ENVIRONMENT PUBLIC AUTHORITY

Decision No. 210/2001
Pertaining to the Executive By-Law of the Law of Environment Public Authority

Chairman,
Director General of Environment Public Authority,

Having reviewed law No. 21/1995 concerning the establishment of the Environment Public Authority as amended by law No. 16/1996.

- The decision of Environment Supreme Council No. 1/1997 issued for the constitution of the Authority's Board,

- Reports of the technical committees formed of specialized cadre at the Authority, and all the concerned state bodies for preparing the by-law,

- Following the approval of the Board of Directors at its meeting No. (5) held on May 7, 2001 on the by-law,

It has been decided

ARTICLE ONE

The executive by-law of law No. 21/1995 regarding the establishment of the Environment Public Authority amended by Law No. 16/1996 attached herewith.

ARTICLE TWO

This decision shall be published in the Official Gazette and shall be effective after one year from the date of its publication. Any text that may contravene the provisions of the said decision shall be abrogated.

Dr. Mohammed Abdul Rahman Al Sar'awi
Chairman and Director General

Issued on Rajab 5, 1422 AH
Corresponding to September 22, 2001 AD

By-Law of
Law No. 21/1995, Amended by Law No. 16/1996
Concerning the Establishment of the Environment Public Authority

(Environmental Requirements and Standards in the State of Kuwait)

Chapter I
Development and Environment
The Environmental Impact of the Development Projects

ARTICLE (1)

The following terms – used in the implementation of this chapter's provisions – shall have the meanings as explained against each one of them:

- **The project:** The plan for the performing of any one of the activities specified in the Appendix No. (1) of this by-law.

- **Studies of the environmental impact:** These are comprehensive scientific studies for assessing the effects of developmental projects and activities on the environment. These studies would determine the expected effects and forecast, measure and explain them, and finding methods of controlling them in order to confine their negative impacts during the various stages of the project.

- **The initial report:** It is a report to be submitted to the Authority in its primary form. Such a report would include complete technical description of the project and the environment and demonstrate the type of the anticipated effects and their evaluation methods and results, the proposed measures to reduce their impacts over the different stages of the project as well as the applicable environmental monitoring ways.

- **The final report:** It includes environmental impact study in its final form. Such a report shall be submitted to the Authority for consideration to obtain environmental approval prior to execution. This report shall be more comprehensive than the first one and contain the amendments, which are required from the license to carry out.

ARTICLE (2)

All governmental, joint, private parties and others should carry out studies of the environmental impacts of their projects prior to execution them on when introducing modifications or expansion to the existing projects.

Concerned authorities which are entitled to grant licenses for the establishment of any project or introducing modifications or expansions to the existing projects, and also the responsible parties for organizing and planning

of land use, should oblige the license to carry out environmental impact studies of these projects in accordance with the Article (4) of this by-law, and to be presented to the Authority for approval.

ARTICLE (3)

The Environment Public Authority in collaboration and coordination with concerned state bodies to find an appropriate mechanism for speedy consideration of the license applications related to the environmental outcome, response to queries of the license applicants, prepare re-classification for environment experts and consultants, and provide the necessary forms, questionnaires and records.

The Authority shall permanently review the projects listed in the Appendix No. (1) of the by-law, including upgrading them by adding some projects when necessary by a decision of the Authority. Such revision will be performed in accordance with the rules of the Authority, concerning whether they have negative effect on the environment or not, and in the light of the applied scientific criteria and the world industrial development.

The studies of the environmental impact of the projects will deal with the direct or indirect outcome that would led to environment pollution, natural imbalance, impact on public hygiene, or how they may have effect on life, enjoyment, private or public properties, natural biological and non-biological resources in permanent way, and how they may have effects on historical, cultural, natural territories and the game parks.

ARTICLE (4)

All parties referred to hereinabove shall abide by the regulations and requirements specified by the Authority when proceeding with environmental impact study. They have to submit an initial report to the Authority to study and to give its opinion. Such a report should include the following details:

(1) Complete technical description of the specified project, or the modification or expansions which are proposed to be introduced to an existing project, together with the necessary engineering plans, type of technology, equipments means and materials which would be used in the building or the expansion.

(2) Statement of the economic and social feasibility of the suggested project.

(3) Comprehensive description of the environmental project and the surrounding areas, which may be affected by the project execution, or introduction of modifications or expansion to an existing project.

(4) A comprehensive statement on the expected impacts on environment as a result of the proposed project execution.

(5) Evaluation of negative, positive, accumulative and non-accumulative, direct and indirect impacts on the short-term and long-term stages, on the environment during the various phases of the project execution (as from the preparation stage, execution, operation, maintenance, accomplishment till after the expected age of the project or cancellation thereof), as well as the scientific illustration applied in assessment of these effects

(6) An overall statement of the steps that should be brought about in order to restrain or reduce the negative effects of the project on environment, which may be exposed to harm on the short and long run.

(7) Commitment of applying continuous protection measures after project accomplishment, with necessary monitor and control systems that must be followed.

The Authority should respond to these parties within 60 days from the date of collecting the detailed information specified hereinabove.

All license, applicant parties should after obtaining the Authority's approval on the initial report coordinate with the Authority and stipulate the time needed for submitting final report including the environmental impact of the proposed project. The Authority has to study the final report and will give its opinion within 60 days from the submission date thereof.

ARTICLE (5)

The Authority shall have the right to ask information, statements, documents or carrying out additional studies related to the environmental impacts on the suggested project prior to presenting the final report about their studies by the project owner.

Chapter II
The work environment and the Indoor environment

ARTICLE (6)

All industrial facilities should each according to its type of activity meet all the engineering and environmental requirements specified in Appendix No. (2) of this By-law.

ARTICLE (7)

All facilities shall provide suitable healthy atmosphere to their workers, while performing their duties and protect them against any emission or leakage of air pollutants. For implementing safety and healthy vocational conditions including the appropriate choice of machinery, equipment, materials and fuel, provided that workers exposure shall not exceed the following limits:

(1) Maximum limits of occupational exposure to chemicals at work atmosphere should be as per the tables illustrated in Appendix No. (3-1) of this by-law.

(2) Maximum limits of biological effects due to the occupational exposure to chemicals must be as per the tables illustrated in Appendix No. (3-2) of this by-law.

For ensuring the air quality, and avoiding any impact of the dangerous chemicals at the indoor environment, the instructions guide listed in the tables illustrated in Appendix No. (3-3) of this by-law should be followed.

ARTICLE (8)

All facilities and individuals while proceeding production or service or other activities – have to protect their workers against noise within the following maximum limits:

(1) The maximum permitted level of noise in an industrial environment within limited time, should be within limit as specified in Appendix No. (4-1) of this by-law.

(2) The maximum permitted level of noise inside the industrial facilities measured by (dBA), should be as stipulated in Appendix No. (4-2).

(3) The maximum permitted level of noise at an indoor non-industrial environment whatever its source should be as specified in Appendix No. (4-3) of this by-law.

ARTICLE (9)

All facilities should undertake to protect their workers against ultra-sonic waves at an industrial environment. Such limits are specified in Appendix No. (5) of this by-law.

ARTICLE (10)

(1) All facilities should take all necessary procedures to maintain temperature and humidity degrees inside workplace within the maximum limits listed in Appendix No. (6-1) of this by-law. In case of work necessity under higher degrees, the facilities should provide the workers with appropriate protection means, such as special wears and the like.

(2) All facilities should maintain temperature and humidity degrees inside mental works place within the extremes specified in Appendix No. (6-2) of this by-law.

(3) At low temperature work condition, all suitable safety occupational procedures should be taken such as respiratory device for warning the inhaled air, and wearing the protective wears that maintain body temperature within the extremes mentioned in Appendix No. (6-3) of this by-law.

(4) In order to ensure suitable temperature at the indoor environment, the limits of temperature listed in Appendix No. (6-4) of this by-law must be followed.

(5) Public closed and semi-closed places should have adequate ventilation means that suit the place's capacity, volume and type of activity practiced therein in a way that secure air changing, cleanness and suitable temperature. All that shall be guided by air flow rations mentioned in Appendix No. (6-5) of this by-law.

ARTICLE (11)

All facilities should provide suitable lightening not less than the limits stipulated in Appendix No. (7) of this by-law.

ARTICLE (12)

All facilities should take all the necessary precautions to protect workers against high vibration degrees at all works venues. They shall abide by the limits of hands vibration at the axes (x, y, z) mentioned in Appendix No. (8) of this by-law.

ARTICLE (13)

All facilities should abide with the following levels and rates of in-active radiation exposure:

A- Levels of Exposure to Ultraviolet Ray:

(1) Ultra-violet ray intensity within a spectrum field of (320-400 Nanometer) dropping on naked eye should not exceed (1 mm/cm^2) for more than 16 minutes, and shall not exceed (1 joule/cm^2) if exposure time is less than 16 minutes)

(2) In cases of skin and eyes exposure to ultra-violet ray at all spectrum fields ranging between (180-400) Nanometer, the limits listed in Appendix No. (9-1) of this by-law must be applied.

B- Exposure to Electro-Magnetic Fields (E.M.F):

Occupational exposure to electro-magnetic fields shall be guided by the two frequencies 50/60 Hertz in the values shown in Appendix No. (9-2) of this by-law.

C- Exposure to Laser Ray:

(1) Occupational selected exposure to some common laser rays must be within the extremes stipulated in Appendix No. (9-3) of this by-law.

(2) Eyes direct exposure to laser band (looking inside the band) must be within the exposure limits specified in Appendix No. (9-4) of this by-law.

(3) Eye exposure to laser ray of expanded source (non-point) shall be in the limits mentioned in Appendix No. (9-5) of this by-law.

(4) Skin exposure to laser should be within the limits stipulated in Appendix No. (9-6) of this by-law.

Chapter III
Chemical Resources Management

The environmental criteria for chemical substances production, safety, transport, storage, import and export from and to the State of Kuwait, and the customs transit through its territories

ARTICLE (14)

All parties which produce, fill, handle, transport, import, export and deal with customs transit of chemicals should abide by the environmental conditions and criteria stipulated herein, and comply with the classification of dangerous chemicals mentioned in Appendix No. (10-1) of this by-law. Ministry of Health, Interior and Defense are exempted from this, and also any party who would be permitted by the Environment Public Authority.

ARTICLE (15)

Any party who would produce, import or export chemicals must obtain a license from the concerned authorities after taking consent of the Environment Public Authority.

The licensing Authority may cancel or cease the activity (in case it was proved that the product is environmentally or healthy harmful). Or, it may permit the above if there was a possibility of producing an item with developed modification, which may improve environment or maintain it. In all cases the Authority's approval must be obtained prior to marketing or importing any product.

ARTICLE (16)

The parties who produce, export and import of chemicals should maintain a record numbered and sealed by Environment Public Authority containing the following information:

(1) Type and quantity of the raw materials used in production.
(2) Type and quantity of the chemical product.
(3) Any other details specified by the Environment Public Authority.

ARTICLE (17)

Parties who produce, import or export chemical materials should comply with the following requirements:

(i) Conditions of the refills

(1) The refill should be of good quality from inside that suit the substance inside it, and may not be affected by acids, alkaline and solutions. The refill must be painted with a substance resistant to rust, erosion, and reaction. It should be tightly closed, not to be fragile and can bear all transport circulation, vibration and thermal changes circumstances.

(2) The volume of the refill must be suitable to contain all signs, information, pictures, drawings and symbols internationally recognized and which show dangers toxicity of these substances, how they can be opened emptied, used or disposed thereof. All these details must be placed clearly on the refill, and details cannot be removed, or modified according to the instructions listed in the Appendix Nos. (10-2, 10-3) attached with this by-law. They should be written in Arabic language, and should contain the following data, in particular:

a) Name of the manufacturing company, production and expiry dates, operation and registration numbers.
b) Refill content, chemical and trade names, activity substance, total and net weights, concentration degree, type of danger and toxicity.
c) Steps to be taken at emergency cases that may cause harm to environment and public hygiene.
d) The appropriate storage.

