines describe a number of stages and required information that the ministry/agency can use to develop specific Terms of Reference for a full EIA of an industrial establishment

1 Description of the Proposed Project

Provide information on the following

- Location of all project-related sites transportation corridors, etc
- General layout of facilities at establishment-related sites
- Maps with appropriate scales to illustrate the general setting of establishment sites and transportation corridors, as well as surrounding areas likely to be environmentally affected These maps shall include topographic contours as available as well as locations of major surface waters roads, towns, and administrative boundaries

Describe processes

- Flow diagrams of processes/operations batch or continuous type of machines
- Raw materials and auxiliary substances (water consumption) raw material storage
- Power supply
- Pre-construction construction and operation and maintenance activities staffing and support facilities and services
- Daily/weekly operating hours
- Finished goods production (unit per year) capacity
- Water production (oil and chemicals waste) waste storage
- Wastewater with effluents quantified
- Air emissions quantified
- Noise
- Reclamation (e g return of the land to a natural state) activities such as in mining establishments
- Required off-site investments
- Life expectancy for major components

2 Description of the Environment

Assemble, evaluate, and present baseline data on the environmental characteristics of the study area Include information on any change anticipated before the project commences Such 'baseline" conditions are those expected to exist in future, even if the proposed establishment does not take place In relation to baseline studies it is important to avoid compiling irrelevant data

The following issues should be considered (For industrial areas where these issues have been studied further baseline data might not be necessary for an individual establishment)

2 1 Physical/Chemical Environment

- Geology geological layers seismic history topography, oils
- Climate and meteorology prevailing winds
- Ambient air quality major polluters in the area
- Surface water hydrology, flood hazards
- Water resources
- Coastal parameters
- Receiving water quality ability to assimilate effluent discharges and maintain water quality standards for desired uses
- Other significant pollutant sources in the area and prospects for their mitigation

2 2 Biological Environment

- Flora and fauna rare or endangered species within or in areas adjacent to the establishment
- Sensitive habitats
- Species of commercial importance affected by the establishment

2 3 Sociocultural Environment (include both present and projected aspects when appropriate)

- Nearby communities year round and seasonal land use planned development activities community structure population employment and labor market income distribution goods and services recreation public health
- Cultural properties archeologically and historically significant sites
- Indigenous peoples and traditional tribal lands

3 Legislative and Regulatory Considerations

Describe pertinent regulations and standards governing environmental quality, health and safety, protection of sensitive areas protection of endangered species siting land use control, etc at the international, national, regional and local levels Is the establishment in accordance with national, regional local development and management plans?

4 Determination of the Potential Impacts of the Proposed Project

Identify all significant changes which the project would incur These would include but not be limited to, changes in employment opportunities wastewater effluents, air emissions, solid wastes land use infrastructure exposure to disease risk of industrial hazards noise, traffic, and sociocultural behavior Also assess the impacts from changes caused by the project on baseline environmental conditions In this analysis, distinguish between positive and negative impacts direct and indirect impacts and immediate and long-term impacts Identify the impacts that are unavoidable irreversible or imminent Wherever possible a quantitative description of impacts in terms of environmental costs and benefits is useful

Impact analysis for industrial projects should be divided between construction impacts and operation impacts For industrial manufacturing plants there are potential construction impacts of housing construction works and operation impacts from process operations (e g stack emissions effluent discharges noises industrial hazards)

Assess the risk of occurrence of potential industrial hazards (e g accidental spills fires explosions impoundment structural failure gaseous releases) Consider the ability of the community to provide emergency response services for potential industrial hazards Also it is necessary to consider the ability of the establishment and the community to provide medical services to respond to emergencies

Based on the above an assessment of the potential impact follows

The beginning stage is characterization of the extent and quality of available data explaining significant information deficiencies and any uncertainties associated with the prediction of impacts For information that could not be obtained until after the project execution commences provide TOR for studies to monitor operations over a given period and modify designs and/or operational parameters based upon updated impact analysis

5 Alternatives to the Proposed Project

Describe the alternatives that were examined in the course of developing the proposed project The concept of alternatives extends to siting design fuels, raw materials and technology selection, construction techniques and phasing and operating and maintenance procedures Include the "no action ' alterative

Alternatives should include the following

- The no action" alternative
- Alternative means of meeting industrial product requirements
- The alternative of upgrading existing facilities
- Alternative routes and sites
- Alternative design and alternative methods of construction

Describe how alternatives compare in terms of potential environmental impacts

- Capital and operating costs
- Suitability under local conditions and monitoring requirements

When describing the impacts indicate which are irreversible or un-avoidable and which can be mitigated

To the extent possible it is necessary to quantify the costs and benefits of each alternative and incorporate the estimated costs of any associated mitigating measures A comparative description of the reasons for selecting the proposed project over the other alternative should be prepared

6 Development of a Management Plan to Mitigate Negative Impacts

For the proposed establishment a recommendation of feasible and cost effective measures to prevent or reduce significant negative impacts to acceptable levels is required Also include measures for emergency response to accidental events (e g ruptures leaks tanker truck accidents fires explosions) as appropriate Estimate the impacts and costs of these measures and of the institutional and training requirements to implement them Consider compensation to affected parties for impacts that cannot be mitigated Prepare a management plan including work programs budget estimates maintenance schedules staffing and training requirements and other necessary support services to implement the mitigating measures

7 Development of a Monitoring Plan

A detailed plan to monitor the implementation of mitigating measures and the impacts of the project during construction and operation should be prepared Include in the plan an estimate of capital and operating costs

8 Secure Interagency Coordination and Public/NGO Participation

Secure coordination with other government agencies involved in EIA, obtain the views of local NGOs and affected groups, and keep records of meetings and other activities, communications and comments

9 Environmental Assessment Report

Provide an environmental assessment report that is concise and limited to significant environmental issues The main text should focus on findings, conclusions and recommended actions supported by summaries of data collected and citations for any references used in interpreting those data

Also organize the environmental assessment report according to the outline below

1. Executive Summary
2. Policy Legal and Administrative Framework
3. Description of the Proposed Project
4. Description of the Environment
5. Significant Environmental Impacts
6. Analysis of Alternatives
7. Mitigating Management Plan
8. Monitoring Plan
9. Interagency and Public/NGO Involvement
10. Non technical Summary of the Report for Political and Public Use
11. List of References
12. Appendices
    - List of Environmental Assessments Prepared
    - Records of Interagency and Public/NGO Communications
    - Data from Unpublished Reference Documents

Appendix 5
Indoor Air Quality Standards

Maximum Limits of Air Pollutants Inside Work Premises According to Industry Type

Limits are given for the concentrations of chemical substances in the air to which workers may be exposed day after day without the development of hazards to health These are divided into three types

1 Mean-Time Exposure Limit

The limit to which workers may be exposed on each ordinary working day (8 hours) for 5 days a week throughout the period of their working life without the occurrence of any health impairments

2 Short-Term Exposure Limit

The limits to which workers may be continuously exposed for short time periods The limit for each short-term exposure is for a period of 15 minutes and may not be exceeded at any time during the working period It shall not be repeated more than four times on the same day The period between each short term exposure and the next one shall be at least 60 minutes

3 Ceiling Limit

The ceiling limit shall not be exceeded even by a moment

When absorption through skin is a factor in increasing exposure the remark + skin is recorded next to the limits Concerning dust that merely causes annoyance without tangible harmful health effects the limit shall be 10 mg/m^3 for inhalable particles Concerning simple asphyxiant gases that have no significant physiological effects the influencing factor shall be the oxygen concentration in the atmosphere, which shall not be less than 18%

Substance	Exposure Limits Mean Time ppm	mg/m³	Short Term ppm	mg/m³	Remarks
Acetaldehyde	100	180	150	270	
Acetic Acid	10	25	15	37	
Acetic Anhydride	5	20			+ skin
Acetone	750	1780	1000	2375	
Acetonitrile	40	70	60	105	+ skin
Acetylene Tetrabromide	1	15	1 5	20	
Acetyl Salicylic Acid (Aspirin)		5			
Acrolein	0 1	0 25	0 3	0 8	
Acrylamide		0 3		0 6	+ skin
Acrylic Acid	10	30			
Acrylonitrile	2				+ skin
Aldrin		0 25		0 75	+ skin
Allyl Alcohol	2	5	4	10	+ skin
Allyl Chloride	1	3	2	6	
Metal Aluminum and its Oxides	10		20		
Pyro Powders	5				
Soldering Smoke Fumes	5				
Soluble Salts	2				
Alkylates	2				
Amino Pyridine	5 5	2	2	4	
Ammonia	25	18	35	27	
Ammonium Chloride (Fumes)		10		20	
Amyl Acetate- Normal	100	530	150	800	
Amyl Acetate- Secondary	125	670	150	800	

Substance	Exposure Limits Mean Time ppm	mg/m³	Short Term ppm	mg/m³	Remarks
Aniline and analogous compounds	2	10	5	20	+ skin
Antimony and its compounds (counted as Sb)		0 5			
ANTU		0 3		0 9	
Arsenic and its soluble compounds (counted as Arsenic)		0 2			
Arsenic Gas	0 05	0 2			
Petroleum Asphalt Fumes		5		10	
Atrazine		5			
Azinphos Methyl		0 2		0 6	+ skin
Barium and its soluble compunds (counted as Barium)		0 5			
Benzene (Petrol)	10	30	25	75	
Benzyl Chloride	1	5			
Beryllium		0 002			
Diphenyl	0 2	1 5	0 6	4	
Bismuth Telluride		10		20	
Anhydrous Tetra Sodium Borate		1			
Deca Hydrates		5			
Penta Hydrate		1			
Boron Oxide		10		20	
Boron Tribromide	1	10	3	30	
Boron Trifluoride	1	3			ceiling
Bromine	0 1	0 7	0 3	2	
Bromine Penta Fluoride	0 1	0 7	0 3	2	

Substance	Exposure Limits Mean Time ppm	mg/m³	Short Term ppm	mg/m³	Remarks
Bromoform	0 5	5			
Butadiene	1000	2000	1250	2750	
Butane	800	1100			
Butyl Acetate- Normal	150	710	200	150	
Butyl Acetate- Secondary	200	950	250	1190	
Butyl Tri Acetate	200	950	250	1190	
Butyl acrylate	10	55			
Butyl Alcohol- Normal	50	150			+ skin
Butyl Alcohol- Secondary	100	305	150	450	
Tru Butyl Alcohol	100	300	150	450	
Butyl Amines	5	15			+ skin
Tetra Butyl Chromate (counted as Chromium Oxide CrO_3)		0 1			+ skin ceiling
Butyl Lactate	5	25			
Butyl Mercaptan	0 5	1 5			
Cadmium Dusts and Salts (counted as Cadmium)	0 05				ceiling
Cadmium Fumes	0 05				ceiling
Calcium Carbonate				20	
Calcium Hydroxide		5			
Calcium Oxide		2			
Carbaryl		5		10	
Carbofuran		0 1			
Carbon Black		3 5		7	
Carbon Dioxide	5000	9000	15000	27000	
Carbon Disulfide	10	30			+ skin

Substance	Exposure Limits Mean Time ppm	mg/m³	Short Term ppm	mg/m³	Remarks
Carbon Monoxide	50	55	400	440	
Carbon Tetra Chloride	5	30	20	125	
Carbon Tetra Bromide	0 1	1 4	0 3	4	
Chlordane		0 5		2	+ skin
Chlorinated Camphene		0 5		1	+ skin
Chlorinated Diphenyl Oxide		0 5		2	
Chlorine	1	3	3	9	
Chlorine Dioxide	0 1	0 3	0 3	0 9	
Chloro Acetaldehyde	1	3			ceiling
Chlorobenzene	75	350			
Chloro Diphenyl (42% chlorine)		1		2	
Chloro Diphenyl (45% Chlorine)		0 5		1	
Chloroform	10	50	50	225	
Dichloro Methyl Ether	0 001	0 005			
Chloropicrin	10	45			
Chlorthiophos		0 2		0 6	+ skin
Chromium and its compounds (counted on the basis of Chromium)		0 5			
Hexavalent Chromium Compounds (counted on the basis of Chromium)		0 005			
Volatile Coal Tar Products Soluble in Benzene		0 2			
Cobalt and Cobalt Dust and Fumes		0 1			
Copper Fumes		0 2			