(ii) Requirements of handling

(1) While handling the chemicals, smoking having meals or drinking shall be strictly prohibited, by abiding the information and details mentioned on the refill, and the work venue should be clean, with adequate ventilation systems during handling operations. Also, suitable fire fighting devices should be available and emergency plan must be already prepared in order to face any unexpected accidents may happen while handling, well trained workers should deal with such substances. They should wear and use protective wears and equipment during handling works.

(2) Mechanical and electrical equipment should be used while upon handling the chemicals. Each device must be employed for its designated purpose, and should be fit and well-maintained and suit the specified loads. Handling routes must be free from any obstacle that may hinder the movement of these equipments or its capacity during handling operation.

(3) Worker should not move more than his physical ability of chemical upon manual handling. All pathways must be free from obstacles. Suitable light contains should be used. Preferably sledges or fitted stairs may be used during loading and unloading works.

(iii) Transport requirements

The carriers should be well aware of the perils of chemicals when transporting them by land, sea or air. He should take all safety precautions. These substances must hold the internationally approved signs and symbols, and should be filled in refills that fulfill the conditions stipulated in this article. The carrier and his representatives must keep the shipment documents.

(iv) Requirements for the import and export of chemicals

(1) The following details should be submitted to the Environment Public Authority in order to import and export of chemicals:

a) List of ingredients.
b) Serial number of the substance.
c) Health and environmental impacts.
d) Purpose, the importing or the exporting party.
e) Precautions that should be applied upon emergency cases.
f) Chemical and physical specifications.
g) Product classification number or the customs statistical number according to the organizing system.
h) Ideal method of substances discharge or their containers.

(2) The importing and exporting parties of chemicals should abide by the provisions of prior approval agreement (PIC) and other international agreements effective in the State of Kuwait.

ARTICLE (18)

For construction of warehouse for hazardous chemical substances, the following requirements should be applied:

(i) Obtaining a license for a warehouse construction in accordance with the following measures

(1) Obtaining the approval from the officials of the concerned authorities including the Environment Public Authority.

(2) Submitting an application to the Environment Public Authority in order to obtaining a license for commencing the constructional works, attached with it an engineering drawing of the site, complete description of the materials to be stored, capacity of refills and their dangers, as well as the stipulated rules in storing thereof. The license shall not be granted except after performing final inspection by the concerned authorities.

(ii) Requirements of warehouse site and specifications

(1) The building should be single floor only (ground floor, separated or isolated from other activities with fire resistant walls), storing in the basement is prohibited.

(2) The site should be provided with adequate water sources for fire fighting purposes.

(3) Free access for fire engines and emergency equipment void of obstacles or water spots should be available.

(4) The warehouse must be an independent building, designed in a way that prevents fire danger, pouring or injuries. The structure should suit the nature of substances to be stored, and shall be fire resistant for not less than two hours.

(5) The warehouse ground should be smooth unslippy free from cracks with special canals that assemble leakage of extinguishing polluted water.

(6) Finishing and joints between walls, ceilings and grounds must be tightly closed.

(7) Providing the suitable ventilation through the following means:

a) Providing one of the warehouse's walls with air holes and on the opposite walls holes for drawing air. Such holes should be 300 mm from ground level. Holes of air entry and exit should be far from each other as possible.
b) Furnishing the warehouse with mechanical ventilation system that permits air change with a rate not less than one cubic meter per minute for each $3m^2$ of the ground area, provided that would not be less than $4m^3$.

(8) Refraining from releasing leaked and poured materials to the public sewage network except after taking the suitable steps such as the use of the traps, sorters or basins in order to neutralize the substances action, or the use of effective treatment units. When storing large quantities of perilous substances, an emergency drainage system should be prepared that contain the leakage substances and the polluted water.

(9) Providing many emergency exits easily opened in the dark and heavy smoke, be opened to the outside, and free from containers prepared for transport.

(10) All electrical equipment connections should be inside in the ground the warehouse. The electrical circuits must be provided with ground leakage

circuit fuse, as well as protective devices against overload. Also, the electrical extensions must be spark resistant according to the type of the stored substances.

(11) Providing 10 cm high thresholds at the entrance to hold leaked substances back.

(12) The warehouse should be furnished with a plan that shows the nature of the stored dangerous substances at every corner of the stored substances with their hazardous specifications. Also, location, of emergency equipment, pathways and fire fighting means should be specified. Such a plan should be weekly updated and be kept at a place far from the storage location.

(13) To be away from neighboring buildings in a distance that must be specified according to the kind and danger of stored chemicals according to the following schedule:

A schedule which shows the range of dangerous materials separation in accordance with UN Classification System and the requirement that must be observed

Category	1-1	1-2	2-2	2-3	1-3	1-4	2-4	3-4	1-5	2-5	1-6	8
1-1		C	C	C	C	C	C	C	C	C	C	C
1-2	C			C	B	B	C	B	C	C	B	B
2-2	C			C	A	A	B	A	A	B	A	A
2-3	C	C	C		C	C	C	C	C	C	C	C
1-3	C	B	A	C		B	B	B	C	C	B	A
1-4	C	B	A	C	B		B	B	C	C	B	A
2-4	C	C	B	C	B	B		B	C	C	B	A
3-4	C	B	A	C	B	B	B		C	C	B	B
1-5	C	C	A	C	C	C	C	C		B	B	B
2-5	C	C	B	C	C	C	C	C	B		C	B
1-6	C	B	A	C	B	B	B	B	B	C		A
8	C	B	A	C	A	A	A	B	B	B	A	

Remarks: Separation distance between two different categories of dangerous materials is determined by using the symbol found in the point of decussating between the vertical line representing the first category and the horizontal line representing the other category:

A. Separation distance must be at least 3 meters.
B. Separation distance must be at least 5 meters.
C. Storing it in the same room or space is prohibited. The minimum separation distance among storage areas must be 10 meters.

(iii) Storage conditions

(1) Packages must be organized so as to be always stable and balanced. The height of lined up packages must not exceed 3 m., unless shelves system was used.

(2) Materials must be lined up in a way that does not hinder the fork cranes and handling or emergency equipment.

(3) Dangerous materials must be separated in accordance with International Classification System, and requirements provided in the schedule mentioned in this article, secondly, item (13).

(4) All spoiled packages must be got rid of in a correct way. Further the cleanness of the area must be continuously preserved by removing cardboard, wood and packaging materials. Dust leakage into storage packages must be prohibited.

(5) In the industrial establishments chemicals, when stored, must be stored in stores, which have separation distances of three metes away from production utility of flammable materials or any other fire source.

(6) Processes in store must be accurately supervised by a well trained expert supervisor.

(7) Flammable materials stacks must not be stored beside the building main pillars, which are not proof.

(8) Smoking, drinking and eating must be prohibited in places where dangerous materials are stored or handled.

(9) Workers must not inter the stores unless after wearing protective clothing which suites existing chemical dangers. The same include suitable breathing sets in case of necessity.

(10) Equipment must be maintained for influx suitable quantities of materials used in purification and pollution removal must be provided.

(11) Record that reports the following must be kept:
Stored materials, quantity, quality, purpose of use and date of supply and the quantity of discharged materials as well as wastes elements system.

(12) Dangerous materials must be kept away from anywhere frequented by public according to the requirements provided in the following schedule.

A schedule showing the range of dangerous materials separation from anywhere frequented by the public

Category	Minimum space (meter)
1	50
2-1	5
2-2	5
2-3	15
3-1	10
4-1 to 3-4	5
5-1 to 5-2	5
6-1 to 6-3	5
7	Depending on activity level
8	5

Chapter IV
Management of Household, Hazardous, Healthcare and Sludge Wastes

First: Management of Household and Hazardous Wastes

Article (19)

The following expressions shall have the meanings as explained against respective terms:

Household wastes: Means any wastes resulting from the household use (Houses include hotels and entertainment utilities) as long no hazardous wastes are included therein.

Hazardous wastes: Means any wastes posing potential direct hazards to man or animal's health or the environment in general, resulting from industrial, commercial and agricultural activities and from the household wastes, which are identifiable by any of the discipliners stated in appendix (11-1) and classified in appendix (11-2) hereof and, thus, require carrying out the toxicity tests, analyzing the waste filtrate to check the permissible limits stated in appendix (11-3) hereof.

Treatment: Is any method or technique used to change the physical, chemical, biological properties of the wastes, handle the wastes, make use of the materials or energy therein, change the hazardous wastes to non or less hazardous wastes for safer transportation, storage or disposal thereof.

Disposal dump: Means or utility used to dispose of wastes in environment friendly methods such as storing, treatment, or the due disposal of hazardous wastes.

Generator: Means any such person who generates or becomes the main cause for the production thereof or who possesses the same.

Identification Number: It is the number specified by the Environment Public Authority for each product, transporter or storage, treatment or disposal utility of hazardous wastes.

Incinerator: Any such closed set used to incinerate by controlled flames in order to destroy wastes, provided the main aim of the incineration process is to not make use heat energy as boilers, or minimize or restore the resulting materials, such as the industrial furnaces.

Backfilling (Dumping): Means wastes disposal by use of an engineering method, digging the wastes in or over the ground, provided it is not ground storage dump or treatment utility.

Transporter (Carrier): is the person licensed to transport wastes.

Article (20)

Selection of household wastes dump shall consider the following requirements:

(1) The dumpsite shall be at least five kilometers away from residential areas and be selected upon well-known scientific basics, which consider the geological and hydrological properties as well as the climatic factors and the various human activities.

(2) The dumping site shall be far from such areas of economic value; agriculture and mineral or unique material environments areas such as protectorates of unique animal or plant life, pastures, rain water catchments or course.

(3) The site shall be in a dry and hot weather places in which evaporation rates exceed rainfall rates. The common wind direction shall be away from residential blocks or streets.

(4) The space between filling up site and the nearest subterranean water borehole in the region shall be minimum 2 km. The location shall be in a direction opposite to that of the region subterranean water stream.

(5) The site shall be place and free of ups and downs. The soil shall be argillaceous and not sandy. Soil permeability must not exceed 10^{-7} cm/second. The area must be free of any earth cracks or any other various natural phenomena. In addition, the site must be close to water source and soil strata used in daily coverage.

Article (21)

Backfilling site design shall have the following conditions:

(1) The site must be specified and connected to specified and paved ways that are connected with the main road. Traffic and guidance signs that determine the entry and the way out of the area.

(2) The site shall be enclosed with an iron fence in minimum height of 2 meters. The same must be provided with a main gate for car entry, with a carload scales to weight every car entering into the location.

(3) The backfilling hole volume in the site regarding height, width and depth, shall be sufficient for minimum 15 years use. The hole walls shall be sloping to insure that it will not collapse. Some compressed materials that fix the walls shall be used. The height between the bottom of the hole and subterranean water shall be minimum 10 m.

(4) The site shall be designed in accordance with engineering and environmental requirements. Followed in preparing wastes backfilling locations. These include the following:

a) Site backfilling holes must be padded with unpenetrating covering or insulating layer of natural soil such as compressed soil strata. Thereof permeability must not exceed 10^{-7} cm/sec.
b) The site shall be provided with accumulating and bypassing systems of gases resulting from bacterial dissolution.
c) The site shall be provided with a system for bypassing water accumulated in the bottom of backfilling holes.
d) The site shall be provided with surface drainage system to direct rain and floodwater away from the site.
e) The site shall be provided with a sewerage system. The same shall be consisted of a layer of pebbles directly under the surface layer. Therefore, thickness must be minimum 30 cm. and thereof. Permeability must be minimum 10^{-3} cm/ sec. Thereof shall be a plastic pipe network, which contains holes and ends in catchments.
f) Monitoring points around the site, shall be installed to watch the leakage and spread of gases generated in wastes back filling sites. In addition wastes must be dug in order to insure subtrainean water validity.
g) The site shall be provided with a station for washing car tires after discharging its load and before leaving the site.

Article (22)

On operating the site the following shall be observed:

(1) Separating materials apt to biotic dissolution from other wastes and not to bury then in the backfilling site.

(2) The site shall be operated in a way that forms no danger on the citizens' or workmen's health, besides following a method that depends on spreading the wastes in the form of layers and mashing them with heavy machines. They shall be separated with layers of isolating material such as sand or Gutch (low penetration materials).

(3) Materials shall be buried in cells separated by a layer of medium size stones which has a vertical pipe with side holes penetrating it to facilitate gas escape. The same shall be connected to the generated gas bypass system.

(4) Prohibiting any use of the site for house wastes burial to get rid of any kind of dangerous wastes, bury any kind of wastes, or to follow a random burning method in the site under any circumstances. Moreover, he must continually struggle the spread of insect, rodents and lost animals at the site in cooperation with the concerned authorities.

(5) The burial site shall be covered after daily burial with a soil layer, the thickness of which must not be less than 25 cm. and permeability of which must not be less than 10^{-7} cm/second). It shall be showered with water to fix it along with rolling it with equipment available at the site.

(6) The dumping site shall be covered after the end of the period determined for its use with a soil layer, the thickness of which shall not be less than 60 cm. and the penetration of which shall be not more than (10^{-7} cm/second). The cover final sliding degree shall be between (6-10 degrees) to bypass rainwater to sanitary drainage system in order to prohibit the wearing away of the site surface layer if not planted.

(7) The special information form shown in Appendix No. (11-4) of this regulation shall be kept.

Article (23)

All precautions and means necessary for the safety and health of site workers shall be provided in the dumping site in accordance with what is stipulated in laws and regulations in effect.

Article (24)

A license from competent authorities shall be obtained in order to collect and transfer wastes. This license shall be issued after confirming that all conditions of such wastes transfer safety are available in a way that does not affect public health, environment or natural sources.

Article (25)

Importing or exporting of dangerous wastes or permitting its entry or passings are prohibited in the State of Kuwait. An except thereof is exporting dangerous wastes which the country does not have the technical ability, required facilities, means or ports suitable for getting rid of it in an environmentally safe way, provided that a written approval from importing authority should be issued as well as the approval of Environment Public Authority board.

Article (26)

The generator (source) of any of the dangerous wastes provided in the two Appendixes (11-1), (11-2) of this regulation shall obtain their identification number from Environment Public Authority.

The generator should comply with the following stipulations:

(1) These wastes production rate shall be reduced in quantity and quality by developing the used technology; following clean technology and

choosing alternatives of the product or raw materials that are less dangerous on environment and public health.

(2) Wastes shall not be transferred outside the site unless after the approval of Environment Public Authority. Temporary storage in an environment friendly way shall be observed. Any authority that produces dangerous wastes due to its activity must not deal with any waste carriers or storage, treatment or elimination sites, which do not have identification number from Environment Public Authority and necessary licenses from concerned authorities.

(3) Wastes shall be transferred to special sites determined by concerned authorities in the state.

Article (27)

In selecting the dangerous wastes disposal site following stipulation must be observed:

(1) The site shall be remote from residential areas in a sufficient distance. It shall be managed in a way that creates not danger on citizens' or workmen's health. The site shall be provided with good streets and public services such as electricity and water. In addition it shall be near the dangerous wastes generation areas. Materials of daily filling up and covering, such as soil strata ...etc. shall be available near to the site. The site expiry date shall be 20 years minimum.

(2) The distance between the dangerous wastes disposal sites and the nearest subterranean water borehole shall not be less than 2 km. The area shall be free from any agricultural activities and shall not be of unique nature that makes it suitable for human usage, such as if it contains some rare or perishing animals and plants. The filling up site shall be flat and free of any ups and downs. The soil shall be argillaceous and not sandy. Soil penetration must not exceed 10^{-7} cm/second. The area must be free of any earth cracks and remote from earthquakes, flowages and floods areas. The length between bottom of the hole and subterranean water must not be less than 10 meters.

(3) It is necessary to install some monitoring points around the site to watch gas leakage probability in a horizontal way. It is also necessary to install a watching system on the generated gases, as well as to dig some wastes and prepare monthly report of results to be submitted to the competent authorities.

Article (28)

In designing dangerous wastes disposal site the following points must be observed:

(1) A network of streets shall be provided to facilitate transportation and circulation of wastes inside and outside the site.

(2) The burial whole volume in the site, as for length, width and depth shall be sufficient to be used for 20 years maximum. The whole walls shall be side sloping from (1-3) and fixed to ensure it will not collapse.

(3) The hole walls and bottom shall be covered with a coating resistant to liquid leakage into subterranean water, bacteria, heat and sudden cracks. The coating material thickness and quality must be according to the nature of wastes that are filled with and subterranean water depth.

(4) The site shall be provided with a drainage system to divert rain and flood water away from the site. Subsystem shall consist of a layer of pebbles put directly under the surface layer and its thickness must not be less than 30 cm. and its penetration must not be less than (10^{-3} cm. / second). There shall be a plastic pipes network, which contains holes and ends in a corchment.

(5) The site shall be provided with a drainage system to bypass accumulated water in the bottom of backfilling hole. Therefore, the site ground must be sloping and provided with plastic pipes with side holes that transfers filtered liquids into a special hole where such liquids are bypassed and treated if the filtering materials concentration exceeded the limits allowed in Appendix (11-3). Then they are disposed after being treated in a secure way, in condition that the system shall contain one or two layers.

(6) The site shall be provided with an incinerator to get rid of wastes to be burnt, and provide different planets special for treatment of semi solid wastes, such as oil, sludge and some chemicals before burning them, so as to remove water and oil from them.

Article (29)

The owner or user of the dangerous wastes disposal site shall comply to the following:

(1) To obtain a license from concerned authorities after the consent of Environment Public Authority. This shall be before constructing and operating dangerous wastes disposal site and the site shall follow the ways of disposal provided in Appendix No. (11-5) of this regulation.

(2) To verify, on receiving hazardous wastes, that their identification number, certified transfer document and security data form of the freight are available. Each waste freight shall be checked before receiving it to ensure that it conforms to stipulations provided in transfer document attached.

(3) The site shall be operated in a way that creates no danger on the residents and worker's health. The owner or the user shall not follow random burial method and to follow waste separation and he shall not use the site to bury house garbage or random burning in it under any circumstances. In addition he shall check the spread of insects, rodents and lost animals in cooperation with concerned authorities.

(4) He shall take all necessary precautions in transportation and circulation of barrels at the site to avoid leakage of its contents. It important to treat dangerous wastes such acids and alkalis before burial and to separate liquid dangerous wastes from other liquids in burial, as well as to define special places to bury liquid wastes and others to bury solid wastes.

(5) Wastes transportation and burial data form provided in the appendix No. (11-6) of this stipulation shall be filled. The data of this form shall be written down in a record special for the site.

(6) It is necessary to provide suitable means and equipment to maintain security and health of site workers and to train them on suitable work methods as well as to put an emergency plan to face risks if its necessary.

(7) He shall maintain a special record that includes the following data:

a) A description of each dangerous waste group delivered and its quantity, quality as well as method and date of its storage, treatment or disposal, besides the place and quality of each dangerous waste at the site.
b) Search results and periodical supervision reports data of air quality, subterranean water and cases of emergency.
c) Copies of waste transportation documents and reports related to them as well as all wastes security data.

(8) An annual report introduce Environment Public Authority about wastes activities, which includes:

a) The name and address of the site and Environment Public Authority site identification number and the period that the report covers.
b) Identification numbers of the site from which wastes were received.
c) The description and quality of each amount of dangerous wastes received from each generator separately.
d) Method of storage, treatment or disposal of dangerous wastes.

(ARTICLE 30)

Conditions for storing hazardous waste:

(1) Separate substances either by isolating them in a separate facility or separate them in the same building by using insulated fireproof walls, or by leaving enough space or placing fireproof inert substances in between.

(2) Isolate the storage area away from buildings and other installations by erecting a proper fence, and forbid entry to everyone except to persons working in the area. Substances must be stored far from the fence area and in a well-organized way, by leaving enough space for easy movement between the stored materials. Open storage areas must be used to store secure substances only. Covering flammable waste must be done with as little as flammable covers as possible.

(3) Storage sites must be in cold, dry and ventilated areas.

(4) Waste must be stored in containers with edges so that it can preserve any spillage.

(5) Storage areas must be emptied of flammable sources. A separate storage must be supplied to liquid waste with glow less that 32^{o}C. Highly flammable waste should be stored in refrigerators and cold storages.

(6) Substances should be classified according to their nature. Clear labeling with large letters so that substances can be distinguished.

(7) Labels should be place on stored containers so that flammable, oxidized or poisonous material can be easily distinguished. Labels should indicate nature of substances, degree of toxicity and the right way of dealing with the substances in case of accidents or spillage. Labels should indicate the chemicals name as well as the commercial name and proper storage indicators.

(8) Separate oxidized waste from other, which it can react to. It must be stored in dry areas clear of flammable or acidic material.

(9) Unstable chemical substances that are easily solvent must be stored in airtight containers and dark cold areas. Large quantities of these substances must be stored in separate areas that are uncovered so in case of explosions, waves can be absorbed. Temperature and humidity at this storage facility must be controlled.

(10) Gas cylinders must be stored away from flammable and heat sources.

(11) Waste must be stored in protected containers not prone to breakage or damage. Containers should be closed with covers that do not allow gas leakage and should be made easy to open.

(12) Glass containers that contain highly hazardous waste must be placed inside bigger containers, which will not react to the stored material.

(13) Contaminated stores or containers should be cleaned when closed.

(14) It is necessary to install an alarm system that will operate during emergencies. The alarm sound must be recognized and staff working in the stores must handle its mode of operation. It is necessary to supply the facility with a fire fighting system and necessary fire fighting equipment to resist fire or spillage.

(15) Daily record of stored substances must be supplied where the kind, quantity and area of storage must be recorded.

(ARTICLE 31)

The carrier (transporter) that is storing hazardous waste for a period exceeding five days will be subjected to the special conditions as the owners and ones who are using storage areas as included in the pervious article.

(ARTICLE 32)

The carrier (transporter) of hazardous waste must adhere to the following:

a) Identification number must be obtained from the Environment Public Authority.
b) Instructions on loading hazardous waste and delivery must be followed through transportation document.
c) Different specification substances must not be mixed.
d) Emergency plan must be planed so that emergency cases can be countered. This has to be certified by the Environment Public Authority. Necessary equipment must be supplied to execute this plan.
e) Distinctive plates must be fixed to the sides and back of the vehicle, plates must include nature and kind of cargo and the international symbol which must be obtained by permission from the local authorities. Plates should be removed when transportation is over.
f) Records and documents of hazardous waste must be kept so that they can be presented to the authorities when asked.

(ARTICLE 33)

Driver of transportation vehicle must keep the following documents:

a) The document and the notification of the cargo according to the Appendix No. (11-7) and (11-8) and present them to the specialized authority in the country or other countries, when exporting hazardous substances according to the exception included in Article 25 of this document.

b) Notarized copy of the insurance certificate against fire accidents individuals and property.
c) Training certificate on hazardous waste transportation by safety means and on handling hazardous waste during emergencies.
d) Detailed logbook on the vehicle's route.