Substance	Exposure Limits Mean Time ppm	mg/m³	Short Term ppm	mg/m³	Remarks
Cooper Dust and Mists (counted as Copper)		1		2	
Raw Cotton Dust		0 2		0 6	
Cresolate	5	22			+ skin
Cyanide Salts counted as Cyanide		5			+ skin
Cyanogen	10	20			
Cyanogen Chloride	0 3	0 6			ceiling
Cyclohexane	300	1050	375	1300	
Cyclopentadiene	75	200	150	400	
Cyclopentane	600	1720	900	2580	
D D T		1		3	
Decaborane	0 05	0 3	0 15	09	+ skin
Diazinon		0 1		0 3	+ skin
Diazomethane	0 2	04			
Diborane	0 1	0 1			
Dichloracetylene	0 1	04			ceiling
Ortho Dichloro-benzene	50	300			ceiling
Para Di Chlorobezene	75	450	110	675	
1 2 Dichloro Ethylene	200	790	250	1000	
Dichloroethyl Ether	5	30	10	60	+ skin
Dichlorvos	0 1	1	0 3	3	+ skin
Dicrotophos		0 25			+ skin
Dieldrin		0 25		0 75	+ skin
Diethanolamine	3	15			
Di Methyl Aniline	5	25	10	50	+ skin
Dinitro Benzene	0 15	1	05	3	+ skin

Substance	Exposure Limits Mean Time ppm	mg/m³	Short Term ppm	mg/m³	Remarks
Dinitro Orthocresyl		0 2		0 6	+ skin
Di-Nitrotoluene		1 5		5	+ skin
Dioxin	25	90	100	360	+ skin
Di Propylene Glycol (Methyl Ether)	100	600	150	900	+ skin
Diquat		0 5		1	
Diselvirum		2		5	
Endosulfan		0 1		0 3	+ skin
Endrin		0 1		0 3	+ skin
Epichlorohydrin	2	10	5	20	+ skin
Ethyl Acetate	400	1400			
Ethanol	1000	1900			
Ethanol Amine	3	8	6	15	
Ethyl Benzene	100	435	125	545	
Ethyl butyl ketone	50	230	75	345	
Ethyl Chloride	1000	2600	1250	3250	
Ethylene Dichloride	10	40	15	60	
Ethylene diamine	10	25			
Ethylene Oxide	10	20			
Ethylene Dichloride	10	40	15	60	
Ethylene Glycol Particles		10		20	
Vapor	50	125			ceiling
Ethyl Mercaptan	0 5	1	2	3	
Ferrous Vanadium Dust		1		0 3	
Glass Fiber Dust		10			
Fluorides (counted on the basis of Fluorine)		2 5			

Substance	Exposure Limits Mean Time ppm	mg/m³	Short Term ppm	mg/m³	Remarks
Fluorine		2	2	4	ceiling
Formaldehyde	2	3			ceiling
Formic Acid	5	9			
Gasoline	300	900	500	1500	
Heptachlor		0 5		2	+ skin
Heptane	400	1600	500	2000	
Hexachloro Cyclopentadiene	0 01	0 1	0 03	0 3	
Hexachloro-Naphthalene		0 20		0 60	+ skin
n Hexane	50	180			
Hexane Isomers	500	1800	1000	3000	
Hydrogen Bromide	3	10			
Hydrogen Cyanide	10	10			ceiling
Hydrogen Fluoride	3	2 5	6	5	
Hydrogen Sulfide	10	14	15	21	
Iodine	0 1	1			ceiling
Iron Oxide Fumes (counted as Iron)	3	5		10	
Isopropyl Alcohol	400	980	500	1225	
Iron Penta Carbonyl	0 1	0 8	0 2	0 16	
Isobutyl Alcohol	50	150	75	225	
Lead Dusts and Fumes Non Organic (as Lead)		0 15		0 45	
Lead Arsenate		0 15		0 45	
Lead Chromate		0 05			
Lindane		0 5		0 5	+ skin
Liquid Petroleum Gases	1000	1800	1250	2250	
Magnesium Oxide Fumes		10			

Substance	Exposure Limits Mean Time ppm	mg/m³	Short Term ppm	mg/m³	Remarks
Malathion		10			+ skin
Manganese Dust and Compounds (as Manganese)		5			ceiling
Managanese Fumes		1		3	
Manganese Tetra Oxide		1			
Mercury (as Mercury)					+ skin
Alkyl Compounds		0 01		0 03	
Fumes of all other Compounds except Alkyl		0 05			
Aryl Compounds and Inorganic Compounds		0 1			
Methomyl		2 5			+ skin
Methoxychlor		10			
Methyl Alchohol	200	260	250	310	+ skin
Methyl Bromide	5	20	15	60	
Methylene-Ketone Butyl	5	20			
Methyl Chloride	50	105	100	205	
Methyl Chloroform	5350	1900	450	2450	
Divinyl Methylene					
MDI Isocyanite	0 02	0 2			ceiling
Methylene Chloride	100	360	500	1700	
Ethyl Methyl Ketone	200	590	300	885	
Hydrazine Methyl	0 2	0 35			+ skin
Isocyanite Methyl	0 02	0 05			+ skin
Mercaptan Methyl	0 5	1			
Parathion Methyl		0 2		0 6	+ skin
Mevinphos	0 01	0 1	0 03	0 3	+ skin

Substance	Exposure Limits Mean Time ppm	mg/m³	Short Term ppm	mg/m³	Remarks
Monocrotophos					
Naphthalene	10	50	15	75	
Nickel Cabonyl (as Nickel)	0 05	0 53			
Nickel Metal		1			
Soluble Compounds of Nickel		0 1		0 3	
Nicotine		0 5		1 5	+ skin
Nitric Acid	2	5	4	10	
Nitric Oxide	25	30	35	45	
p-Nitroaniline		3			+ skin
Nitrobenzene	1	5	2	10	+ skin
Nitro Chlorobenzene		1		2	+ skin
Nitrogen Dioxide	3	6	5	10	
Nitrogen Trifluoride	10	30	15	45	
Nitroglycerine	0 02	0 2	0 05	0 5	+ skin
Nitrotoluene	2	11			+ skin
Octachloro-naphthalene		0 1		0 3	+ skin
Mineral Oil mist		5		10	
Osmium Tetra Oxide (as Osmium)	0 0002	0 002	0 0006	0 006	
Oxalic Acid		1		2	
Oxygen Difluroide	0 05	0 1	0 15	0 3	
Ozone	0 1	0 2	0 3	0 6	
Paraffin Wax Fumes		2		6	
Bronchial (Size of Inhalable particles		0 1			
Parathion		0 1		0 3	+ skin

Substance	Exposure Limits Mean Time ppm	mg/m³	Short Term ppm	mg/m³	Remarks
Naphthalene Pentachloride	0 5		2		
Pentachlorophenol		0 5		1 5	+ skin
Ethylene Dichloride	50	325			
Phenol	5	19	10	38	+ skin
Phenotheazene		5		10	+ skin
p-Phenylenediamine		0 1			+ skin
Phenyl hydrazine	5	20	1	45	+ skin
Phenyl Mercaptan	0 5	2			
Phosgene	0 1	0 4			
Phosphine	0 3	0 4	1	1	
Phosphoric Acid		1		3	
Yellow Phosphorus		0 1		0 3	
Picric Acid		0 1		0 3	+ skin
Platinum Metal		1			
Platinum Salts (soluble as Platinum)		0 002			
Potassium Hydroxide		2			ceiling
Propionic Acid	10	30	15	45	
Propyl Alcohol	200	500	250	625	+ skin
Pyrethrins		5		10	
Pyridine	5	15	10	30	
Rotenone		5		10	
Selenium Salts		0 2			
Selenium Hexafluoride	0 05	0 2			
Silicon				20	
Silicon Carbide				20	

Substance	Exposure Limits Mean Time ppm	mg/m³	Short Term ppm	mg/m³	Remarks
Silver Metal		0 1			
Soluble Silver Salts		0 01			
Sodium Azide	0 1	0 3			ceiling
Sodium Disulfite		5			
Sodium Fluoroacetate		0 05		0 15	+ skin
Sodium Hydroxide		2			ceiling
Sodium Metabisulfute		5			
Stilbene	0 1	0 5	0 3	1 5	
Protein Decomposing Enzymes (100% Pure Crystalline Enzyme)		0 00006			ceiling
Sulur Dioxide	2	5	5	10	
Sulfuric Acid		1			
Sulfur Hexafluoride	1000	6000	1250	7500	
Sulfur Monochloride	1	6	3	18	
Sulfur Pentafluoride	0 025	0 25	0 075	0 75	
2 4 5 - T		10		20	
TEPP	0 004	0 05	0 01	0 2	+ skin
1 1 2 2 Tetra chloroethane	5	35	10	70	+ skin
Tetra Le id Ethyl (as Lead)		0 1		3	+ skin
Tetryl		1 5		3	+ skin
Soluble Th allium Salts (as Thalium)		0 1			+ skin
Thiram		5		10	
Tin and its Inorganic Compounds (except Tin Oxide) (as Tin)		2		4	

Substance	Exposure Limits Mean Time ppm	mg/m³	Short Term ppm	mg/m³	Remarks
Tin Organic Compounds (as Tin)	0 1		0 2		+ skin
Titanium Dioxide				20	
Toluene	100	375	150	560	+ skin
Toluene Di Isocyanite	0 02	0 14			ceiling
Orthotoluidine	2	9			
Trichloro acetic acid	1	5			
1 2, 4 - Trichloro Benzene	5	40			
Trichloro ethylene	50	270	150	805	
Naphthalene Trichlorine		5		10	
2 4 6 - Trinitrotoluene		0 5		3	+ skin
Trimethyl Benzene	25	125	35	170	
Tri-Phosphate Orthocresyl		0 1		0 3	
Natural Uranium and its Soluble and Non-Soluble Compounds (as Uranium)		0 2		0 6	
Inhalable Vanadium Dusts and Fumes (counted as Vanadium)					
Vanadium Oxide		0 5			
Vinyl Chloride	5	10			
Warfarin		0 1		0 3	
Soldering Fumes		5			
Solid Timber Dusts		1			
Soft Timber Dusts		5		10	
Xylene	100	435	150	655	+ skin
Zinc Chloride Fumes		1		2	

Substance	Exposure Limits Mean Time ppm	mg/m³	Short Term ppm	mg/m³	Remarks
Zinc Oxide Fumes		5		10	
Zirconium Compounds (counted as Zirconium)		5		10	

Limits of Exposure to Mineral Dusts

1 Silica- Silicon Dioxide

A Crystalline

- Quartz limit

$$= \frac{\text{300 million particles per cubic foot}}{\text{percentage of Quartz concentration in dust} + 10}$$

- Inhalable (less than 5 microns) **dust limit**

$$= \frac{\text{10 mg per cubic meter}}{\text{percentage of Quartz concentration in dust} + 3}$$

- Crystobalite and Tridimite limits

Half the value calculated for Quartz should be used

B Non-Crystalline

- Limit 20 million particles per cubic foot

2 Asbestos

Limits for asbestos dusts with fiber lengths greater than 5 microns

Amosite	0.5 fibers per cm^3 of air
Crocidolite	0.2 fibers per cm^3 of air
Other Kinds	2 fibers per cm^3 of air

3 Talc

Fibrous Type	2 fibers per cm^3 of air
Non Fibrous Type	20 million particles per cubic foot of air

4 Mica

20 million particles per cubic foot of air

5 Natural Graphite

15 million particles per cubic foot of air

6 Coal

- Inhalable Dust

If the percentage of silica is less than 5%

= 20 million particles per cubic foot of air

If the percentage of silica is greater than 5%

$$= \frac{10\ mg/m^3}{\text{Percentage of silica in inhalable dust} + 2}$$

Limits for Nuisance Causing Dust

If less than 1% quartz

Limits for total dust	= 30 million particles per cubic foot = 10 mg per cubic meter
Limits for inhalable dusts	= 5 mg per cubic meter

If the percentage of quartz exceeds 1% the limits for quartz are applicable

Examples of nuisance dusts

- Alumina
- Calcium Carbonate
- Marble Limestone
- Calcium Silicate
- Portland Cement
- Synthetic Graphite
- Gypsum - Calcium Sulfate
- Magnesium Sulfate
- Kaolin
- Metallurgical Wool Fibers
- Zinc Oxide
- Cellulose Fibers
- Mists of Vegetable Oils - Except Irritating Oils