(ARTICLE 34)

Hazardous waste transportation vehicle must be subjected to specific conditions according to the type of cargo:

a) **ACIDS AND ALKALINES:** Vehicle's container must be resistant to corrosion resulting from transportation or leakage.

b) **WASTE INCLUDING HAZARDOUS (TOXIC) DUST:** Room ceilings must be clean and smooth and must be utilized to put covering on cargo

c) **FLAMMABLE AND OILY WASTE:** Vehicle must be supplied with electric separation instrument and a fire extinguisher chemical powder cylinder with capacity of no less than 10kg. Exhaust must be vertical.

d) **HIGHLY REACTIVE SUBSTANCES:** Vehicle must carry appropriate fire extinguisher. Cargo must be safely carried in order to avoid vibration during transport.

e) **HEALTH CARE WASTE:** Vehicle's container must be of an appropriate size with a height of 1-2 meters and must include a partition between drivers compartment and the rest of the vehicle, so container can withstand collision at the speed of 30km/ph. Container should be smooth from the inside and must be able to withstand cleaning with steam or other chemicals. Containers with upper cover should not be used.

e) **LIQUIDS:** Vehicle's container must be able to carry spill substances of the same size as of the biggest container (barrel).the volume should not be less than 10% of the total cargo. And when transferred to a reservoir or similar containers, it should be closed and discharge pipes must be fixed to stop leakage.

(ARTICLE 35)

The licensee is obligated to build an incinerator with the following specifications:

A: SPECIFICATIONS OF BUILDINGS AND INSTALLATIONS:

(1) All buildings and installations and special services with regard to the generator as well as the fire fighting system must comply with specifications set out by the government authorities.

(2) Incinerator must be inside an open room for ventilation purposes and must have a ceiling to protect incinerator from climate changes. Particular location must be designated for waste collection and incineration. This area must be covered with reinforced concrete resistant to corrosion. Special points must be designated to and linked to sewage discharge. Special plans and specifications for construction of incinerator must receive prior approval from the Environment Public Authority.

(3) Incinerator building must be provided with a Spare parts storage area and another storage area for temporary waste storage where all safety procedures are implemented. Rest rooms for staff must also be provided. Incinerator doors must be made of iron or other metal and locked safely after working hours.

(4) An adjacent building next to the incinerator must be provided specifically for washing and cleaning cars and containers carrying contaminated waste material. Steam or hot water must be used then discharged through a public sewage system in the area after making certain that physiological and chemical specifications of the water complies to the specifications of the Ministry of Public Works and the Environment Public Authority. Special treatment unit must be built if specifications do not apply.

(5) Fuel ground storage and daily services must be provided according to the Kuwait National Petroleum Company and Kuwait Fire Service Directorate, relevant documents must be presented.

B- TECHNICAL SPECIFICATIONS FOR INCINERATOR:

(1) Incinerator must be designed to incinerate hazardous waste, metal waste, medical, solid, liquid and gas waste such as organic compounds as halogens, chlorine, and different waste from chemical and microbiological laboratories.

(2) Incinerator capacity must not be less than 500Kg/Hour

(3) Incinerator must be supplied with two Incineration rooms. First room incineration must not be less than 1000^{o}C, second room not less than 1200 ^{o}C.

(4) Design of Incineration room must allow gases in the second room more than 2 second; percentage of extra oxygen must not be less than 3% during the incineration period.

(5) Temperatures of gas emissions from the incinerator must be in the average of 150 ^{o}C so as to avoid problems of condensation and corrosion in the chimney.

(6) Efficiency rate of incinerator should not be less than 99.99%

(7) Incinerator must be equipped with mechanical system to feed solid waste. Must also be equipped with automatic lifting containers of different sizes for emptying purposes in the feeding area. System's parts must be resistant to corrosion.

(8) Incinerator must be equipped with feeding system for liquid and gas waste. The system for liquid waste must contain separate reservoirs. Each reservoir's capacity must not be less than 30 liters. Each reservoir must separately feed incinerator so as to avoid mixing waste before the incineration. The whole system must be resistant to corrosion. Feeding system must be equipped with automatic washing system.

(9) Incinerator must be equipped with control systems for contaminant emissions such as filters with an efficiency rate no less than 99.99% of gas halogens and flying particles during incineration.

(10) Incinerator control room should be equipped with a main control board that should be supplied with the following:

a) Open and close switch
b) Separate open and close flame (torch) switch
c) Digital thermometer to record temperatures in the two incineration rooms
d) Concentration of carbon monoxide and oxygen must be recorded, to make sure of incineration efficiency.

(11) Incineration flames must work on natural gas, an alternative switch must work on diesel fuel.

(12) Insulation layer in the incineration units around diameter and the partition between substance and outer brick must be of appropriate thickness to minimize outer later rising temperature. Brick must withstand temperatures no less than 1400 ^{o}C and in the first room must withstand no less than 1600 ^{o}C in the second incinerator unit.

(13) Metal objects of incinerator must withstand temperatures for no less than 1600 ^{o}C.

(14) The main (first) incineration unit or room must be equipped with a sprinkler system especially when temperatures are increased so as to limit effects on metal interior.

(15) Incinerator must be equipped with a continuous control and measurement system as follows:

a) Flow and temperature of gas emissions
b) Total particulate matter
c) Concentrations of carbon monoxide
d) Concentrations of nitrogen oxides
e) Concentrations of sulfur oxides
f) Concentrations of hydrofluorides
g) Opacity
h) Concentrations of total hydrocarbons
i) Ammonia
j) Hydrochlorides

All measurement equipment must be linked to the main incinerator control room.

(16) Incinerator in the first room must be equipped with mechanical equipment for getting rid of ash residue. Organic substances left in ash must be less than 2% in weight

(17) Incinerator must be equipped with appropriate chimney whose design and material must depend on incinerator capacity. Total chimney height must not be less than twelve (12) meters from ground level. Chimney height must exceed the nearest building no less than three meters.

(18) Chimney must be equipped with opening (hole) to collect samples of gas emissions. It must be within an appropriate radius and height from the chimney. Safety procedures must be provided collecting samples.

(19) Contaminated emissions from chimney must be within the limits allowed by the Environment Public Authority and must comply with the following values:

Table of allowed averages of emissions from hazardous incinerators

Pollutant	Maximum Limits	Pollutant	Maximum Limits
Total particulate	34 mg/dscm	Mercury	0.05 mg/m^3
Carbon monoxide	40 ppm	Arsenic	4 $\mu g/m^3$
Dioxin/Furan	0.1 ng/m^3	Chromium	0.5 mg/m^3
Hydrogen chloride	70 mg/m^3	Selenium	0.05 mg/m^3
Sulfur dioxide	50 mg/m^3	Antimony	0.5 mg/m^3
Nitrogen oxide	250 ppm	Copper	0.5 mg/m^3
Hydrogen fluoride	1 mg/m^3	Cobalt	0.5 mg/m^3
Total hydro carbons	40 mg/m^3	Manganese	0.5 mg/m^3
Ammonia	10 mg/m^3	Nickel	0.5 mg/m^3
Volatile organic compounds	10 mg/m^3	Vanadium	0.5 mg/m^3
Lead	0.5 mg/m^3	Tin	0.5 mg/m^3
Cadmium	0.05mg/dscm	Opacity	5% Or less

(ARTICLE 36)

Management of the incinerator must be applied by the following:

(1) Incinerator must be managed in a way that does not endanger the safety of working staff and citizens. Continuous cleanliness of incinerator must be followed.
(2) Operation and maintenance of incinerator must be carried by qualified technicians with enough experience in this field. Operating and maintenance staff will be subjected to periodical technical tests by the Environment Public Authority to access their competence.
(3) Getting rid of ash resulting from incineration must be carried in dumping areas specially for dumping hazardous waste. Standards for dumping must be applied according to the Environment Public Authority.
(4) Incinerator must be maintained periodically according to a maintenance program. Spare parts must always be supplied and periodical reports on operating and maintenance must be presented to the Environment Public Authority.
(5) Workers must be trained correctly to operate incinerator and equipment prior to operation. Staff must be subjected to follow safety rules.
(6) Masks and appropriate clothing and footwear must be supplied and must be in good condition in order to protect staff. Periodical health check must be carried to avoid work-related diseases. First aid kits must be available.

(ii) MANAGEMENT OF HEALTH CARE WASTE

(ARTICLE 37)

Each term is accompanied by following meaning:

- **Health Care Waste:** All waste that is produced by government or non-government installations that provide different health care such as hospitals, clinics, blood banks, dental clinics, laboratories and health institutes, medicine and antidote production facilities, veterinary centers, research organizations, nursing from homes. It is divided into:

A- Non-hazardous Health Care Waste: All house hold waste such as produced by cleaning works inside health installations. This includes the larger part of total health care waste.

B- Hazardous Health Care Waste: Waste that is produced by contaminated sources or possible contamination by liquid or chemical or radioactive contaminants which are considered hazardous to individuals and society and to the environment during its production, usage, storage or movement or when trying to get rid of it, and they are classified as follows:

- **Infectious Waste:** Waste that contains disease causes such as (bacteria, virus, parasites, or fungi) and has enough concentrations to cause disease such as biological cultures, surgery waste, and Intensive care units waste, dialysis waste of patients contacting infectious diseases.

- **Waste from Human and Animal Residue:** Waste that contains cells, human organs, genetic cells, animal carcasses, blood and its derivatives and bodily liquids.

- **Poisonous Genetic and Cell Material:** Highly hazardous pharmaceutical material such as (medicine, radioactive material, chemical substances) which has the capacity to kill or stop cell division, and gene structure and can cause health problems such as physical deformity in the gene and cancer. Some substances are used to treat some cancers and transplants in the nuclear medicine department, tumor treatment, diagnosis by radiation or any material used in the preparation of such substances, in addition to the patient's excretion such as stool or urine or vomit when treated with the above substances. Also toilet water after use by such patients.

- **Sharp Object Waste:** Waste that contains sharp objects such as syringes, scalpels, surgical gauze, saws, blades, broken glass or any sharp object that can cause body puncture or tear.

- **Chemical Waste:** Chemical waste that is solid, liquid, or gas as a result of diagnosis or treatment or from laboratories or material used in cleaning and sterilization.

- **Pharmaceutical Waste:** Waste resulting from production and preparation of medicine and compounds, expired or damaged medicine, contaminated medicine, serums and vaccines as well as containers used for the manufacture, packing and distribution of the above substances.

- **Waste which Contains High Concentration of Heavy Metals:** Highly poisonous waste like (mercury residue, cadmium residue, lead residue).

- **Radioactive Contaminated Waste:** Waste that contain all solid, liquid and gas substances contaminated with nuclear material resulting in the diagnosis of human cells as well as liquids, and tumor diagnosis.

- **Waste from Pressurized Gas Cylinders:** Empty or damaged gas cylinders in addition to cartridges, sterilization containers and aerosols.

- **Incinerator Alternatives:** Techniques to treat waste other than incineration.

(ARTICLE 38)

All rules apply in the first clause of this chapter on handling of health care waste outside health installations.

(ARTICLE 39)

Handling health care waste requires license from specialized authorities after getting approval from the Environment Public Authority.

(ARTICLE 40)

Every health installation must have a specific program to manage heath care waste: this must include the responsible individual for managing health care waste and ways of dealing with it and ways of handling and getting rid of waste. There must be continuous training program for all workers in the installation.

(ARTICLE 41)

The following must be implemented when gathering and moving waste inside a health care installation:

(1) Bags should not be filled with waste for more than three quarters of its size, they must not be pushed down nor have bodily contact nor handled from the bottom when carried. It must be handled from the top, and care must be taken to close all waste containers before it is transferred for storage. Containers must be labeled and waste details must be written on label. Containers containing hazardous or toxic waste must be labeled, under the supervision of nursing staff.

(2) Waste bags and containers must be collected on a daily basis or periodically by trolleys with safety specifications for this purpose by trained staff.

(3) Hazardous health care waste products resulting from infectious diseases rooms and departments and from intensive care units must be collected under direct supervision of the health care waste official.

(4) Cleaning and sterilizing trolleys carrying waste must be done on a daily basis in a special location within the health installation. Residue must be treated before disposal.

(5) Labels of the following information must be attached:

a) Name of waste product (health installation or research lab)
b) Name of location (wing or department)
c) Product type
d) Weight and amount of stored waste in container
e) Date of collection
f) Time and date of storage.

(ARTICLE 42)

The following conditions must be applied when storing health care waste within a health installation:

(1) Designate a specific location to store untreated waste before transfer, making sure that unauthorized personnel are prohibited from entering, the location must be far from health care installations and offices, food storage and preparation as well as from restaurants. Location must be within easy reach for vehicle that is designated to transfer waste.

(2) Storage location area must have solid floor, resistant and easy to clean. Area must be supplied with water, disinfection and sterilization substances and a proper sanitary system. Suitable lighting system and ventilation and refrigeration and it must be tightly closed.

(3) The location must be supplied with cleaning material, protective clothing, safety equipment, fire-fighting system, and disinfection and sterilization substances. Specialized officials must run the location.

(4) Bags or waste containers must be stored at separate locations such as large rooms or buildings suitable for the amount of waste storage and the number of times and collection. Hazardous health care storage should not exceed 24 hours during the summer and 48 hours during the winter. As for waste from human organs and limbs, these must be treated or gotten rid of within seven days or refrigerated at temperatures between (0.5 to minus -9^{o}C). Or they must be frozen at less than zero centigrade, since this waste can be stored after refrigeration for one month before treatment. It is necessary to store hazardous waste at a specified location for that purpose away from the rest of heath care waste.

(5) Storage of radioactive waste with the coordination of the authorities must be collected in lead containers covered with lead tops in order to prevent the leakage and spread of radiation during the period of radioactive disintegration. These containers must be stored at special locations specially for this type of waste with the following specifications:

a) Storage location must be in a specially designed building furnished with fireproof walls and resistant non-porous floors.
b) The location must be equipped with sample air collection instruments, alarm system, and control system to monitor radiation leakage.
c) Location must be equipped with resistant movable curtains placed in appropriate spot

ARTICLE 43

Plastic bags waste and health care waste containers must have the following specifications:

FIRST: PLASTIC BAGS SPECIFICATIONS:

- Thickness must not be less than 150 microns, it must be supplied with cords for tying the bags

- The total volume should not be less than 100 liters. Bags should be of size suitable to fit in container

- The color of these plastic bags will suit the required color mentioned in Appendix (11-9).

- Highly hazardous infectious diseases waste must be put in bags that can withstand high temperatures and cannot melt made of Polyethylene-Polyamide Composite

SECOND: SPECIFICATIONS OF CONTAINER WHERE BAGS ARE LEFT DURING USAGE:

- Must be equipped with tightly shut cover that can be opened with the foot. Must be of a size that can withstand waste bags and must be equipped with handles for easy movement.

- Must be easy to clean and made of material capable of withstanding sterilization, also must be easily movable and equipped with wheels.

- That containers used for yellow colored bags must be labeled with "hazardous medical waste" on all its sides and cover.

THIRD: SPECIFICATIONS OF SHARP OBJECT WASTE CONTAINERS:

Containers must be made of non-puncturable, non-porous material. Must be equipped with a tight cover and an opening that permits entry of sharp instruments. Container size must be suitable for carrying with one hand and must be equipped for a handle for that purpose.

ARTICLE 44

Rooms and locations specifically equipped, as alternative to incinerators must have the following specifications:

(1) Must be away from air conditioning fresh air ventilation openings connected to the hospital, also must be far away from hospital kitchen, operating theatres and intensive care units.

(2) Floors should be made of non-absorbent material, non-porous and resistant to sterilization substances.

(3) Interior walls must be non-porous, crack resistant, covered with a layer of porcelain or any similar material that can easily facilitate cleaning. Must be concave at area connected to ceiling and floor.

(4) Ceilings must be rust resistant and equipped with heat resistant material.

(5) Must be equipped with suitable controls system in order to minimize emission of contaminant gases and foul odors to the environment. Must be equipped with high efficiency filters.

(6) Must be equipped with a surveillance and observation system to monitor contaminant gases as well as alarm systems.

(7) Must be equipped with air conditioning system also equipped with air purification filters. Must have separate air-conditioning system.

(8) Air-conditioning system in the room must be equipped with negative pressure.

(9) Suitable natural and artificial light must be provided.

(10) Location where liquid waste emanates must be connected to a nearest drainage network to drain treated waste according to standards applied in Appendix (14) of this regulation. Location must have its own drainage system.

(11) Location must be equipped with cleaning equipment and water hoses to be used by staff in case of chemical spillage on skin.

(12) Location should be equipped with fire alarm system and fire fighting equipment.

(13) Staff personally on location must be equipped with suitable protective instruments.

ARTICLE 45

All government, participants and private body wishing to import or use know-how and system of health care treatment waste must be committed to acquire a license from the Ministry of Health and specialized authorities after approval from the Environment Public Authority.

ARTICLE 46

The following procedures must be applied when using know-how technology alternative to incineration:

FIRST: STERILIZATION BY AUTOCLAVE: This method entails heat effects resulting from saturated steam with increased pressure at the correct period of time needed to kill minute living organisms found in waste. The following must apply when using this system:

(1) The system must be equipped with waste shredding units and a mechanical feeding system. It must also be equipped with a mechanical control board with indicators to observe and monitor heat and pressure. It must also be equipped with a logbook citing time of operation for each cycle. It is necessary to equip system with special filters to minimize emission of contaminants and foul odors in to air.

(2) A trained and qualified sterilization technician must operate autoclave.

(3) Heat and high pressure resistant bags must be used.

(4) Bags should be inserted in autoclave in order to enable all waste to be exposed to steam and heat throughout treatment period.
(5) Should not be used to treat hazardous, chemical or radioactive waste or body organs and body parts.

(6) Biological test must be conducted to confirm efficiency of sterilization by using a challenge test and Bacillus Stearo Thermophilus Spores. Minimum test result must be 4 Log 10 Reduction. This test should be conducted periodically at least once a month according to Appendix (11-10) of this list.

(7) Autoclave should not exceed its capacity.

(8) In case of damage, health and environment authorities must be informed during a time frame not exceeding 24 hours.

SECOND: TREATMENT BY MICROWAVE: This method entails that waste should be showered with water, then damp waste should be exposed to microwave within a sealed system, where water will be heated to sterilization resulting in heat inside waste because of microwave. This system entails the following:

(1) Must be equipped with one or more than one shredding unit.

(2) Period of sterilization and degree of heat and length of wave and frequency must be suitable for efficient sterilization.

(3) Efficiency test must be carried out periodically, the rate of surviving bacteria in waste must not be less than 99.99%

(4) Must be equipped with system to absorb foul odors.

(5) Must not be used to shred tissue and hazardous chemical waste.

(6) Radioactive element used by system after its supposed end of lease of life end must be disposed of in an environmentally safe manner.

THIRD: CHEMICAL TREATMENT: this method depends on applying strong disinfectants such as (Sodium Hypo-chlorite, Chlorine Dioxide, Parasitic Acid). The following system should be applied:

(1) The concentration of chemical disinfectants, degree of temperatures and period of sterilization must be suitable.

(2) Efficiency test must be carried out by using suitable disinfectants for the system. Suitable amounts of disinfectant solution must be applied to suitable disinfection period at the third level. Rest of disinfectant

solution must be treated before disposal in sewage according to the standards listed in this regulation.

(3) Toxicity Characteristic Leachate Procedure (TCLP) must be carried out on treated waste residue. Results must comply to permit standards mentioned in Appendix (11-11) of this regulation.

(4) Instrument must be of chemical and heat resistant material. Oxidized substances must be pumped through sealed pipes that are resistant to chemicals.

FOURTH: HEAT DISINTEGRATION TREATMENT: This method of heat disintegration through plasma occurs when very high temperatures result in the disintegration of waste to dust and gases. This procedure occurs in two stages: in the first stage waste is passed to the first room by plasma in the absence of oxygen. In the second stage waste is passed to the second room in the presence of oxygen so that organic modification occurs resulting in sterilized waste to dump in health waste dumps. The following should apply when using this system:

(1) System shredder must be at the third level as clarified in Appendix (11-10) of this regulation.

(2) There must be compliance with permitted amounts of emissions produced by hazardous waste incinerators as determined by table of Article (35) of this regulation.

(3) System must not be used to treat tissue and hazardous chemical waste residue.

FIFTH: RADIATION TREATMENT: This method depends on subjecting infectious waste to ionized radiation, infrared or ultraviolet radiation for a specific period to dispose of minute living organisms. Compliance with Ministry of Health standards must be applied when using this system as follows:

(1) An alarm system to monitor radiation leakage and radiation measurement equipment must be fixed.

(2) Floors must be covered with non-porous material and must be easy to clean.

(3) Ceilings and walls must be non-porous and easy to clean.

(4) Location must be equipped with insulation made from an absorbent material such as lead or cement.

(5) Location exterior must be equipped with cautionary signs to forbid entry of unauthorized personnel.

(6) Staff on location must wear protective gear made of lead and must carry radiation measurement instruments.

(7) Location staff must be subjected to periodical medical check-ups.

SIXTH: SHARP OBJECTS WASTE SYSTEM PACKAGING: Sharp objects waste must be packed in polymer cover and dumped at designated health care waste dump.

SEVENTH: CONTINUOUS FEEDING SYSTEM: This system entails that shredded infectious waste must pass through a heated room where a spiral cylinder is rotating and hot oil current must pass through it. This system is subjected to the same conditions as heat disintegration treatment.

THIRD: SANITARY AND INDUSTRIAL SLUDGE

A: SANITARY SLUDGE

(ARTICLE 47)

What is meant by sludge in this chapter is any sticky semi-solid organic substance held by bacteria, viruses, poisonous metal, organic chemical and oily substances, in addition to solid sediment discharged by sanitary and industrial systems. It can also be produced by water treatment installations and from industrial installation.

(ARTICLE 48)

In all cases, sanitary sludge must be treated before usage.

(ARTICLE 49)

When using sanitary sludge in agricultural areas, the level of contaminants must not exceed to the limits allowed in the Appendixes (11-11, 11-12, 11-13, 11-14) of this regulation. When used in non-agricultural areas, levels must not exceed Appendix (11-15) of this regulation.

(ARTICLE 50)

The following conditions must apply before marketing and distributing sanitary sludge:

(1) Obtain approval from the Environment Public Authority to confirm it corresponds to environmental and health regulations. When used in

agriculture, approval must be obtained from the Agricultural and Fisheries Authority.

(2) Treated sludge must be labeled as follows:

a) Name and address of product distributor.
b) That product is produced by sanitary sludge and complies with local standards contaminant concentrations must be labeled.
c) Warning about product toxicity and must not be handled by children. Must be used in locations with distance not less than 10 meters (30 feet) of levels of surface water.

(ARTICLE 51)

Imported fertilizer must be tested at the Agricultural and Fisheries Authority before release to be sure it complies with environmental standards included in (Article 49) of this by regulation.

(ARTICLE 52)

When moving or disposing or dumping sanitary sludge, conditions specific to household waste must apply as shown in the first clause of the fourth chapter of this regulation.

(ARTICLE 53)

It is prohibited to use non-dry sanitary sludge in other than tree planting (irrigation plant) or a forestation. When used in planting, trenches no deeper than 50 centimeters must be dug where sludge is deposited, then it should be covered with a layer of soil of 30 centimeters, making sure that planting should be done months after that.

As for dry sanitary sludge, it should be used in tree planting, landscaping except vegetables whose fruits are under the soil or which can be eaten fresh. The sludge must be turned over with a layer of earth no less than 30 centimeter in thickness or by gravels earth with total thickness of 30 centimeters.

(ARTICLE 54)

The following should apply when collecting and drying sanitary sludge:

(1) Designate a specific location far away from residential areas, must be enclosed by a fence and equipped with suitable health installations, separating and tossing over machines.

(2) Sludge must be collected in designated location, spread to a 50-centimeter layer and periodically tossed over mechanically for six months at least to guarantee drying out of bacteria.

(ARTICLE 55)

Sludge treatment plants must designate an area of land within the plant and away from moist and saturated land, for the purpose of temporarily storing sludge for one day or shorter periods.

In case of sludge surface dumping in piles for less than a period of one year, compliance with standards in Appendix No. (11-16) of this list must be observed.