Limits for Raw Cotton Dust

Mean Time limit	= 0 2 mg/m^3
Short term limit	= 0 6 mm/m^3

Limits for Carcinogens

Substance	Limits	Remarks
Acrylonitrile	2 ppm	+ skin
Asbestos	See mineral dusts	
Bis Chloro Methyl Ether	0 001 ppm	
Chromate (Clearing Chromate Ore)	0 05mg/m^3	as Chromium
Hexavalent Chromium - some compounds that are non-soluble in water	0 05mg/m^3	as Chromium
Volatile Materials in Coal Tar	0 2mg/m^3	as materials soluble in benzene
Nickel Dusts and Fumes	0 1mg/m^3	as Nickel
Acidified Nickel Sulfate	5 ppm	
Vinyl Chloride	10 ppm	
Benzene	2ug/m^3	
Beryllium	5 ppm	+ skin
Carbon Tetrachloride	10 ppm	
Chloroform	0 1 ppm	+ skin
Hydrazine	1 ppm	+ skin
Hydrazine Vinyl	0 5 ppm	+ skin
Hydrazine Dimethyl (1 1)	0 2 ppm	
Dimethyl Sulfate	0 1 ppm	+ skin
Hydrazine Methyl	upper limit	+ skin
Ethylene Oxide	1 ppm	
Formaldehyde	1 ppm	
Hexa Chlorobutadiene	0 02 ppm	
Methyl Iodide	2 ppm	+ skin

Substance	Limits	Remarks
2- Nitrpropane	10 ppm	
beta- Propiolactone	0 5 ppm	
Aminopropylene	2 ppm	+ skin
o-Tolidine	2 ppm	+ skin
Vinyl Bromide	5 ppm	
Vinyl Dioxide	10 ppm	
Cyclohexene		

Carcinogenic Substances with No Known Limits that Workers are Not Allowed to Touch or Deal with in Any Way

1 Octaphenenyl Amino (Parasenyl Amino)
- Benzidine
- Chloromethyl ether
- Beta-naphthylamine

2 Dinitro Phenyl

Industrial Materials or Operations Suspected of being Carcinogenic

Amitrole
Production of Antimony Trioxide
Production of Arsenic Trioxide
Benzo (A) Pyrene
Production of Cadmium Oxide
3 3 Dichloro Benzidine
Carbamyl Chloride Dimethyl
Ethylene Dibromide
Phosporamide Hexamethyl
N - Nitrosodimethylamine
N - Amino Phenyl Beta Naphthol

Ventilation in Work Premises

Ventilation aims to maintain the concentration of pollutants below permissible maximum limits The provision of adequate ventilation inside works premises shall be accomplished in two ways

- General ventilation
- Local ventilation

1 General Ventilation

General ventilation is a suitable method for the treatment of solvent fumes of low toxicity It is not suitable for highly toxic substances or for pollutants that are irregularly emitted or in large quantities It is generally not suitable for dealing with dust and fumes

General ventilation systems shall be deigned after identifying the volumes of evaporated substances and computing the required volumes of air that need to be moved to cause a change of air that is sufficient to maintain concentrations of pollutant substances below the maximum permissible limits The technical engineering aspects shall be taken into consideration when establishing the ventilation system Specialized engineers shall supervise the execution of this system and shall use the recommendations set forth in the following reference book

> *American Conference of Governmental Industrial Hygienists Committee on Ventilation Industrial Ventilation A Manual of Recommended Practice* 13th ed A C G I H Lansing MI 1974

2 Local Ventilation

Local ventilation is more effective in controlling different types of pollutants It consists of a hood a set of pipes and an air purifying apparatus that cleans the air before its emission to the outside with a fan to keep the air in motion Whatever the design of the hood might be the speed of air at the pollution point source should be sufficient to remove it before being dispersed into the work premises

Technical and engineering aspects should be taken into consideration in designing the local ventilation system and its implementation by specialized engineers making use of the above-mentioned reference for general ventilation

Whenever general or local ventilation systems are used, maintenance should be supervised periodically by specialized engineers Efficiency measurements should be carried out during the periodical maintenance

Appendix 6
Environmental Trust Fund

Many developing countries are successfully using environmental funds at the national, regional, and local levels to help finance environmental protection activities Law 4/1994 recognizes the valuable role that environmental funds can play in achieving Egypt's environmental objectives by authorizing the creation of an environmental protection fund at the national level (its operating procedures however have not yet been adopted) Law 4 also authorizes incentive systems and pilot programs for innovative approaches to environmental management This locally managed fund is still a pilot program and is implemented as such by these guidelines

The proposed Environmental Trust Fund for the 10th of Ramadan will become a key mechanism for

- recycling revenues from the multi-media discharge fee back to industry
- providing financial incentives (assistance) for industry to comply with environmental requirements
- disbursing funds to the Municipal Authority to finance its responsibilities in the environmental management program
- leveraging funds for environmental protection from commercial lenders other levels of government bilateral donor agencies and international financial institutions

The financial incentives will play a particularly important role in the early phases of implementing the environmental management program The early phases will require the largest investments from industry as companies bring themselves into compliance with environmental standards The need for financial assistance will thus be greatest during this period Since firms will not yet have responded to the regulated standards and fees at this point discharges will be relatively high as will revenues flowing into the Fund from the multi-media discharge fee There is therefore a balance over time between revenues and revenue requirements As discharges decline so will revenues into the Fund and the need for financial assistance

Sources of Funding

The Environmental Trust Fund receives revenues raised from

- the multi-media discharge fee
- revenues that the Fund managers are able to leverage from bilateral donors, international financial institutions and other sources

Collection and Processing of Fees and Charges

The multi-media discharge fee is applied as a license fee To obtain their license or renewal firms pay the assessed fee to the Municipal Authority The Municipal Authority directs the fee revenues to the Environmental Trust Fund

Administration of the Fund

The Fund has a two-part management structure

- the Board of Trustees (or a subcommittee of the Trustees if the Board so desires) is the decision-making body

- an Administrative Unit possibly within the Municipal Authority will provide day-to-day administrative support

The responsibilities of the Board of Trustees are to

- set policies and funding priorities
- establish project financing criteria
- monitor project selection to ensure consistency with policies priorities and criteria
- approve all disbursements over a size specified by the Board
- monitor financial control and accounting
- issue annual reports and financial statements
- undertake to have an independent audit of the Fund on a yearly basis
- pursue opportunities to leverage the Fund s resources

The Administrative Unit is responsible for day-to day management activities including

- promote the incentives program among industry

- approve disbursements under the size specified by the Board for projects that are consistent with the Fund's policies, funding priorities, and project financing criteria
- monitor individual projects to ensure they meet the terms of the funding agreement
- take enforcement action when the terms of a funding agreement are not fulfilled
- assist the Board as directed

Disbursements from the Fund

The Fund will act as a flow-through mechanism for revenues earmarked for specific activities These include

- revenues from the Phase I hazardous waste generation fee earmarked for the operation of the industrial waste exchange
- revenues from the Phase I air emissions fee earmarked for the Municipal Authority's activities related to air emissions

The Board of Trustees may choose to dedicate revenues from the fixed component of the wastewater discharge fee to finance the Municipal Authority's activities related to wastewater regulations

Other projects will be eligible for disbursements including firms undertaking pollution prevention and control projects through an applications procedure

Transparent procedures and criteria for funding decisions is the core of the disbursement program The Board of Trustees will develop the procedures and criteria An explicit scoring system will increase the transparency of decisions This system involves mandatory criteria judged on a pass/fail basis coupled with non-mandatory criteria for which each criterion is assigned a score Suggested criteria for the Board s consideration include

- *Mandatory Criteria*
  - targeted towards priority environmental concerns especially industrial wastewater
  - technical feasibility
  - plan for continued maintenance and operation
  - competitive procurement process

- *Scored Criteria*

  - environmental effectiveness (impact on priority environmental concerns)
  - multi-media benefits (minimal cross-media transfer of pollutants)
  - consistency with the hierarchy of reduction/prevention reuse and recycling
  - cost-effectiveness
  - degree of leverage
  - degree of technology transfer

Disbursements are in the form of direct grants since grants best overcome any weaknesses in local credit markets, have relatively low administrative costs and can provide larger incentives for industry than soft loans, grants for interest, loan guarantees and other forms of financial assistance Grants are capped at a maximum of 50% of project costs An additional cap of 80% on assistance received from all donors shall also apply

Project proponents seeking funding assistance must submit a funding application form The Fund's administrative unit shall develop the application form after the Board of Trustees has established funding priorities and selection criteria Once submitted the administrative unit will conduct a two-stage review process

- *Stage 1 Project Screening* — Applicants shall first submit an application describing the general objectives and nature of the project The administrative unit shall first review the application for completeness and notify the applicant of any missing information The administrative unit shall then review properly completed applications and notify the applicant whether the proposed project is consistent with the general priorities established by the Board of Trustees

- *Stage 2 Detailed Review* — Applicants whose projects are deemed consistent with the funding priorities shall be invited to submit a detailed application including an assessment of technical feasibility The administration and/or the Board of Trustees shall review the detailed applications and issue a funding decision

  Funding decisions are made on a quarterly or semi-annual basis rather than a first-come first served basis This allows a better comparison of funding applications to determine which best meet the selection criteria The names of grant recipients and the sum awarded shall be made publicly available

Award recipients will be subject to project monitoring and reporting requirements, as defined by the Board of Trustees

Appendix 7
Waste Exchange Program

A waste exchange is primarily an information clearinghouse that facilitates the transfer of wastes from one industry establishment to a separate establishment where the wastes can be used as productive inputs This chapter describes a waste exchange program to be established in the 10th of Ramadan City The role of the Municipal Authority is to establish and administer the waste exchange The hazardous waste fee is designed to generate enough revenues to fund the waste exchange

Objectives of the Program

A waste exchange in the 10th of Ramadan City will help industry to identify and exploit opportunities to reuse and recycle industrial wastes Industry will benefit from the waste exchange through

- avoiding the hazardous waste generation fee on wastes that are reused or recycled
- potential reductions in raw materials costs for buyers of waste materials
- potential increases in revenue for sellers of waste materials
- potential reductions in waste transportation and management costs for sellers of waste materials

Environmental benefits from the waste exchange will include

- reductions in the waste going to landfill or other disposal sites
- reductions in the need for special waste treatment and disposal facilities and the need to transport these wastes
- more efficient use of resources

Operations

The waste exchange will facilitate the reuse and recycling of industrial waste by providing the following services

- *Information to Identify Potential Trades* — Providing information will be the basic function of the waste exchange Lists of potential buyers with the waste materials they are looking for and potential sellers with the waste materials they have available will be provided through a catalog

- *Matching Buyers and Sellers* — The exchange will also make direct efforts to match buyers and sellers This will involve active efforts by exchange staff to find a specific match for a waste and efforts to link generators with possible buyers with whom they could work in the future

- *Market Development* — The exchange will provide outreach to appropriate industries to attempt to find or generate interest in a particular waste stream, either on a one-time or long-term basis The Data Management System (see below) will assist in identifying sectors to target

- *Education and/or Technical Assistance with Source Reduction Reuse and Recycling* — The waste exchange will undertake an education and technical assistance program to increase corporate awareness on the environmental impacts of their waste management choices and opportunities for waste reduction reuse and recycling The program will involve providing educational materials seminars and waste audits

The Municipal Authority will administer the waste exchange This will facilitate the needed links between the waste exchange the Data Management System and the hazardous waste generation fee The Data Management System will contain important information for the functioning of the waste exchange namely information on each company's generation and management of hazardous waste The Data Management System therefore will also be the database for the waste exchange Staff responsible for the Data Management System will also have responsibility for maintaining waste exchange data thereby avoiding duplicative administrative activities

The exchange is essentially a service for industry to assist in improving waste management practices thereby reducing or avoiding the hazardous waste generation fee A mechanism for industry input into the administration of the exchange is thus needed A multi-stakeholder advisory committee should be established for this purpose and should involve major users

The waste exchange will be funded from the revenues derived from the hazardous waste generation fee Hazardous waste fee revenues will be dedicated to the Environmental Trust Fund, which in turn will disburse resources for the operation of the exchange

Once the administrative structure is in place, the administrators can consider contracting out some of the services of the waste exchange For example, the waste exchange can contract local environmental consultants to conduct waste audits for companies that request them This option should be explored after reviewing the fee revenues that are available and the availability of local private sector expertise to provide the services, and the efficiency gains that might result

Implementation

Twinning the waste exchange in the 10th of Ramadan City with an existing waste exchange would assist implementation by transferring lessons already learned in other jurisdictions This might be facilitated by the Environmental Pollution Prevention Project, possibly with the aid of the U S Environmental Protection Agency, Office of Solid Waste and Emergency Response

Establishing the waste exchange will likely require six months and the services of one full-time individual Office space and equipment (phone line computer and software, fax machine and line, photocopier furniture) will also be needed Major set-up activities include

- developing the database of waste buyers and sellers
- publishing some form of monthly quarterly or bi-annual listing of waste exchange information to potential users
- producing promotional materials
- training staff to provide technical assistance