When disposing of sludge by incineration, suitable incinerators must be used, where temperatures must not be less than 850-900 (Celsius degree) centigrade, and where conditions listed in (Article 35) and (Article 36) of this regulation must apply.

B- INDUSTRIAL SLUDGE:

(ARTICLE 56)

Industrial sludge should be treated before disposal by turning it into non-harmful compounds, or it must be treated to minimize its danger when thrown in receivable location.

(ARTICLE 57)

Industrial sludge must be disposed of according to the following:

(1) **Oily Sludge:** sludge and oil must be separated by heating it to 88 centigrade for (4-6) hours, then it must be left for sedimentation for (12-24) hours, or by chemical or biological means if possible. Clean oil must be collected and remaining sludge must be disposed of by the following methods:

a) **Incineration:** After burning oily sludge, remaining ash must be dumped at healthy dump locations.
b) **Dumping:** Oily sludge must be mixed with absorbent substances to avoid oil penetration in ground layer or underground water.
c) **Spreading over agricultural land:** sludge must be spread at (10-15) centimeter thickness for one week in hot areas and some nutritional substances may be added to facilitate biological disintegration of sludge.

(2) **Toxic Sludge:** Disposed of by the following:

a) **Dumping:** Dumping ditched must be dug according to environmental conditions specific for dumping hazardous waste listed in this regulation.
b) **Surface Dumping:** Sludge must be covered with a layer of soil and pressed.
c) **Incineration:** Non-disintegrating organic compounds will be destroyed in suitable incinerators.
d) **Sludge Solidification:** By adding substances which will help it to solidify, such as silicates, cement or lime.
e) Spreading over agricultural land.
f) Chemical or Biological methods.

(3) **Chemical Sludge:** Disposed of by the following:

a) **Incineration:** Where organic compounds will be destroyed in suitable incinerators.
b) **Dumping:** This method should be used specifically for sludge containing alum.
c) **Spreading over agricultural land:** This method is applied when sludge contains large quantities of lime and alum, must be spread on land on an average of 2.5 cm per year.
d) **Recovery:** Lime and Alum can be recovered from sludge by applying chemical procedures.

CHAPTER V
PROTECTION OF MARINE AND COASTAL ENVIRONMENT

FIRST: PROTECTION OF MARINE ENVIRONMENT

(ARTICLE 58)

Ambient seawater quality must be preserved according to specifications listed in Appendix (12) of this regulation.

(ARTICLE 59)

Liquid-Effluent discharge into the marine environment should not exceed levels listed in Appendix (13) of this regulation.

In any case, it is not allowed to discharge treated liquid waste in the marine environment except at a distance no less than 500 meters from the coast. Liquid effluent should not be discharged in fishing areas, swimming areas and natural sanctuaries.

(ARTICLE 60)

Industrial liquid discharge into public drains should not exceed allowed limits listed in Appendix (14)

(ARTICLE 61)

Treated liquid wastewater must not exceed limits allowed listed in Appendix (15) of this regulation when used for irrigation.

(ARTICLE 62)

Unbottled water must have the specifications listed in Appendix (16) of this regulation.

Second: Protection of Coastal Environment

(ARTICLE 63)

The following must apply when burying beach:

(1) Verify maximum efficiency of the drying density of sediment area before and after burying coastal line.

(2) Place coastal barriers before starting the digging and burying operation so that vital locations close to the project can be preserved from the effects of contaminated substances that accompanies such an operation.

(3) A homogeneous and suitable burying substance must be used with the area sediment, care must be observed with regard to the nature of the coast and the type of waves and currents in the area.

(4) Same coast sands or sand from delicate environments (such as gulfs, swamps, and areas close to the coast) must not be used.

(5) Coast must be buried with sand close to its nature. Sand size must exceed 0.25 millimeter. At high activity coasts sand size must not be below 0.4 millimeters. Level of mud and in sand must be from 5% to 10%.

(ARTICLE 64)

The following should apply when building jetties:

(1) Obtain approval from the authorities to build the jetty.

(2) Jetty must be constructed on concrete or steel or wooden foundations on condition it is not linked so that water and moving sands can pass through. Level of foundation height must be suitable to natural coast level. Jetty must face the sea on the high tide and sanctuaries or boards must not be built on the jetty sides. There should be one jetty for every five kilometers on the southern coast.

(3) Coastal jetties must not be constructed near areas where mangroves grow.

(4) Jetties must be maintained periodically. Pikd sand around concrete foundations must be moved.

(ARTICLE 65)

Wave breakers, concrete rock walls must be built according to the suitability of the speed and direction of marine waves and tides. It is prohibited to build from debris. Periodic maintenance must be observed.

(ARTICLE 66)

Pulling out rocks, gravels or disposing of coastal sands is prohibited except by permission from the authorities.

(ARTICLE 67)

Coastal installations must be far from the coast at a distance of no less than 150 meters from coastal sand line and around the Bay and at a distance no less than 50 meters from a stable coast. Approval for construction must be obtained from the Environment Public Authority and other specialized authorities. Design and construction must comply with the nature of the Kuwaiti environment and must be preserved.

(ARTICLE 68)

A complete survey must be conducted for the desired area before obtaining a building license to construct touristic projects on the coastal line. The following conditions must apply:

(1) Nature of waves, tides, coast declination, type of sediment, water depth must be determined in order to illustrate the effects of wave movement toward the possibility of coast erosion or sand sedimentation.

(2) Designate suitable areas for sport activities such as swimming and fishing, divide different marine sport activities in order to preserve delicate marine flora.

(3) Declare the level of distance of the location from industrial or drainage dumping.

(4) Touristic projects must conform to the coastal nature and architectural style of the State of Kuwait.

(5) Microbiological results of the touristic coast's project must be done at the microbiological laboratory affiliated with the Environment Public Authority to make sure it is safe for swimmers.

(ARTICLE 69)

The following conditions must be complied with for obtaining a license to build a port or harbor:

(1) The Location must be a long distance from oil pipelines, cables, sewage outlet and delicate environment areas such as fish, shrimp and bird nurseries. The location must conform to waves, water currents tided and sediment movements.

(2) The Environment Public Authority must be informed about Digging and debris in order to locate a location for its disposal.

(3) All procedures should be taken to preserve seawater quality and fish.

(ARTICLE 70)

When building a water distillation plant and electricity power station, all environmental and natural aspects must be observed when choosing a location, in order to guarantee that the surrounding environment will not be affected.

CHAPTER VI
PROTECTION OF EARTH CRUST FROM POLLUTION

FIRST: PROTECTION OF EARTH CRUST AND DESERT AREAS

(ARTICLE 71)

Either normal people or campers or any other must observe the following conditions when visiting desert areas:

(1) Obtain prior approval from Kuwait Municipality to set up camp after paying insurance fee and retrieving the amount in case all conditions are observed in this Article or deduct the amount according to the amount of damage to the environment. Law No. 21/95 as amended to Law 16/96 must not be breached as well other valid laws.

(2) Camps must be away at a distance no less than five kilometers from neighboring borders, government, military and oil installations. As for public roads, electricity lines sanctuaries, vital installations the distance should not be less than one kilometer. Camps must be a away from agricultural land and tree planting areas. It is prohibited to set up camps in residential areas and close to animal or plant sanctuaries.

(3) Sand barriers or fences or any barriers that may damage the environment around the camp is prohibited.

(4) Paved and specified roads established by the authorities must be followed.

(5) Camping area must not be paved with asphalt or the ground leveled with heavy machines. Camp area must be cleaned and area must be leveled after use.

(6) All conditions must be followed as stipulated in this regulation with regard to the preservation of plants and wild animals.

(ARTICLE 72)

The following conditions must be complied with when extracting gravel, sand, and limestone from specified locations designated by the Kuwait Municipality:

(1) Locations must be far from residential, agricultural and industrial areas. Also from areas of unique natural environment. It is necessary that the distance must not be less than five kilometers from high voltage lines. It is important to choose locations designated by Kuwait Municipality to extract sand.

(2) Groundwater depth in the area must not be less than fifty meters, the height between the bottom of the whole and groundwater layer should not be less than ten meters. The distance between the location and the nearest groundwater well should not be less than two kilometers.

(3) Lorry drivers must drive on paved roads leading to the sites and must cover the lorry box to avoid flying objects.

(4) Sand fences should not be placed, and it is necessary to level the roads and not to leave any litter or equipment at the sites after finishing work. The area must be environmentally rehabilitated by spraying it with a stabilizer.

(5) Necessary procedures that will guarantee workers' health should be taken, by supplying masks and protective clothing.

(ARTICLE 73)

Without breaching decrees of law number 41 for the year 1988 with regard to organizing livestock and pertaining rules, in order to graze the following conditions must be complied with:

(1) It is important to comply with the conditions stated in Article 71 of this regulation with regard to setting up camps.

(2) It is prohibited to uproot plants or collect wood in tree planted areas.

(3) Grazing animals is prohibited in the southern part of the country beginning from January until the end of June and in the northern part from the beginning of July until the end of December.

(4) It is necessary to comply with the set program with regard to organization of grazing land and the proper distribution of animals in grazing areas. Animals should not gather around water wells.

(5) Fragile grazing land must be distributed and fenced in to specific areas, where grazing is forbidden without permission. The authorities must provide animal feed and designated grazing areas must be fenced.

(6) Small fenced areas must be established within the grazing area and must be in a relatively good condition, where grazing must be prohibited so that natural reproduction can occur giving a chance for natural seeding in areas around fences.

(7) Grazing movement should be organized within grazing grounds by implementing a grazing period that depends on dividing the grazing area in to two: an area where grazing is allowed and another where

grazing is not allowed, but year after year grazing should be rotated between the two areas.

Second: Exploitation of land irrigated farming

Article (74)

For exploiting the irrigated land, the following conditions should be conformed thereby:

(1) Refrain from the use of fragile characteristics in irrigated or rainy farming.

(2) Reforming of the brackish lands via the construction of drainage networks with the implementation of modern irrigation means and the use of soil ameliorations.

(3) Growing the plants that suit the climate, earth quality, rationalization of water consumption, restriction of brackish water use, and construction of biological brackish which match wind blowing, direction and speed.

(4) Refrain from the use of insecticides such as DDT and Aldrin.

(5) The use of the suitable fertilizers which maintain the following specifications of soil:

Hydrogen Number	pH	7.5-8.5
The electro conduct of saturated soil specimen	E.C	<6.0 mmhos
Sodium harm	SAR	<13.0
Percentage of circulated sodium	ESP	<15%
Depth till “Gatch” lay or the land water level		>1.5 meter
Calcium carbon ratio	$CaCO_3$	<15%
Gypsum	GYPSUM	<5%
Bulk density	Bulk density	1.4 ± 1 gm/cm^3

(6) Disposal of the agricultural remnants through bury thereof in natural holes like successive strata should be under the supervision of the Public Authority for Agriculture Affairs and Fish Resources as well as the Environment Public Authority. Disposal of drainage water through surface sewage or using it in irrigation shall not be allowed except upon permission by the concerned authority. In case there were sewage water purification plants, approval from the Environment Public

Authority should be obtained concerning the location of the drainage prior to the construction of these plants.

(7) When using the liquid remnants in irrigation, the following criteria should be followed:

a) **For the Sandy Lands:** The suspended matter should not exceed 1 cm^3 per liter (volume), and lubes, grease and resins should not be above 10 part per million and the sulfide (estimated on the base of S) must not be above 1 part per million.

b) **For the Muddy Lands:** The hydrogen number should not be less than 6 and not above 9. The Biological Oxygen Demand (B.O.D) must not exceed 80 part per million (ppm) and Chemical Oxygen Demand (C.O.D) should be at 50 part per million (ppm), the sulfides (estimated on the base of S) must not be over 0.1 part per million (ppm), grease lubricants and resins should be less than 5 part per million, melted salts must be 2000 part per million (ppm) and cyanide must not be above 0.1 part per million (ppm).

Article (75)

Wind drift and earth erosion phenomena in non-agricultural lands imply the stabilization of soil according the location nature and the drift degree via the use of the appropriate stabilization means.

Chapter VII

Protection of the Ambient Air from Pollution

Article (76)

All air pollutants emitted from their various sources should be within limits that may not affect the quality of the ambient air at the residential or industrial areas shown in the Appendix Nos. (17-1) (17-2) successively included herein.

The concerned parties should take the all necessary measures if the criteria of ambient air quality were breached.

Article (77)

All facilities or individuals should not upon proceeding the various activities – exceed the community noise levels (Leq) specified in the tables Nos. (18-1), (18-2), (18-3), (18-4) of these regulation.

The concerned authorities should take the necessary measures when noise may surpass sound intensity specified in Appendix No. (18-5) of these regulations for maintaining public peace.

Article (78)

Vehicles with exhausts produce substances above the maximum limits shown in Appendixes Nos. (19-1), (19-2) of this by-law should not be used.

The concerned parties should protect the environment against contamination in coordination with Environment Public Authority.

Article (79)

Air pollutants emit from any fixed facility should not exceed the allowed limits specified in Appendix No. (20) of this by-law.

The facility's owner should keep a sealed and numbered record from Environment Public Authority for scoring emissions and their quality. He should notify the Authority in case such emission exceeds the aforementioned limits.

Chapter VIII

Biodiversity Diversification

Article (80)

The following terms shall have the meanings as explained against respective terms:

National Conservation Land: They are geographical areas demarcated by Environment Public Authority. They are classified, organized and managed to achieve specified goals with the aim of maintaining the natural heritage and the biological diversification. Other authorities may establish parks for specific purposes upon approval of the Environment Public Authority.

Trading: Covers import, export, sale, offer for sale, bargaining and exchange.

Endangered rare species: Means any animal or plant or other creatures which live in their natural habitat, and rate of their interbreed is less than their perish rate which may lead to drop in their number below the normal ratio.

Article (81)

Catching hunting, killing, collecting or causing harm to all primitive land or marine species are banned as well as their youngsters, eggs, nests or shelters for two years as from the date of this by-law. Uprooting or causing harm to the coral reef and their compound is also prohibited. Hunting for the scientific purposes or for the public interests and what is allowed by the Public Authority for Agriculture Affairs and Fish Resources is exempted from the above.

Article (82)

Practicing any activity within the parks supervised by the Environment Public Authority or any other party which may damage or destroy the ecological environment or causing how to wild or marine life, or hurt their aesthetic value, or break the natural balance.

Parties permitted by the Authority to carry out some activities for scientific and security purposes are released from the above.

Article (83)

Any works, activities or acts performed at the areas surrounding the game parks which may have effects on the game park or the natural phenomena are prohibited except upon the Environment Public Authority approval.

Article (84)

The Environment Public Authority in coordination with the other concerned parties shall handle the operations of continuous monitoring and supervision to ensure the implementation of plans, decisions and regulations concerning the execution of the programs related to the protection and reproduction of animals and plants especially those endangered with extinct, and the rehabilitation of the extinct species.

Article (85)

Trading with primitive extinct creatures, or any part or products thereof is prohibited. Their lists are specified by the Environment Public Authority in agreement with the concerned parties and also those mentioned in CITES Treaty and other valid international agreements. Cases licensed by the concerned authorities upon the approval of the Authority and related to scientific or treatment purposes or for zoos or fairs, is exempted from the above.

Chapter IX

General Provisions

First: Legal Control

Article (85)

Employees who are mandated by the General Manager of the Environment Public Authority shall have the capacity of legal control pertaining the execution of the provisions of the Law No. 21/1995 concerning the establishing of the Environment Public Authority, modified by Law No. 16/1996. For that purpose, they will investigate and vindicate the breach of the said law regulations, and what would be needed of steps such as access to violation venues, drafting reports and referring them to the concerned investigation power, taking specimen, and measurements and carrying out the necessary studies in order to determine the range of environment pollution, sources thereof, and ensuring the implementation of rules regarding environment protection. They may also resort to policemen to implement the above if necessary. They may carry out medical checks including taking biological specimen from any person had been vulnerable to contamination after obtaining his written approval thereon.

Second: Reconciliation Rules

Article (87)

The General Manager of the Authority or any of the employees mentioned above or appointed by the general manager may accept reconciliation for the breaches specified in Law No. 21/1995 modified by law No. 16/1996 and the successive executive regulations and decisions concerning the establishment of the Environment Public Authority. They may notify the violator of his contravention and confirm the reconciliation in a report. The violator who may accept reconciliation pay within one week as from the date of the petition Kuwaiti Dinars ten thousand, the maximum limit of the penalty specified in Article No. (13) of this law. The penal case and effects thereof shall be ruled out by reconciliation and the payment of the said amount.

Anyone of the above may reject reconciliation if that was justifiable through the conduct of the violator or repetition of the law provisions or the executive decisions thereof.

Reconciliation request shall not be accepted unless the violator removed the pollution sources or damages thereof at his own expense.

Third: Indemnity for the Environmental Damage

Article (88)

The Authority, Board and other specialized parties may claim for compensation for the environmental destruction in accordance with the rules specified in the civil law, and the international treaties in effect.

Fourth: Penalties

Article (89)

Acts that contravene the provisions specified in this by-law shall be punished by the penal defined in Article (8, 10, 13) of Law No. 21/1995, amended by Law No. 16/1996 concerning the establishment of the Environment Public Authority.

Chapter X

APPENDIXES

Appendix No. (1)
Development and Environment
The Environmental Impact of the Developmental Projects
Projects List

Appendix No. (1)

Project List which Need to Conduct an Environmental Impact Study before Executing them or Modification or Expansion of the Existing Ones

No.	A- The Natural Resources Projects of the Fossil Origin
1	Drilling projects (exploration and excavation) manufacture, remanufacture, storage, transport, sale and assembling of petroleum and all its derivatives but not limited to gasoline, diesel, lubricants and grease, including facilities and equipment needed
2	Drilling projects (exploration and excavation), manufacture, storage and transport of gas including the necessary facilities and equipment

No.	B- The Natural Resources Projects of Non-Fossil Origin
1	Exploration, excavation, manufacture, storage and transport of sand projects including the needed facilities and equipment
2	Exploration, excavation, manufacture, storage and transport of grave projects including the necessary facilities and equipment
3	Aluminum fusion, manufacture and storage projects including the related facilities and equipment
4	Iron smelting, manufacture and storage projects including the related facilities and equipment
5	Fusing and manufacture metal such as gold and other metals
6	Metals paint and manufacture projects such as steel and other metals
7	Manufacture and storage of cement and concrete projects
8	Manufacture and storage of fiberglass, sponge and glass projects
9	Manufacture and storage of cement bricks, clay and tiles projects
10	Manufacture and storage of insulators projects
11	Manufacture and storage of paper and printing projects
12	Manufacture and storage of wood projects and the like
13	Textile manufacture projects

No.	C- Other Industrial Projects
1	Manufacture, filling and storage of all the chemical projects
2	Manufacture, filling and storage of drugs and medical compounds projects
3	Manufacture, filling and storage of all pesticides projects
4	Manufacture, filling and storage of paints projects
5	Manufacture, filling and glass transport of gases projects
6	Manufacture and storage of ammunition and fireworks projects
7	Manufacture, filling and storage of all batteries projects
8	Manufacture, filling and storage of tires and their accessories projects
9	Manufacture, filling and storage of all cooling supplies projects

No.	D- Communication Projects
1	Communication and transmission towers erection whether they were wire wireless projects including the microwave appliances
2	Half radars projects
3	Control and monitoring projects

No.	E- Food, Animal and Agricultural Resources projects
1	Production, filling and storage projects of food stuffs
2	Collection, raising and slaughtering of animals projects
3	Tanning and manufacture of animals skins projects
4	Fish – farming whether at sea or at beds outside it
5	Land reclamation projects including the needed facilities
6	Land farming projects with the needed facilities
7	Vegetable and animal ghee and derivatives thereof projects

No.	F- Projects Related to Housing and Industry
1	Horizontal housing projects regardless to locations thereof
2	Vertical housing projects regardless to locations thereof
3	Temporary housing projects, vertical or horizontal projects
4	New inhabited cities projects regardless to locations thereof
5	Projects of industrial zones construction

No.	G- Projects of Special Nature
1	Projects located nearly or inside the game parks or the significant areas ecologically and environmentally
2	Projects of any activity or work constructed on the islands and coast of the State of Kuwait
3	Projects of filling up the coast and islands edges
4	Projects that may have effect on the heritage, historical, recreational, scientific, cultural and utilities nature existing there around
5	Hospitals and health facilities including incinerators and labs thereof
6	Military projects

H	Waste Appendix No. (1) Related Projects
1	Discard of wastes (irrespective of the way followed whether dumping, incineration or others), whether the wastes are solid, semi solid, liquid or gaseous, hazardous or non-hazardous, municipal, industrial or medical. This includes relevant sites, installations, equipment, transport according to the Basle agreement.
2	Treating wastes projects (irrespective of the way followed whether recycling or reuse or others) whether the wastes are solid, semi solid, liquid, gaseous, hazardous, non-hazardous, municipal, industrial or medical. This includes relevant sites, installations, equipment and transport.

F	Power Generation and Water Desalination
1	Power generation stations (irrespective of energy source) including power conducting lines, sub-stations as well as relevant installations and equipment.
2	Water desalination projects (irrespective of the mode) including lines for transport, gathering, storage, pasteurization, treatment, as well as the relevant installations and equipment.
3	Projects for the use of subterranean water resources including exploration, extraction, transport, manufacture, injection as well as the relevant installations and equipment.

G	Land, Air and Marine Transport
1	Expressways including bridges and land transport lines.
2	Railways.
3	Tunnels.
4	Anchors and seaports irrespective of area.
5	Deepening of sea-lanes, anchors and seaports.
6	Marine bridges.
7	Dry docks for vessel repair, painting, maintenance and annexes.
8	Boat, ship and accessories construction.
9	Airport and accessories construction irrespective of area and type.

Appendix No. (2)

Engineering and Environmental Requirements of Industrial Sector

First: Engineering and Environmental Requirements of Industrial Chemical Sector

1-1 Petroleum And Refineries Industry Activity

(1) The use of the most advanced technologies to control the gas pollutants emerging from the industrial processes which is harmful to environment; The continuous monitoring and the periodical maintenance of these equipments must be carried on.

(2) The use of closed system for chemical substances mixing to prevent the emission of the compounds which are harmful to public hygiene and environment, and which come out of the industrial processes.

(3) Paint and smoldering operations should be carried in special cabinets equipped with effective local ventilation to protect paint workers against paint or dye pollutants.

(4) Providing tightly closed cabinets for isolating furnaces tubes and other sources, which produce radiation inside them, and equipping them with adequate conditioning means to protect workers during their shift.

(5) Taking the necessary precautions against the damages of the radiological elements specified by the international bodies especially when detecting leakage from pipes.

(6) Supplying the analytical labs and lubricant quality measurement labs with local ventilation equipment; “Gas chambers of high effectives in order to discharge of gas pollutants” and to limit the bad effects thereof on the staff of these labs.

(7) The use of appropriate advanced technologies in order to limit the industrial noise through isolating the high level noisy places in special enclosures, or applying suitable engineering solutions to minimize the noise produced by machines to the allowed limits by 85 (dBA) for a period of not more than (8) hours daily. It is recommended that purpose and compressors which produce high noise to be erected on rubber sound and vibration absorbing bases.

(8) Installation of sound silencer for high noise sources such as vapour exist points from pipes.

(9) Providing chambers for monitoring workers who work at places of high level of noise during working hours. Also, guide signs must be placed at the entrance indicating to the use of protection means against high noise.

(10) Providing adequate lightening with periodical maintenance of the lamps, replace the damaged ones or increase them in order to improve the level of lighting.

(11) Furnishing the work venue with modern alarum means of high sensitivity detecting any concentration of So_2, H_2S and NH_3 dangerous pollutants.