The database is a key component of the waste exchange It must efficiently track the wastes generators have available wastes that users are seeking to buy and the successful exchanges that are made It must be up-dated and used to produce the listing of buyers and sellers At a minimum the database must contain the following fields

- a transaction number
- listing status (generator/user/exchanged)
- material name and description
- quantity of material
- frequency of material available or wanted

- date listing entered
- date material exchanged
- generator name and contact information
- industry sector of the generator
- buyer name and contact information
- industry sector of the buyer

Successful promotion is essential for the exchange to be effective Promotional activities to ensure high rates of participation in the exchange include

- including information on the exchange with information materials on the multi-media discharge fee
- providing seminars or workshops for local businesses to describe the waste exchange
- informing local companies through newsletters, industry journals, or by advertising in local business magazines, newspapers, radio stations, television stations or through various community groups
- encouraging media coverage of the exchange
- working with the industry associations to promote the exchange
- providing an educational and public awareness campaign which includes waste audits site visits information on source reduction, reuse and recycling technical assistance informational Fact Sheets on waste management issues case studies of successful exchanges and an information telephone line
- giving awards to recognize companies that develop innovative waste management solutions

Once established the waste exchange will likely need two full-time equivalents one individual to provide technical assistance answer phones update the database and perform research projects and the second individual to perform site visits waste audits educate the business community and execute the marketing and promoting functions

Appendix 8
Ministry of Industry:
List of Dangerous Substances

MINISTRY OF INDUSTRY- LIST OF DANGEROUS SUBSTANCES		
CHEMICAL NAME	CAS-NO	CLASSIFICATION
Acenaphthene	82-32-9	still not classfied (SNC)
Acenaphthylene	208-96-8	SNC
Acephate	30560-19-1	Xn, R22
Acetaldehyde	75-07-0	Fx, Xn, R12 Xı, R36/37, Carc3, R40
Acetamide	60-35-5	Carc3, R40
Acetone	67-64-1	F, R11
Acetonitrile	75-05-8	F, R11 T,R23/24/25
Acetophenone	98-86-2	Xn, R22 Xı, R36
Acetyl Chloride	75-36-5	F,R11 R14 C,R34
Acifluorofen, Sodium	62476-59-9	SNC
Acrolein	107-02-8	F,R11 T,R25 Tx,R26 C,R34
Acrylamide	79-06-1	Carc2,R45 Mut,R46 T,R24/25-48/23/24/25
Acrylic Acid (specific limits)	79-10-7	R10 C,R34
Acrylonitrile (specific limits)	107-13-1	Carc2, R45 F,R11 T,R23/24/25 Xı,R38
Adipolnitrile	111-69-3	SNC
Alachlor	15972-60-8	Xn,R22 Carc3,R40 R43
Aldicarb	116-06-3	Tx,R27/28
Aldicarb Sulfone	1646-88-4	SNC
Aldrin	309-00-2	T,R24/25-48/24/25 Carc3 R40 N,R50/53
Allyl Alcohol	107-18-6	R10 T R23/24/25 Xı,R36/37/38 N R50
Allyl Chloride	107-05-1	F,R11 Tx R26 N R50
Aluminum Phosphide	20859-73-8	F R15/29 Tx,R28 R32
Aminopyridine	504-24-9	SNC
Ammonia	7664-41-7	R10 T R23
Ammonium Acetate	631-61-8	SNC
Ammonium Methacrylate	16325-47-6	SNC
Ammonium Sulfamate	7773-06-0	SNC

MINISTRY OF INDUSTRY- LIST OF DANGEROUS SUBSTANCES

CHEMICAL NAME	CAS-NO	CLASSIFICATION
Aniline (specific limits)	62-53-3	XN, R20/21/22 Carc, R40 T, R 48/23/24/25 N, R50
ortho-Anisidine	90-04-0	Carc2, R45 Tx, R26/27/28 R33 N, R51/53
Anthracene	120-12-7	SNC
Antimony	7440-36-0	Xn, R20/22
Antimony Trioxide	1309-64-4	Carc3, R40
Arsenic, Inorganic	7440-38-2	T, R23/25
Asbestos (Various CAS NR)	1332-21-4	Carc1, R45 T, R48/23
Azobenzene	103-33-3	Xn, R20/22
Barium (Various CAS NR)	7440-39-3	Xn, R20/22
Barium Cyanide	542-62-1	SNC
Baygon (Propoxur)	114-26-1	T, R25
Benefin	1861-40-1	SNC
Bentazon	25057-89-0	Xn, R22 Xi, R36
Bentazo(a)Anthracene	56-55-3	Carc2, R45
Benzaldehyde	100-52-7	Xn, R22
Benzene	71-43-2	Carc1, R45 F, R11 T, R48/23/24/25
Benzidine	92-87-5	Carc1, R45 Xn, R22
Benzo(a)Pyrene	50-32-8	Carc2, R45 Mut, R46 Rep, R60 Rep2 R61
Benzo(a)Pyrene	192-97-2	SNC
Benzo(b)Fluoranthrene	205-99-2	Carc2, R45
Benzo(ghi)Perylene	191-24-2	SNC
Benzo(j)Fluoranthrene	205-82-3	Carc2, R45
Benzo(k)Fluoranthrene	207-08-9	Carc2 R45
Benzoic Acid	65-85-0	SNC
Benzo Trichloride (Trichloromethylbenzene)	98-07-7	Carc2, R45 Xn 522 t R23 Xi, R37/38 R43

MINISTRY OF INDUSTRY- LIST OF DANGEROUS SUBSTANCES CHEMICAL NAME CAS-NO CLASSIFICATION		
Benzyl Chloride	100-44-7	Xn, R22 T,R23 Xi, R37/38-41 Carc3,R40
Beryllium	7440-41-7	Carc2, R49 T, R25-48/23 Tx, R26 Xi, R36/37/38 R43
Beryllium Sulfate	13510-49-1	SNC
Biphenyl	92-52-4	Xi, R36/37/38 N,R50/53
Bis(2-Chloroethoxy) Ether	111-91-1	SNC
Bis(2-Chloroisopropyl) Ether	39638-32-9	SNC
Bis(2-Chloroethyl) Ether	111-44-4	R10 Tx, R26/27/28 Xn, R40
Bis(Chloromethyl) Ether	542-88-1	SNC
Bisphenol (4,4'-Isopropylidendiphenol)	80-05-7	Xi, R36/37/38 R43
Boron	7440-42-8	SNC
Brominated Dibenzo Furans		SNC
Bromochloro Methane	74-97-5	SNC
Bromodichloro Methane	75-27-4	SNC
p-Bromodiphenyl Ether	101-55-3	SNC
Bromo Ethane	74-96-4	Xn, R20/21/22
Bromoform	75-25-2	T,R23 Xi, R36/38
Bromo Methane	74-83-9	T,R23 Xl, R36/37/38 N R50/53-59
Bromotrichloro Methane	75-62-7	SNC
1,3 Butadiene	106-99-0	Carc2 R45 Fx,R12
n-Butanol (specific limits)	71-36-3	R10 Xn, R20
Butyl Benzyl Phthalate	85-68-7	SNC
Butylate	2008-41-5	SNC
Butyl Chloride	507-20-0	SNC
Butyl Phthalyl Butyl Glycolate	85-70-1	SNC
Cacodylic Acid (Arsenic Compounds)	75-60-5	T,R23/25

MINISTRY OF INDUSTRY- LIST OF DANGEROUS SUBSTANCES

CHEMICAL NAME	CAS-NO	CLASSIFICATION
Cadmium	7440-43-9	SNC
Calcium Cyanide	592-01-8	Tx,R28 R32
Captan	133-06-1	Xi,R36 Carc3,R40 R43
Carbaryl	63-25-2	Xn,R22
Carbofuran	1563-66-2	Tx,R26/28
Carbon Disulfide (specific limits)	75-15-0	F,R11 Xi,R36/38 T,R48/23 Rep3,R62 Rep3,R63
Carbon Tetrachloride (specific limits)	56-23-5	T, R23/24/25-48/23 Carc3,R40 N R59
Carbonyl Sulfide	463-58-1	SNC
Carbosulfan	55285-14-8	SNC
Carboxin	5234-68-4	SNC
Chloral Hydrate	302-17-0	T,R25 Xi,R36/38
Chloramben	133-90-4	SNC
Chlordane	57-74-9	Xn, R21/22 Carc3,R40 N,R50/53
Chlorimuron-Ethyl	90982-32-4	SNC
Chlorine	7782-50-5	T,R23 Xl,R36/37/38
Chlorine Cyanide	506-77-4	Fx,R12 Tx R26
Chlorine Dioxide	10049-04-4	SNC
Chlorite	14998-27-7	SNC
p-Chloro Aniline (Dichloro Anilin)	106-47-8	T R23/24/25 R33
2-Chloro Acetophenone	532-27-4	SNC
Chloro Benzene (specific limits)	108-90-7	R10 Xn R20
Chloro Benzilate	510-15-6	Xn,R20
1-Chloro Butane	109-69-3	F R11
2-Chloro Butane	78-68-4	SNC
Chloro Cyclo Pentadiene	41851-50-7	SNC

MINISTRY OF INDUSTRY- LIST OF DANGEROUS SUBSTANCES

CHEMICAL NAME	CAS-NO	CLASSIFICATION
Chloro -1,1- Difluoro Ethane	75-68-3	SNC
Chloroform (specific limits)	67-66-3	Xn,R22-48/20/22 Xi, R38 Carc3,R40
Chloro Methane	74-87-3	Fx,R12 Carc3,R40 Xn,R48/20
Chloromethyl Methyl Ether	107-30-2	Carc1,R45 F,R11 Xn,R20/21/22
beta-Chloro Naphthalene	91-58-7	SNC
2-Chloro Phenol	95-57-8	Xn,R20/21/22
p-Chloro Phenyl Methyl Sulfide	123-09-1	SNC
p-Chloro Phenyl Methyl Sulfane	98-57-7	SNC
p-Chloro Phenyl Methyl Sulfoxide	934-73-6	SNC
2-Chloro-1,1,1,2-Tetrafluoro Ethene	2837-89-0	SNC
o-Chloro Toluene	95-49-8	Xn,R20
Chloro Sulfuron	64902-72-3	SNC
Chromium III	16065-83-1	SNC
Chromium VI	7440-47-3	SNC
Cobalt	7440-48-4	Xn,R42/43
Copper Cyanide (specific limits)	544-92-3	Tx,R26/27/28
Creosote (partly classified)	8001-58-9	Carc2,R45
Cyanide, Free	57-12-5	Tx,R26/27/28 R32
Cyanogen (Dicyan)	460-19-5	F,R11 T,R23
Cyanogen Bromide	506-68-3	Tx R26/27/28 R32
Cyanogen Chloride		SNC
Cyclohexanone (specific limits)	108-94-1	R10 Xn R20
Cyclohexyl Amine (specific limits)	108-91-8	R10,Xn,R21/22 C R34
2,4-Diamino Toluene	95-80-7	Carc2,R45 Xn,R21 T,R25 Xi R36 R43
Diazomethane	334-88-3	Carc2 R45

MINISTRY OF INDUSTRY- LIST OF DANGEROUS SUBSTANCES

CHEMICAL NAME	CAS-NO	CLASSIFICATION
Dalapon, Salt (2,2 Dichlorpropionsyre)	75-99-0	Xn,R22 Xi,R38-41
Dibenzo (a,h,) Anthracen	53-70-3	Carc2,R45
Dibenzo (a,c) Fluoroanthrene	5385-75-1	SNC
Dibenzo Furan	132-64-9	SNC
1,2 diBromo-3-Chloropropane	96-12-8	Carc2,R45 Mut,R46 T,R25 Xn,R48/20/22
1,4-diBromo Benzene	106-37-6	SNC
diBromochloro Methane	124-48-1	SNC
diBromodiChloro Methane	594-8-3	SNC
p,p-diBromo Diphenyl Ether	2050-47-7	SNC
1,2-Dibromo Ethane (specific limits)	106-93-4	Carc2,R45 T,R23/24/25 Xl,R36/37/38
diBromo Methane (specific limits)	74-95-3	Xn,R20
diButyl Phthalate	84-74-2	SNC
diChloro Acetic Acid	79-43-6	C,R35
1,2-diChloro Benzene (specific limits)	95-50-1	Xn,R22 Xi,R36/37/38 N,R50/53
1,3-diChloro Benzene	541-73-1	Xn,R22
3,3-diChloro Benzidine	91-94-1	Carc2 R45 Xn R21 R43 N,R50/53
diChloro diFluoro Methane	75-71-8	SNC
p,p-diChloro diPhenyl diChloro Ethane	72-54-8	SNC
p,p- diChloro diPhenyl diChloro Ethylene	72-55-9	SNC
1,1-diChloro Ethane (specific limits)	75-34-3	F R11 Xn,R22 Xi,R36/37
1,2 diChloro Ethane (specific limits)	107-06-2	Carc2,R45 F,R11 Xn,R22 Xi,R36/37/38
1,1-diChloro Ethylene (specific limits)	75-35-4	Fx,R12 Xn,R20-40
cis 1,2-diChloro Ethylene	156-59-2	SNC
trans 1,2 diChloro Ethylene	156-60-5	SNC

MINISTRY OF INDUSTRY- LIST OF DANGEROUS SUBSTANCES CHEMICAL NAME CAS-NO CLASSIFICATION		
1,1-diChloro-1-Fluoro Ethane	1717-00-6	SNC
diChloro Methane	75-09-2	Carc3,R40
2,4-diChloro Phenol	120-83-2	Xn,R22 Xi,R36/38
2,4 -diChloro Phenoxy Acetic Acid	94-75-7	Xn,522 Xi R36/37/38
4-(2,4-diChlorophenoxy) Buturic Acid	94-82-6	Xn,R21/22
1,2-diChloro Propane	78-87-5	F R11 Xn,R20/22
2,3-diChloro Propanol	616-23-9	SNC
1,3 diChloro Propene	542-75-6	R10 Xn,R20/21 T,R25 Xi,R36/37/38 R43
1,1-diChloro-2,2,2-Trifluoro Ethane	306-82-2	SNC
di(2-Ethylhexyl) Phthalate	117-81-7	SNC
diEthyl Phthalate	84-66-2	SNC
diEthyl-para-Nitropheyl Phosphate	311-45-5	SNC
diEthyl Sulfate	64-67-5	Carc2,R45 Mut2,R46 Xn,R20/21/22 C,R34
diEthylene Glycol Dinitrate	693-21-0	E,R3 Tx,R26/27/28 R33
diEthylene Glycol Monobutyl Ether	112-34-5	Xi,R36
diEthylene Glycol Monobutyl Ether Acetate	124-17-4	SNC
diMethyl Amino Azobenzene	60-11-7	SNC
diMethyl Amine	124-40-3	Fx,R12 Xi R36/37
n,n-diMethyl Aniline	121-69-7	T R23/24/25 R33
3 3-diMethyl Benzidine	119-93-7	Carc2,R45 Xn,R22
diMethyl Carbamoyl Chloride	79-44-7	Carc2,R45 Xn,R22 Xi,R36/37/38
n n-diMethyl Formamide	68-12-2	Rep2 R61 Xn,R20/21 Xi R36
2,4-diMethyl Phenol (Xylenol)	105-67-9	T,R24/25 C R34
2,6-diMethyl Phenol (Xylenol)	576-26-1	T,R24/25 C,R34
3,4-diMethyl Phenol (Xylenol)	95-65-8	T,R24/25 C,R34

MINISTRY OF INDUSTRY- LIST OF DANGEROUS SUBSTANCES

CHEMICAL NAME	CAS-NO	CLASSIFICATION
diMethyl Phthalate	131-11-3	SNC
diMethyl Sulfate	77-78-1	Carc2,R45 T,R25 Tx,R26 C,R34
diMethyl Tere Phthalate	1206-61	SNC
m-diNitro Benzene	99-65-0	Tx,R26/27/28 R33 N,R50/53
o-diNitro Benzene	528-29-0	Tx,R26/27/28 R33 N,R50/53
4,6-diNitro -orthoCresol	534-52-1	Tx,R27/28 R33 Xi,R36 Mut3,R40 R44
4,6-diNitro -orthoCyclo Hexyl Phenol	131-89-5	T,R23/24/25
2,4-diNitro Phenol	51-28-5	T,R23/24/25 R33
2 4-diNitro Toluene	121-14-2	T,R23/24/25 R33
diNitro Toluene Mixture		
1,4-Dioxane (specific limits)	123-91-1	F,R11 R19 Xi,R36/37 Carc3,R40
diPhenamide	957-51-7	Xn,R22
diPhenyl Amine	122-39-4	T,R23/24/25 R33
1,2-diPhenyl Hydrazine	122-66-7	T,R23/24/25 R33
diSulfoton	298-04-4	Tx,R27/28 N,R50/53
1,2-Epoxy Butane	106-88-7	F R11 Xn R20/21/22 Xi,R36/37/38 Carc3,R40
Ethyl Acetate	141-78-6	F,R11
Ethyl Benzene (specific limits)	100-41-4	F,R11 Xn R20
Ethyl Carbamate	51-79-6	Carc2,R45
Ethyl Chloride	75-00-3	Fx R12
Ethylene Diamine (specific limits)	107-15-3	R10 Xn,R21/22 C R34 R43
Ethylene Thiourea	96-45-7	Rep2 R61 Xn,R22
Ethyl Ether (Diethylether)	60-29-7	Fx, R12 R19
Ethylene Glycol (specific limitis)	107-21-1	Xn,R22
Ethylene Amine (Aziridin)	151-56-4	Carc2 R45 Mut2,R46 F,R11 Tx,R26/27/28 C,R34

MINISTRY OF INDUSTRY- LIST OF DANGEROUS SUBSTANCES

CHEMICAL NAME	CAS-NO	CLASSIFICATION
Ethyl Phthalyl Ethyl Glycolate	84-72-0	SNC
Ethyl-p-Nitorphenyl Phosphor Thioate	2104-64-5	Tx R27/28 N,R50/53
Fluoranthen	206-44-0	SNC
Fluorene	86-73-7	SNC
Fluorine	7782-41-4	R7 Tx,R26 C,R35
Fluoridone	57756-60-4	SNC
Formaldehyde (specific limits)	50-00-0	T,R23/24/25 C,R34 Carc3,R40 R43
Formic Acid (specific limits)	64-18-6	C,R35
Furan	110-00-9	SNC
Furfural (specific limits)	98-01-1	T,R23/25
Glysophate	1071-83-6	SNC
Hexabromo Diphenyl Ether	36483-60-0	SNC
Hexachloro Benzene	118-74-1	CarC2,R45 T R48/25
Hexachloro Butadiene	87-68-3	SNC
alpha-Hexachloro Cyclohexane	319-84-6	Xn R21 T,R25 Carc3,R40
beta-Hexachloro Cyclohexane	319-85-7	Xn,R21 T R25 Carc3 R40
delta-Hexachloro Cyclohexane	319-86-8	Xn R21 T,R25 Carc3 R40
n-Hexane	110-54-3	F,R11 Xn R48/20
Hydrazine (specific limits)	302-01-2	Carc2 R45 R10 T,R23/24/25 C,R34 R43
Hydrogen Chloride	7647-01-0	C,R35 Xi,R37
Hydrogen Cyanide	74-90-8	Fx,R12 Tx,R26
Hydrogen Sulfide	7783-06-4	Fx,R12 Tx,R26
Hydroquinone	123-31-9	Xn,R20/22
Isobutyl Alcohol (specific limits)	78-83-1	R10 Xn R20
Lead Inorganic	7439-92-1	SNC
Mercury, Inorganic (specific limits)	7439-97-6	Tx,R26/27/28 R33

MINISTRY OF INDUSTRY- LIST OF DANGEROUS SUBSTANCES

CHEMICAL NAME	CAS-NO	CLASSIFICATION
Methanol (specific limits)	67-56-1	F,R11 T,R23/25
Methyl Acrylate	96-33-3	Xi,R36/37/38
Methyl Chloro Carbonate	79-22-1	F,R11 T,R23 Xi, R36/37/38
2-Methyl-4-Chloro Phenoxy Acetic Acid	94-76-6	SNC
4,4-Methylene Bis (2-Chloroaniline)	101-14-4	CarC2,R45 Xn,R22 N,R50/53
Methylene Diphenyl Iso Cyanate (MDI)	0101-68-8	Xn,R20 Xi,R36/37/38 R42
Methyl Ethyl Ketone	78-93-3	F,R11 Xi,R36/37
Methyl Iodine	74-88-4	Xn,R21 T,R23/25 Xi,R37/38 Carc3,R40
Methyl Iso Butyl Ketone	108-10-1	F,R11
Methyl Iso Cyanate	624-83-9	Fx,R12 T,R23/24/25 Xi,R36/37/38
Methyl Mercury (specific limits)	22967-92-6	Tx,R26/27/28 R33
2-Methyl Phenol (specific limits)	95-48-7	T,R24/25 C,R34
3-Methyl Phenol	108-39-4	T,R24/25 C,R34
4-Methyl Phenol	106-44-5	T,R24/25 C,R34
Methyl Tert Butyl Ether	1834-04-4	SNC
Naphthalene	91-20-3	SNC
Nickel Carbonyl	13463-39-3	Rep2 R61 F R11 Tx,R26 Carc3 R40
Nickel Refinery Dust		
Nickel Soluble Salts	7440-02-0	Carc3,R40 R43
Nickel Subsulfide	12035-72-2	SNC
Nitric Acid	7697-37-2	O,R8 C R35
Nitrate	14797-55-3	SNC
Nitric Oxide	10102-43-9	SNC
Nitrite	14797-65-0	SNC

MINISTRY OF INDUSTRY- LIST OF DANGEROUS SUBSTANCES CHEMICAL NAME CAS-NO CLASSIFICATION		
Nitro Aniline	88-74-4	T,R23/24/25 R33 R52/53
Nitro Benzene (specific limits)	98-95-3	Tx R26/27/28 R33
4-Nitro Biphenyl	92-93-3	Carc2,R45
Nitrogen Dioxide	10102-44-0	Tx,R26 Xi,R37
p-Nitrophenol	100-02-7	Xn, R20/21/22 R33
2-Nitropropane (specific limits)	79-46-9	Carc2,R45 R10 Xn,R20/22
n-Nitro-di-n-Butyl Amine	924-16-3	SNC
para Chloro Phenyl Methyl Sulfide	123-09-1	SNC
para Chloro Phenyl Methyl Sulfoxide	934-73-6	SNC
Pentabromo Diphenyl Ether	32534-81-9	SNC
Penta Chloro Benzene	608-93-5	F,R11 Xn,R22
Pentachloro Cyclo Pentadiene	25329-35-5	SNC
Pentachloro Ethane (specific limits)	76-01-7	Carc3,R40 T,R48/23 N,R51/53
Pentachloro Nitro Benzene	82-68-8	R43
Pentachloro Phenol	87-86-5	T,R24/25 Tx,R26 Xi,R36/37/38 Carc3 R40 N,R50/53
Phenol (specific limits)	108-95-2	T,R24/25 C,R34
Phenylene Diamine (specific limits)	25265-76-3	T,R23/24/25 R43
Phenyl Mercury Acetate	62-38-4	T,R25-48/24/25 C,R34
Phosphine	7803-51-2	SNC
Phthalic Anhydride (specific limits)	85-44-9	Xi,R36/37/38
Polychlorinated Biphenyls (specific milits)	1336-36-3	R33 N R50/53
Potassium Bromate	7758-01-2	CarC2,R45 O,R9 T,R25
Potassium Cyanide (specific limits)	151-50-88	Tx R26/27/28 R32
Propylene Glycol	57-55-6	SNC
Propylene Glycol Monoethyl Ether	52125-53-8	SNC

MINISTRY OF INDUSTRY- LIST OF DANGEROUS SUBSTANCES

CHEMICAL NAME	CAS-NO	CLASSIFICATION
Proylene Glycol Monomethtl Ether	107-98-2	R10
1,3-Propylene Oxide (Oxetan)	503-30-0	F,R11 Xn,R20/21/22
Propylene Amine	75-55-8	CarC2,R45 F,R11 Tx,R26/27/28 Xi,R41
Pydrine	51630-58-1	SNC
Pyrene	129-00-0	SNC
Pyridine (specific limits)	110-86-1	F,R11 Xn,R20/21/22
Quinone	106-51-4	T,R23/25 Xi,R36/37/38
Sulfuric Acid	7664-93-9	C,R35
Selenious Acid	7783-00-8	T,R23/25 R33
Selenium Compounds	7782-49-2	T,R23/25 R33
Selenium Sulfide	7446-34-6	T,R23/25 R33
Silver	7440-22-4	SNC
Silver Cyanide	506-64-9	SNC
Sodium Azide	26628-22-8	Tx,R28 R32
Sodium Fluoroacetate	62-74-6	Tx,R26/27/28
Styrene (specific limits)	100-42-5	R10 Xn,R20 Xi,R36/38
Tetrabromo Diphenyl Ether	40088-47-9	SNC
1 2,4,5 Tetrachloro Benzene	95-94-3	SNC
Tetrachloro Cyclo Pentadiene	695-77-2	SNC
1,1,2,2-Tetrachloro Ethane (specific limits)	79-34-5	Tx R26/27 N,R51/53
Tetrachloro Ethylene (specific limits)	127-18-4	CarC3,R40
2,3,4,6-Tetrachloro Phenol (specific limits)	58-90-2	T,R25 Xi,R36/38
Tetra Ethyl Lead (Lead Alkalytes) (specific limits)	78-00-2	Rep1,R61 Rep3,R62 Tx,R26/27/28 R33
Thallic Oxide	1314-32-5	Tx,R26/28 R33

MINISTRY OF INDUSTRY- LIST OF DANGEROUS SUBSTANCES CHEMICAL NAME CAS-NO CLASSIFICATION		
Toluene (specific limits)	108-88-3	F,R11 Xn,R20
1,2,4 Tribromo Benzene	615-54-3	SNC
Tribromo Chloro Methane	594-15-0	SNC
Tribromo Dipehnyl Ether	49690-94-0	SNC
Tributyl Tin Oxide (specific limits)	56-35-9	Xn R21 T,R25-48/23/25 Xi,R36/38
Trichloro Acetic Acid (specific limits)	76-03-9	C,R35
Tricresol (specific limits)	1319-77-3	T R24/25 C,R34
1,2,4 Trichloro Benzene	120-82-1	SNC
1,1 1 Trichloro Ethane	71-55-6	Xn,R20 N,R59
1,1,2 Trichloro Ethane (specific limits)	79-00-5	Xn, R20/21/22
Trichloro Ethylene (specific limits)	71-01-6	Carc3,R40
2,4,5 Trichloro Phenol (specific limits)	95-95-4	Xn,R22 Xi,R36/38 N,R50/53
2,4,6 Trichloro Phenol	88-06-2	Xn,R22 Xi,R36/38, Carc3,R40
2,4,5 Trichloro Phenox Acetic Acid	93-76-5	Xn,R22 Xi,R36/37/38
1,2,3 Trichloro Propane	96-18-4	Xn,R20/21/22
1,1 2 Trichloro Propane	598-77-6	SNC
Triethyl Amine	121-44-8	F,R11 Xi R36/37
Triethylene Glycol Monobutyl Ether	143-22-6	SNC
Triethylene Glycol Monoethyl Ether	112-50-5	SNC
Triethylene Glycol Monomethyl Ether	112-35-6	SNC
2,2,4-Trimethyl Pentane	540-84-1	SNC
Trinitro Benzene	25388-32-6	E,R2 Tx,R26/27/28 R33

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MINISTRY OF INDUSTRY- LIST OF DANGEROUS SUBSTANCES CHEMICAL NAME CAS-NO CLASSIFICATION		
2,4,6 Trinitro Toluene	118-96-7	E,R2 T,R23/24/25 R33
Vinyl Acetate	108-05-4	F,R11
Vinyl Bromide	593-60-2	Fx,R12
Vinyl Chloride	75-01-4	Carc1,R45 Fx,R12
Red Phosphorus	7723-14-0	F,R11 R16
Xylenes (specific limits)	1330-20-7	R10 Xn,R20/21 Xi,R38
Zinc and Compounds	7440-66-6	F,R15-17
Zinc Diphosphide	1314-84-7	R,R15/29 Tx,R28 R32
Zinc Cyanide	557-21-1	Tx,R26/27/28 R32

SNC- Still Not Classified

Appendix 9
Specifications and Management Requirements for Hazardous Waste Storage Facilities

General Facility Standards

Owners and operators also must ensure that their wastes are properly identified and handled, that facilities are secure and operating properly, and that personnel working at facilities are trained in hazardous waste management To satisfy these conditions, owners and operators must take the following actions

- ***Conduct Waste Analyses*** -- Waste analyses are conducted prior to treatment, storage, and disposal This ensures that owners or operators possess sufficient information on the properties of the waste they manage to be able to treat, store, or dispose of them in a manner that will not pose a threat to human health or the environment The regulations require owners or operators to perform detailed chemical and physical analysis of their wastes, to develop and follow a written waste analysis plan that specifies tests and test frequencies, and to test any incoming wastes

- ***Install Security Measures*** -- The security requirements were developed to prevent the unknowing entry of people and minimize the potential for the unauthorized entry of people or animals onto the active portions of facilities To meet these security objectives, a barrier surrounding the active portion of the facility with controlled entry systems or 24-hour surveillance must be installed and warning signs posted Owners or operators also must take precautions to avoid fires, explosions, generation of toxic gases, and any other events that would threaten human health, safety, and the environment Owners and operators are exempt from these requirements 1) if unauthorized or unknowing entry will not result in injury, and 2) if the disturbance of waste or equipment will not result in environmental damage

- ***Conduct Inspections*** -- The regulations require an owner or operator to develop and follow a written inspection schedule to

assess the status of the facility and detect potential problem areas Any observations made during the inspections are recorded in the facility's operating log and kept on file for three years All problems found must be remedied

- ***Conduct Training*** -- The purpose of the training requirement is to reduce the potential for mistakes that might threaten human health and the environment This is accomplished by ensuring that facility personnel acquire expertise in the areas to which they are assigned The requirements specify when facility personnel must be trained (e g , six months after beginning a job) the records to be maintained, and the minimum frequency with which the initial training received by the employees must be updated Both on-the-job training and in-house training programs may be used to meet the training requirements There must be a hazard communication plan, medical surveillance program, health and safety plan for employees, decontamination procedures, and to provide a minimum of 24 hours of safety training The training requirement may be waived if the employee has had equivalent training or work experience

- ***Properly Manage Ignitable, Reactive, or Incompatible Wastes*** -- In general, all ignitable or reactive wastes must be protected from sources of ignition or reaction or treated to remove the cause of concern Owners or operators also must make sure that treatment, storage, or disposal of ignitable, reactive, or incompatible waste does not result in damage to the containment structure (container, tank, surface impoundment landfill cell or pit) and/or threaten human health or the environment Incompatible wastes must not be placed in the same containment structure if there is the potential for reaction

- ***Comply With Location Standards*** -- Location standards prohibit siting a new facility in a location where flood or seismic events could affect a waste management unit Bulk liquid wastes are also prohibited from placement in salt domes salt beds or underground mines or caves

General Operating Requirements

These operating procedures are the tools to ensure that wastes are properly managed The operating requirements are discussed below

Containers

Drums and containers are frequently used to accumulate and store wastes In the past, persons using waste drums often put them somewhere out of sight, without any further concern about what might happen to residues in the containers The drums eventually weathered and corroded, releasing their contents, posing threats to human health and the environment Recognizing that elementary and straightforward precautions may eliminate these problems, basic good management practices are necessary The container regulations, therefore, include

- Using containers in good condition Wastes in leaking or damaged containers must be recontainerized
- Ensuring the compatibility of the waste with the container (i e , corrosive wastes should not be stored in metal containers)
- Handling containers properly to prevent ruptures and leaks
- Preventing the mixture of incompatible wastes
- Containers must be placed in a containment system that is capable of containing leaks and spills This system must have sufficient capacity to contain ten percent of the volume of all containers or the volume of the largest container, whichever is greater (this applied only to those holding liquids, containers holding solids are not factored into this volume determination)
- When closing a container all hazardous waste and hazardous waste residues must be removed, unless the container is to be disposed of as hazardous waste
- After closure, all contaminated equipment or soil must be decontaminated or removed

Tanks

Tanks are stationary devices designed to contain an accumulation of hazardous waste and constructed primarily of non-earthen materials General operating requirements fall into five basic areas

- ***Tank Assessment*** -- An assessment must be completed to evaluate the tank system's structural integrity and compatibility with the wastes that it will hold The assessment covers design standards, corrosion protection, tank tests, waste characteristics, and the age of the tank

- ***Secondary Containment and Release Detection*** -- Unless the tank does not contain free liquids and is located in a building with impermeable floors, secondary containment and release detection is required Secondary containment systems must be designed, installed, and operated to prevent the migration of liquid out of the tank system, and to detect and collect any releases that do occur Commonly used types of containments include liners, vaults, and double-walled tanks

  Owners and operators of interim status tank systems can demonstrate that an alternate design, location, and operating practice will prevent the migration of hazardous wastes or constituents while the tank system is in use

- ***Operating and Maintenance Requirements*** -- Persons using tanks, either to store or treat wastes, must manage the tanks to avoid leaks, ruptures, spills, and corrosion This includes using freeboard or a containment structure (e g , dike or trench) to prevent and contain escaping wastes, and having a shut-off or bypass system installed to stop liquid from flowing into a leaking tank

- ***Response to Releases*** -- Tanks with leaks or spills must be emptied immediately The area surrounding the tank must be visually inspected for leaks and spills Based on the inspection, further migration of the waste must be stopped, and visibly contaminated soils and surface water must be properly disposed All major leaks must be reported, followed by a report describing the fate of the released materials

- ***Closure and Post Closure*** -- All contaminated soils and other hazardous waste residues must be removed from the tank storage area at the time of closure

Surface Impoundments

All surface impoundments are required to have

- The installation of two or more impermeable liners
- A leachate collection system between the liners

- Ground-water monitoring

Variances for these requirements may be acceptable if the owner or operator demonstrates that alternative design and operation, together with location characteristics, will prevent migration of hazardous constituents into ground water

In addition, requirements for proper design, construction, and operation of surface impoundments apply These requirements include preventing liquids from escaping from the top (overfilling, run-on) or sides (dikes) of surface impoundments Liners must be constructed properly, of appropriate materials and thickness During construction and installation, liners and cover systems must be inspected for uniformity, damage, and imperfections After installation all units must be examined weekly to ensure that the integrity of the unit is maintained and that no potentially hazardous situations have developed If the liquid in a surface impoundment suddenly drops for no apparent reason, or if a dike leaks, the surface impoundment must be removed from service and, if the leak cannot be stopped, the impoundment must be emptied

The closure and post-closure requirements for surface impoundments include removing or decontaminating all waste residues, and properly covering and maintaining the impoundment to prevent leaks from occurring

Waste Piles

Permitted waste piles must have an impermeable base with a liner designed and constructed to prevent any migration of wastes out of the pile into adjacent soil or waters A leachate collection system immediately above the liner also must be installed

Run-on and run-off systems must be constructed to prevent water from flowing onto the active portion of the waste pile Construction of liners and cover systems must be monitored to ensure that they are properly installed During operation, the owner or operator must inspect the waste pile once a week, to ensure that there is no deterioration and that the leachate collection system is functioning properly

Containment Buildings

Design and Operating Standards

(a) All containment buildings must comply with the following design standards

(1) The containment building must be completely enclosed with a floor, walls, and a roof to prevent exposure to the elements, (e g , precipitation, wind, run-on), and to assure containment of managed wastes

(2) The floor and containment walls of the unit, including the secondary containment system if required under paragraph (b) of this section, must be designed and constructed of materials of sufficient strength and thickness to support themselves the waste contents, and any personnel and heavy equipment that operate within the unit, and to prevent failure due to pressure gradients, settlement, compression or uplift, physical contact with the hazardous wastes to which they are exposed, climatic conditions, and the stresses of daily operation, including the movement of heavy equipment within the unit and contact of such equipment with containment walls The unit must be designed so that it has sufficient structural strength to prevent collapse or other failure All surfaces to be in contact with hazardous wastes must be chemically compatible with those wastes If appropriate to the nature of the waste management operation to take place in the unit, an exception to the structural strength requirement may be made for light-weight doors and windows that meet these criteria

(i) They provide an effective barrier against fugitive dust emissions under paragraph (c) (1) (iv) and

(ii) The unit is designed and operated in a fashion that assures that wastes will not actually come in contact with these openings

(3) Incompatible hazardous wastes or treatment reagents must not be placed in the unit or its secondary containment system if they could cause the unit or secondary containment system to leak, corrode, or otherwise fail

(4) A containment building must have a primary barrier designed to withstand the movement of personnel, waste, and handling equipment in the unit during the operating life of the unit and

appropriate for the physical and chemical characteristics of the waste to be managed

(b) For a containment building used to manage hazardous wastes containing free liquids or treated with free liquids (the presence of which is determined by the paint filter test, a visual examination, or other appropriate means), the owner or operator must include

(1) A primary barrier designed and constructed of materials to prevent the migration of hazardous constituents into the barriers (e g , a geomembrane covered by a concrete wear surface)

(2) A liquid collection and removal system to prevent the accumulation of liquid on the primary barrier of the containment building

(i) The primary barrier must be sloped to drain liquids to the associated collection system

(ii) Liquids and waste must be collected and removed to minimize hydraulic head on the containment system at the earliest practicable time that protects human health and the environment

(3) A secondary containment system including a secondary barrier designed and constructed to prevent migration of hazardous constituents into the barrier, and a leak detection system that is capable of detecting failure of the primary barrier and collecting accumulated hazardous wastes and liquids at the earliest practicable time

(i) The requirements of the leak detection component of the secondary containment system are satisfied by installation of a system that is, at a minimum

(A) Constructed with a bottom slope of 1 percent or more

(B) Constructed of a granular drainage material with a hydraulic conductivity of $1x10^{-2}$ cm/sec or more and a thickness of 12 inches (30 5 cm) or more, or constructed of synthetic or geonet drainage materials with a transmissivity of $3x10^{-5}$ m^2/sec or more

(ii) If treatment is to be conducted in the building, an area in which such treatment will be conducted must be designed to prevent the release of liquids, wet materials, or liquid aerosols to other portions of the building

(iii) The secondary containment system must be constructed of materials that are chemically resistant to the waste and liquids managed in the containment building and of sufficient strength and thickness to prevent collapse under the pressure exerted by overlaying materials and by any equipment used in the containment building (Containment buildings can serve as secondary containment systems for tanks placed within the building under certain conditions A containment building can serve as an external liner system for a tank, provided it meets certain requirements

(c) Owners or operators of all containment buildings must

(1) Use controls and practices to ensure containment of the hazardous waste within the unit, and, at a minimum

(i) Maintain the primary barrier to be free of significant cracks, gaps, corrosion or other deterioration that could cause hazardous waste to be released from the primary barrier

(ii) Maintain the level of the stored/treated hazardous waste within the containment walls of the unit so that the height of any containment wall is not exceeded

(iii) Take measures to prevent the tracking of hazardous waste out of the unit by personnel or by equipment used in handling the waste An area must be designated to decontaminate equipment and any reinsate must be collected and properly managed

(iv) Take measures to control fugitive dust emissions such that any openings (doors windows, vents, cracks, etc) exhibit no visible emissions In addition all associated particulate collection devices (e g , fabric filter, electrostatic precipitator) must be operated and maintained with sound air pollution control practices This state of no visible emissions must be maintained effectively at all times during normal operating conditions, including when vehicles and personnel are entering and exiting the unit

(2) Obtain certification by a qualified registered professional engineer that the containment building design meets the requirements of paragraphs (a) through (c) of this section

(3) Throughout the active life of the containment building, if the owner or operator detects a condition that could lead to or has caused a release of hazardous waste, must repair the condition promptly, in accordance with the following procedures

(i) Upon detection of a condition that has led to a release of hazardous waste (e g , upon detection of leakage from the primary barrier) the owner or operator must

(A) Enter a record of the discovery in the facility operating record

(B) Immediately remove the portion of the containment building affected by the condition from service

(C) Determine what steps must be taken to repair the containment building, remove any leakage from the secondary collection system, and establish a schedule for accomplishing the cleanup and repairs

(D) Within 7 days after the discovery of the condition, notify the regulatory agency of the condition, and within 14 working days, provide a written notice to the regulatory agency with a description of the steps taken to repair the containment building, and the schedule for accomplishing the work

(ii) The regulatory agency will review the information submitted make a determination regarding whether the containment building must be removed from service completely or partially until repairs and cleanup are complete, and notify the owner or operator of the determination and the underlying rationale in writing

(iii) Upon completing all repairs and cleanup the owner or operator must notify the regulatory agency in writing and provide a verification, signed by a qualified, registered professional engineer, that the repairs and cleanup have been completed according to the written plan submitted in accordance with paragraph (c)(3)(I)(D) of this section

(4) Inspect and record in the facility's operating record, at least once every seven days, data gathered from monitoring

equipment and leak detection equipment as well as the containment building and the area immediately surrounding the containment building to detect signs of releases of hazardous waste

(d) For containment building that contains both areas with and without secondary containment, the owner or operator must

(1) Design and operate each area in accordance with the requirements enumerated in paragraphs (a) through (c) of this section

(2) Take measures to prevent the release of liquids or wet materials into areas without secondary containment

(3) Maintain in the facility's operating log a written description of the operating procedures used to maintain the integrity of areas without secondary containment

Closure and Post-closure Care

(a) At closure of a containment building, the owner or operator must remove or decontaminate all waste residues, contaminated containment system components (liners, etc), contaminated subsoils, and structures and equipment contaminated with waste and leachate, and manage them as hazardous waste

(b) If, after removing or decontaminating all residues and making all reasonable efforts to effect removal or decontamination of contaminated components subsoils, structures, and equipment as required in paragraph (a) of this section, the owner or operator finds that not all contaminated subsoils can be practicably removed or decontaminated, he must close the facility and perform post-closure care in accordance with the closure and post-closure requirements that apply to landfills

Additional Operating Requirements

General Inspection Requirements

(a) The owner or operator must inspect his facility for malfunctions and deterioration, operator errors, and discharges which may be causing – or may lead to – (1) release of hazardous waste constituents to the environment or (2) a threat to human health The owner or operator must conduct these inspections often enough to identify problems in

time to correct them before they harm human health or the environment

(b)

(1) The owner or operator must develop and follow a written schedule for inspecting monitoring equipment, safety and emergency equipment, security devices, and operating and structural equipment (such as dikes and sump pumps) that are important to preventing, detecting, or responding to environmental or human health hazards

(2) He must keep this schedule at the facility

(3) The schedule must identify the types of problems (e g malfunctions or deterioration) which are to be looked for during the inspection (e g , inoperative sump pump, leaking fitting, eroding dike, etc)

(4) The frequency of inspection may vary for the items on the schedule However, it should be based on the rate of deterioration of the equipment and the probability of an environmental or human health incident if the deterioration, malfunction, or any operator error goes undetected between inspections Areas subject to spills, such as loading and unloading areas, must be inspected daily when in use

(c) The owner or operator must remedy any deterioration or malfunction of equipment or structures which the inspection reveals on a schedule which ensures that the problem does not lead to an environmental or human health hazard Where a hazard is imminent or has already occurred, remedial action must be taken immediately

(d) The owner or operator must record inspections in an inspection log or summary He must keep these records for at least three years from the date of inspection At a minimum, these records must include the date and time of the inspection, the names of the inspector, a notation of the observations made and the date and nature of any repairs or other remedial actions

Personnel Training

(a)

(1) Facility personnel must successfully complete a program of classroom instruction or on-the-job training that teaches them to perform their duties in a way that ensures the facility's compliance with the requirements of this part The owner or

operator must ensure that this program includes all the elements described in the document required under paragraph (d)(3) of this section

(2) This program must be directed by a person trained in hazardous waste management procedures, and must include instruction which teaches facility personnel hazardous waste management procedures (including contingency plan implementation) relevant to the positions in which they are employed

(3) At a minimum, the training program must be designed to ensure that facility personnel are able to respond effectively to emergencies by familiarizing them with emergency procedures, emergency equipment, and emergency systems, including where applicable

(i) Procedures for using, inspecting, repairing, and replacing facility emergency and monitoring equipment

(ii) Key parameters for automatic waste feed cut-off systems

(iii) Communications or alarm systems

(iv) Response to fires or explosions

(v) Response to ground-water contamination incidents

(vi) Shutdown of operations

(b) Facility personnel must successfully complete the program required in paragraph (a) of this section within six months after the date of their employment or assignment to a facility or to a new position at a facility whichever is later Employees must not work in unsupervised positions until they have completed the training requirements of paragraph (a) of this section

(c) Facility personnel must take part in an annual review of the initial training required in paragraph (a) of this section

(d) The owner or operator must maintain the following documents and records at the facility

(1) The job title for each position at the facility related to hazardous waste management, and the name of the employee filling each job

(2) A written job description for each position listed under paragraph (d)(1) of this section This description may be consistent in its degree of specificity with descriptions for other similar positions in the same company location or bargaining unit, but must include the requisite skill, education, or other qualifications, and duties of employees assigned to each position

(3) A written description of the type and amount of both introductory and continuing training that will be given to each person filling a position listed under paragraph (d)(1) of this section

(4) Records that document that the training or job experience required under paragraphs (a), (b), and (c) of this section has been given to, and completed by, facility personnel

(e) Training records on current personnel must be kept until closure of the facility, training records on former employees must be kept for at least three years from the date the employee last worked at the facility Personnel training records may accompany personnel transferred within the same company

General Requirements for Ignitable, Reactive, or Incompatible Wastes

(a) The owner or operator must take precautions to prevent accidental ignition or reaction of ignitable or reactive waste This waste must be separated and protected from sources of ignition or reaction including but not limited to open flames, smoking cutting and welding, hot surfaces frictional heat sparks (static, electrical or mechanical), spontaneous ignition (e g , from heat-producing chemical reactions) and radiant heat While ignitable or reactive waste is being handled, the owner or operator must confine smoking and open flame to specially designated locations "No Smoking' signs must be conspicuously placed wherever there is a hazard from ignitable or reactive waste

(b) Where specifically required by other sections of this part, the owner or operator of a facility that treats, stores or disposes ignitable or reactive waste, or mixes incompatible waste or incompatible wastes and other materials, must take precautions to prevent reactions which

(1) Generate extreme heat or pressure, fire or explosions, or violent reactions

(2) Produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health or the environment

(3) Produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosions

(4) Damage the structural integrity of the device or facility,

(5) Through other like means threaten human health or the environment

(c) When required to comply with paragraph (a) or (b) of this section, the owner or operator must document that compliance This documentation may be based on references to published scientific or engineering literature, data from trial tests (e g , bench scale or pilot scale tests), waste analyses, or the results of the treatment of similar wastes by similar treatment processes and under similar operating conditions

Labeling Requirements

Managers must ensure that labels are affixed to all containers of hazardous materials The information required on the container label includes

- The identity of the hazardous material
- The hazard warnings of the hazardous material
- The name and address of the waste generator
- The start date for accumulation and storage

Appendix 10
Hazardous Waste Emergency Response Procedures

Contingency Plan and Emergency Procedures

Contingency Plan

Each owner or operator must have a contingency plan for his facility The contingency plan must be designed to minimize hazards to human health or the environment from fires, explosions or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air soil, or surface water

The provision of the plan must be carried out immediately whenever there is a fire explosion or release of hazardous waste or hazardous waste constituents which could threaten human health or the environment

Content of Contingency Plan The contingency plan must describe the actions facility personnel must take in response to fires explosions or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air soil or surface water at the facility

The plan must describe arrangements agreed to by local police departments fire departments hospitals contractors and other government and local emergency response teams to coordinate emergency services

The plan must list names addresses and phone numbers (office and home) of all persons qualified to act as emergency coordinator and this list must be kept up to date Where more than one person is listed one must be named as primary emergency coordinator and others must be listed in the order in which they will assume responsibility as alternates

The plan must include a list of all emergency equipment at the facility (such as fire extinguishing systems spill control equipment communications and alarm systems (internal and external) and decontamination equipment) where this equipment is required This list must be kept up to date In addition the plan must include the location

and a physical description of each item on the list, and a brief outline of its capabilities

The plan must include an evacuation plan for facility personnel where there is a possibility that evacuation could be necessary This plan must describe signal(s) to be used to begin evacuation evacuation routes, and alternate evacuation routes (in cases where the primary routes could be blocked by releases of hazardous waste or fires)

Copies of Contingency Plan A copy of the contingency plan and all revisions to the plan must be

- Maintained at the facility
- Submitted to all local police departments fire departments hospitals and other appropriate government and local emergency teams that may be called upon to provide emergency services

Amendment of Contingency Plan The contingency plan must be reviewed and immediately amended if necessary whenever

- The facility permit is revised
- The plan fails in an emergency
- The facility changes – in its design construction operation maintenance or other circumstances – in a way that materially increases the potential for fires explosions or releases of hazardous waste or hazardous waste constituents or changes the response necessary in an emergency
- The list of emergency coordinators changes or
- The list of emergency equipment changes

Emergency Coordinator At all times there must be at least one employee either on the facility premises or on call (i e available to respond to an emergency by reaching the facility within a short period of time) with the responsibility for coordinating all emergency response measures This emergency coordinator must be thoroughly familiar with all aspects of the facility s contingency plan all operations and activities at the facility the location and characteristics of waste handled the location of all records within the facility and the facility layout In addition this person must have the authority to commit the resources needed to carry out the contingency plan

Emergency Procedures

Whenever there is an imminent or actual emergency situation the emergency coordinator (or his designee when the emergency coordinator is on call) must immediately

- Activate internal facility alarms or communication systems, where applicable, to notify all facility personnel
- Notify appropriate State or local agencies with designated response roles if their help is needed
- Whenever there is a release, fire or explosion the emergency coordinator must immediately identify the character, exact source amount and areal extent of any released materials He may do this by observation or review of facility records or manifests, and, if necessary by chemical analysis
- Concurrently, the emergency coordinator must assess possible hazards to human health or the environment that may result from the release, fire or explosion This assessment must consider both direct and indirect effects of the release, fire, or explosion (e g the effects of any toxic irritating or asphyxiating gases that are generated or the effects of any hazardous surface water run-off from water or chemical agents used to control fire and heat-induced explosions)
- If the emergency coordinator determines that the facility has had a release fire or explosion which could threaten human health or the environment outside the facility he must report his findings as follows
  - If his assessment indicates that evacuation of local areas may be advisable he must immediately notify appropriate local authorities He must be available to help appropriate officials decide whether local areas should be evacuated
  - He must immediately notify the government official designated as the on scene coordinator for that geographical area The report must include
    - Name and telephone number of reporter
    - Name and address of facility
    - Time and type of incident (e g release fire)
    - Name and quantity of material(s) involved to the extent known
    - The extent of injuries if any and

— The possible hazards to human health, or the environment, outside the facility

- During an emergency, the emergency coordinator must take all reasonable measures necessary to ensure that fires, explosions, and releases do not occur, recur or spread to other hazardous waste at the facility These measures must include, where applicable stopping processes and operations, collecting and containing release waste and removing or isolating containers

- If the facility stops operations in response to a fire, explosion or release the emergency coordinator must monitor for leaks pressure buildup, gas generation or ruptures in valves, pipes or other equipment, wherever this is appropriate

- Immediately after an emergency, the emergency coordinator must provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the facility

- The emergency coordinator must ensure that in the affected area(s) of the facility

  - No waste that may be incompatible with the released material is treated stored or disposed of until cleanup procedures are completed

  - All emergency equipment listed in the contingency plan is cleaned and fit for its intended use before operations are resumed

- The owner or operator must notify the appropriate government authorities that the facility is in compliance with above requirements before operations are resumed in the affected area(s) of the facility

- The owner or operator must note in the operating record the time date and details of any incident that requires implementing the contingency plan Within 15 days after the incident he must prepare and keep on file a written report on the incident The report must include

  - Name address and telephone number of the owner or operator
  - Name address and telephone number of the facility
  - Date time and type of incident (e g fire, explosion)
  - Name and quantity of material(s) involved
  - The extent of injuries if any

- An assessment of actual or potential hazards to human health or the environment, where this is applicable
- Estimated quantity and disposition of recovered material that resulted from the incident

Draft Example

Contingency and Emergency Response Plan

General Information

Facility Name and Location

Owner and Operator

Description of Facility Operations
(Provide general description)

The hazardous waste storage facilities in the Solvent Recovery department consist of appropriately designed, closed liquid storage tanks The hazardous waste storage and treatment facilities in the Environmental Controls department consist of appropriately designed closed liquid storage tanks liquid incinerators (thermal oxidizers) a solid waste incinerator (rotary kiln) and container storage area All incinerators have combustion gas quench and scrubber systems

Attachment 1 is the facility site plan

Emergency Officer In the event that the Contingency Plan must be implemented the persons listed in Attachment 2 have been designated as the Emergency Officers These persons are to be contacted in the order given

The Emergency Officer in charge has complete authority to commit the necessary resources of the company in the event an emergency requires implementing the Contingency Plan The Emergency Officer will coordinate the overall emergency response and establish the command center

Implementation The decision to implement the Contingency Plan depends upon whether or not an imminent or actual incident could

threaten human health or the environment This condition may be the result of a fire spill, storm explosion, power failure equipment failure, hazardous vapor release, or other cause The Contingency Plan will be implemented when there is an emergency event involving hazardous waste at one or more of the units covered at this facility

The following list of situations or conditions that may cause the implementation of the Contingency Plan is to be used as guidance for the Emergency Officer

- Fire and/or Explosion
  - A fire that causes a threat or actual release of toxic vapors from the boundary of the TSD unit
  - The fire spreads and could possibly ignite materials at other locations on-site or could cause heat-induced explosions
  - The fire could possibly spread to off-site locations
  - Use of water or water and chemical fire suppressants could result in contaminated run-off
  - An imminent danger exists that an explosion could occur, causing a safety hazard because of flying fragments or shock waves
  - An imminent danger exists that an explosion could ignite other hazardous waste at the facility
  - An imminent danger exists that an explosion could result in release of toxic material
  - An explosion has occurred where the detrimental effects threaten or actually do leave the boundaries of the TSD unit
- Spill or Material Release
  - The spill could result in release of flammable liquids or vapors thus causing a fire or explosion hazard
  - The spill could cause a threat or actual release of toxic liquids or vapors from the boundary of the TSD unit
  - The spill cannot be contained on-site resulting in off-site soil contamination and/or surface water pollution

Emergency Response Procedure

- *Notification* In the event of an emergency situation, all plant personnel are notified by a public address announcement and a coded steam whistle Both pronouncements indicate the location of the emergency The plant emergency response teams immediately respond to the emergency When deemed necessary, the appropriate federal, state, or local agencies, and the fire or police departments will be notified These agencies, with telephone numbers, are listed in Attachment 3

- *Identification of Hazardous Materials* The Emergency Officer will identify the character exact source amount and area extent of the release The initial identification method will be to utilize visual analysis of the material and location of the release In addition documentation or records may be used for identification purposes If, for some reason, the released material cannot be identified samples will be taken for chemical analysis

- *Assessment* The Emergency Officer will assess the possible hazards both direct and indirect, to human health or the environment from a release fire or explosion involving hazardous waste If the Emergency Officer determines that human health or the environment could be threatened this Contingency Plan will be implemented and the appropriate local authorities will be notified for possible local evacuation The Emergency Officer will also contact the appropriate response agencies if appropriate and report the following

  - Name and telephone number of the reporter
  - Name and address of the facility
  - Time and type of incident (e g release fire)
  - Name and quantities of known material(s) involved
  - Extent of injuries if any
  - Possible hazards to human health or the environment outside the facility

- *Control Procedures* The following actions will be taken as appropriate in the areas affected by a major emergency involving a fire or explosion

  - The sounding of a plant wide steam whistle and/or public address system announcement

  - Operations in the area affected will cease immediately

  - All feed lines and additional equipment will be shut down as necessary and practical

- Assess personnel injury and seriousness of injury
- The area will be cleared of all personnel not actively involved in the emergency These persons are to report to the designated assembly points for accountability
- Injured personnel will be attended to and medical treatment will be administered by trained medical personnel
- Routine vehicular traffic and hazardous operations in the area will be terminated until the emergency no longer exists and safety is restored

The need for evacuation procedure will depend on several factors including the nature of the hazard, the characteristics of the waste involved, wind direction, etc The Emergency Officer, along with other emergency response personnel, will determine the appropriate plant evacuation procedure and will advise plant personnel via the public address system

The need for off-plant area evacuation will be determined by the Emergency Officer and civil authorities (sheriff and fire officials) The officials will determine the area to be evacuated and determine means of notification

An appropriate all clear signal will be given when the emergency has been resolved and the safety of personnel is no longer endangered The Emergency Officer will determine when the emergency has passed and will signal the appropriate all clear

The following actions will be taken as appropriate in the areas affected by a major emergency involving chemical spill or material release

- The Emergency Officer will obtain the following information
  - Personnel injured and seriousness of injury
  - Location of the spill or leak the material involved and the source
  - The approximate amount spilled an estimate of the liquid and/or gas discharge rate and the direction the liquid flow or gaseous cloud is moving

- Whether or not a fire is involved

- Clean-up personnel will
  - Make sure all unnecessary persons leave the hazard area
  - Put on protective clothing and equipment as required
  - Remove all ignition sources and use spark and explosion proof equipment if flammable waste is involved
  - If possible, safely stop the leak
  - Remove all surrounding materials that could be reactive with materials in the waste
  - Use absorbent material to contain, divert, and clean up a spill if it has not been contained by other means
  - Place all containment and clean-up materials in appropriate containers for proper treatment or disposal
  - Place all recovered liquid wastes and contaminated soil in the correct container or vessel for proper treatment or disposal

- *Prevention of Recurrence or Spread of Fires Explosions or Releases* Actions to prevent the recurrence or spread of fires explosions or releases include stopping operations collecting and containing released waste and isolating containers

  In addition if the hazardous waste operations cease in response to an emergency the Emergency Officer will instruct plant personnel to monitor valves pipes drums and other equipment for leaks pressure build up gas generation or rupture

  In the event of an incident that triggers the contingency plan an accident investigation will be conducted to determine the cause of the incident and evaluate the measures to prevent a similar occurrence

- *Storage and Treatment of Released Material* Immediately after an emergency the Emergency Officer will have appropriate

personnel make arrangements for proper treatment, storage or disposal of recovered waste contaminated soil surface water, or any other contaminated material

- *Incompatible Wastes* The Emergency Officer will ensure that materials which may be incompatible with the released material are properly moved, segregated stored, or disposed of

- *Post Emergency Equipment Maintenance* After an emergency involving implementation of this Contingency Plan, all emergency equipment used will be cleaned so that it is suitable for reuse Before operations are resumed an inspection of all safety equipment used will be conducted

- *Container Spills and Leakage* Material from leaking drums will be collected and redrummed (by persons adequately protected) Refer to the *Control Procedures* section for a discussion of emergency response procedures for container spills and leakage

- *Tank Spills and Leakage* The contents of leaking tanks will be transferred to other suitable containers and/or tanks Refer to the *Control Procedures* section for a discussion of emergency response procedures for tank spills and leakage Before a leaking tank is put back in service repairs will be made to stop the leak

- *Surface Impoundments Spills and Leakage* This facility does not have hazardous waste surface impoundments therefore, this section is not applicable

Emergency Equipment Attachment 4 will provide a list of emergency equipment maintained at the facility

Coordination Agreements The facility maintains a fully equipped fire fighting system and in on site staffed hospital The need for outside assistance for most emergency situations is not anticipated However the company has established formal arrangements with outside emergency response groups in the event of a major emergency situation Copies of these arrangements are included in Attachment 5

The police department will be contacted for off-site evacuation traffic control etc in the event the facility s own security force is not sufficient The police department will be advised and directed by the facility s Emergency Officer or security personnel The police department is cognizant of the facility layout the location of entrance and exit roadways and the facility security fence and gate arrangements

The company has its own medical staff available for emergency situations In the event that the company's on-site medical staff or medical facilities are not sufficient the company may direct patients to the County Hospital for emergency treatment The County Hospital emergency staff is cognizant of the properties of the hazardous materials handled The company's medical staff and knowledgeable process scientists are made available for consultation if personnel exposure assistance is needed by the hospital staff

In the event of a major fire or spill that cannot be controlled by the company, personnel assistance will be requested of the city's fire department In the event the outside fire department is called in the facility's Emergency Officer will direct all emergency response activities on the plant site The fire department is aware of the properties of the hazardous wastes handled, the facility layout, location of tankage and roadways and have been trained in fire control of fuels and solvents

Evacuation Plan Evacuation of the hazardous waste storage and treatment area may be called by the Emergency Officer

Evacuation of an area is signaled by instructions over the public address system Personnel are instructed to assemble in designated areas for head count prior to release Evacuation of the plant site is signaled by use of the plant steam whistle This is followed by an announcement over the public address system

For all hazardous waste management units the primary evacuation route is through the main office building For all hazardous waste management units the alternate evacuation route is through Gate 5 (the north gate) or any of the other existing perimeter exits dependent of the situation to be determined by the emergency officer

Required Reports Any emergency event (e g fire explosion etc) that requires implementation of the Contingency Plan will be reported in writing within 15 days to the appropriate regulatory official The report will include

- Name address and telephone number of the owner or operator
- Name address and telephone number of the facility
- Date time and type of incident (e g fire explosion)
- Name and quantity of material(s) involved
- The extent of injuries, if any

- An assessment of actual or potential hazards to human health or the environment, where this is applicable, and
- Estimated quantity and disposition of recovered material that resulted from the incident

List of Attachments

1 Facility Site Plans

2 Emergency Officers
Includes names phone numbers (both work and home) and home addresses

3 Emergency Contacts
Law Enforcement phone numbers
Fire Department phone numbers
Hospital phone numbers
Government Agencies phone numbers

4 Emergency Equipment List

5 Copies of formal arrangements with fire and police departments