(12) Radioactive waste should be discharged in the healthy appropriate methods specified by the international institutions in order to avoid the dangers thereof.

(13) Taking the necessary precautions when storing radioactive substances.

(14) Sticking to the level of doses approved internationally regarding the vulnerability of workers who use radiography gauges.

(15) Non-specialized personnel in radioactivity detectors are strictly prohibited from using such means. And workers must be warned against their existing in the places of radioactive substances storage.

(16) Refrain from the use of toner in cleaning workers hands or clothes.

(17) Personnel of radioactivity detectors should attend condensed training courses, and must have environmental awareness with focus on the way of avoiding the dangers of the radioactive materials.

(18) Providing workers with the appropriate personal protection means with concentration the use of them such as:

a) Nozzles with special air filters, which should be periodically changed.
b) Tanks of compressed air to be used in emergency conditions.
c) Safety appropriate overalls, gloves and shoes.
d) Personal cleaning means such as soaps, and the like.

(19) Workers should be subject to medical check up and audiography.

1-2 Activity of Chemical and Organic Fertilizers

(1) Installation of appropriate control means in order to curb the emission of gas pollutants and nasty smell to the industrial and external environment. Such devices should be equipped with filters suitable to the type of pollutants emitting from the industrial

operations. In addition, periodical maintenance and continuous control of the efficiency of these means should always be performed.

(2) Installation of necessary general ventilation means for refreshing the work atmosphere such as A/c units especially at the processing section near the sieve and the garbage cutting machine.

(3) Performing the continuous periodical maintenance of the machines to confine the intensity of the high noise emerging therefrom.

(4) The height of composite piles at the fermentation section should not be above two meters, with the necessity of increasing the times of rolling over to restrain the emission of nasty smells.

(5) Performing periodical examination of composite piles specimen to ensure that plants are free from poisonous substance or harmful bacteria.

(6) Refrain from pumping of cleaning and grounds washing water to the public drainage network, with the possibility of re-using this water after treatment thereof.

(7) Forestation of the area round the plant to curtail the emission of smells and dust to the nearly inhabited areas.

(8) Providing the factory's workers with the personal protection means such as:

a) Nozzles with filters against gases and dust.
b) Overalls, gloves, high neck shoes – leather vests.

(9) Factory workers should undergo medical check up.

1-3 The Activity of Chemical Non-organic Fertilizer

(1) Installation of control equipment and means in the industrial pollutants equipped with filters suitable to the "quality emitting from the industrial operations taking into account carrying out the periodic maintenance and continuous control of these means in order to maintain their efficiency in restraining the emerging the harmful pollutants to the industrial and external environment.

(2) All equipment used in operation and production lines, the automatic mixing machines and the cylos should be tightly closed in order to prevent the harmful effects of the gas and dust pollutants to industry workers.

(3) Use of total or partial isolation for the emergence of the gas or dust pollutants and also for furnaces and compressors places.

(4) Isolation of places where workers face high temperature such as furnaces and smelters in air-conditioned cabinets.

(5) Ceilings, walls and floors of the factory should be fire proof and fire alarm devices should be provided.

(6) Sound silences should be installed at high sounds sources such as the emission of gases or steam in the conveying pipes.

(7) Replacement of the torn out machines and operation equipment by new machines of suitable engineering design to restrain noise emerging therefrom.

(8) Extensions and connections of the factory should be made of anti-high pressure and erosion materials.

(9) Chlorofluoro hydro-carbonate “Freons” should not be use in the industrial operations as such chemical compounds have environmental effects and harms especially on the atmospheric (Ozone).

(10) Discharge the solid and liquid industrial wastes in the appropriate way, and at the places specified therefore by the municipality. Such garbage should not be left for a long time inside or outside the factory in order to avoid the existence of additional source of pollutants harmful to health and environment.

(11) Allocation of warehouses appropriately equipped according to the quality of the stored chemicals. And fast evaporation chemicals warehouses should be provided with suitable cooling means.

(12) Guided warning labels against smoking or setting fire should be placed around and inside the stores of inflammable chemicals, to avoid breaking out of fires.

(13) Substitute system or (transfer) should be applied with workers who work under high temperature such as at furnaces and smelters. This system shall be used to protect workers against long exposure to high temperature and health harms resulted from the radioactivity effects, which lead to thermal fatigue.

(14) Plant workers should be provided with the personal protection means, like.

a) Nozzles equipped with filters protecting against gases and dust.
b) Hand preventive gloves and leather vests to protect them against acids and alkalis.
c) Long neck shoes for all workers.
d) Protective earpieces and spigots against high uproar.
e) High temperature – proof clothes for furnaces workers.

(15) Workers should undergo medical check up and audiography.

1-4 Activity of Adhesive Materials Industry

(1) Sponge manufacturing should be done within tightly – closed lines.

(2) Installation of suitable control means for pollutants diffusion from sponge manufacturing lines in order to curtail the emergence of harmful gas pollutants in the work venue. Such means must have filters suit the type of the emitted contaminants, with a chimney from 3-5 meters higher than the roofs and the buildings nearby the plant. Periodic and continuous maintenance control should be applied to ensure the efficiency of these equipments.

(3) Isolation of raw materials mixing places, and furnishing them with local ventilation means in order to hinder the diffusion of contaminants to the industrial environment.

(4) Packing and organizing the raw and finished materials, and providing pathways for workers.

(5) Cleaning the plant floors, and discharging the industrial liquid and solid wastes in an appropriate way.

(6) Plant workers should always be reminded of the use of their personal protection means, such as:

a) Nozzles equipped with preventive filters against gases and dust.
b) Anti uproar spigots and earpieces.
c) Overalls and long neck shoes.

(7) Plant workers should undergo medical checks especially of lungs functions.

1-5 Plastics Industry Activity

(1) Local ventilation systems of high efficiency should be installed at raw materials addition and blending places which needed for plastic bottles and pipes manufacturing. Such equipment should be connected with filters for collecting dust diffused from the industrial

operations. Periodical maintenance of these systems as well as continuous changes of filters should be carried on.

(2) The use of local control means and technologies with the gas and solid pollutants, such as local ventilation system to be installed at of the plastics bags manufacturing which produce harmful pollutants to restrain such diffusion with high effectiveness. These equipment are:

a) Equipment to be fitted on the top of the extruder to withdraw the gas contaminants resulting from the manufacturing operations.
b) Equipment to be fitted on the top of chemical compounds mixing tanks such as P.V.C. powder in order to limit the diffusion of these dust compounds to the industrial venue and the external environment.
c) Equipment to be fitted at the plastics remnants mincing section for the aim of restraining the spread of dust pollutants to the industrial environment. The local control equipment and the ventilation systems should be always operated over the work period with periodical maintenance and filter change.

(3) Places of ink and organic solutions used in printing plastic products should be tightly closed. Workers should strictly notify not to open these covers except upon necessity.

(4) Gasoline with high rate of benzol should be replaced with white spirit since it is less dangerous when used in washing and cleaning printing machines.

(5) Grinding machines of plastic remnant, pumps and compressors used in manufacturing and production lines should be confined in chambers or cabinets equipped with sound absorbing walls to prevent the spread of the manufacturing noise to the work venue.

(6) Organizing and putting in order the containers of raw and finished materials containers or bottles with labels showing the content type inside the refills.

(7) Providing suitable place where workers rest, and have drinks and meals.

(8) Providing maintenance and chemical workers with refreshing creams for skin so that they would not develop skin diseases.

(9) Providing workers with the following personal protection items.

a) Nozzles with preventive filters against gases and dust.

b) Earpieces and spigots against high noise.
c) Gloves and vests for all workers.

(10) Workers should have periodical medical check up and audiography.

1-6 Activity of Industry Aerosols and Detergent

(1) Installation of local sucking equipment to all the manufacturing lines. Such equipment should be equipped with filters and be connected with a chimney in order to restrain the diffusion of pollutants to the industrial and external environment.

(2) Chlorofluoro hydrocarbonate (Freons) must not be used in the industrial operations due to their harm on health and their bad effects on the atmosphere (Ozone layer).

(3) Control of fresh air inside work venue should continue taking into account that fresh air should be sufficient to the number of workers in one place in order to limit the effect of the harmful gas pollutants.

(4) Discharge of solid and liquid wastes should be in an appropriate way and not leaving them in the corridors or nearby the factory exits.

(5) Refrain from storing raw chemicals used in the industrial operations inside workplace in order to avoid additional source of pollution to the industrial environment. Well-equipped warehouses should be allocated for chemicals storage.

(6) Refrain from releasing chemicals to sanitary sewage network. Liquid wastes should be collected in special barrels and to be discharged appropriately.

(7) Applying substitute system on workers who work at aerosols filling machines to be not more than 4 hours each shift daily.

(8) Workers should be warned against haring snacks, drinks or smoking inside the workplace. Special room should be specified for this purpose.

(9) Workers should use the following personal protection means at the time of work.

a) Earpieces and ear caps against industrial turmoil.
b) Preventive garments and gloves against chemicals.

(10) Workers must undergo medical check up and audiography.

1-7 Activity of Industrial Marble Manufacturing

(1) A cabinet should be allocated for spraying the items with "jelly coat" inside them. There should be local control systems at the product drying place. These systems must be connected with filters, which should be frequently cleaned or totally changed if necessary.

(2) Installation of local ventilation systems at emergence pollutant gases places of the raw materials harmful section when poured on the models. These systems should be fitted as follows:

a) On top of the raw materials section.
b) On top of the vibrators to such dust and prevent if from spread to the industrial environment and the outside venue. These systems should undergo continuous maintenance to keep them efficient in discharging the contaminants.

(3) Workers are obliged to use the following personal protection means:
a) Nozzles with filters protecting against gases and dust.
b) Gloves, shoes and overalls.
c) Preventive eyeglasses against flying objects.
d) Earpieces and ear caps against industrial fuss.

(4) Workers should undergo periodical medical check up and audiography.

1-8 Sponge Industry Activity

(1) Use of advanced local control means and technology at gas pollutant places in order to restrain the diffusion of pollutants, which are harmful to health, industrial and external environments.

(2) Application of total closing at the raw materials mixing places.

(3) Refrain from using fluorochloro hydrocarbonate (Freons) in the industrial operation due to their health and environment damages, especially on the atmosphere (Ozone).

(4) Storage of raw chemicals should be at cooled warehouses equipped with fire extinguishers.

(5) Substantiate system should be applied on the workers of raw materials mixing owing to their harm on public health.

(6) Workers should be warned against the use of chemicals in cleaning their hands and clothes.

(7) Providing personal protection means to mixing and spraying workers as follows:

a) Nozzles equipped with filters frequently changed against gases.
b) Preventive gloves, long neck shoes and leather vests.
c) Preventive earpieces and ear caps.

(8) Workers should undergo periodical medical check up and audiography.

1-9 Fiberglass Industry Activity

(1) Use of advanced local control means and technologies at the gas and solid pollutants places to curtain the diffusion of these pollutants which are harmful to health, industrial and external environment, the following places:

a) Use of local ventilation system at the scraping off and cutting places, composed of veil connected to ventilation pipe then to a chimney. Such system should be furnished with bag filter to collect the fiberglass. The control systems of dust pollutant at the scraping off and cutting section should be fitted on the highest point at the work place not far from the emergence of dust in order to curb the harmful effects of the fiberglass.
b) Use of mobile ventilation system at all instable scraping off and cutting systems.
c) Installation of local ventilation system along resin painting lines of high efficiency to prevent the spread of harmful gas pollutants.
d) Installation of local control equipment at the manual formation places of resin materials. These places should be isolated.
e) Providing the raw materials mixing “Poly Styrene, N.E.K.P.” with local control systems to prevent the harmful effects of the pollutants emerging from the mix operations.
f) Allocation of places inside the plant equipped with local control devices and filters to collect fibreglasses resulting from painting operations, which should not be done at external yards of the factory.

(2) While grounds should be leveled to avoid accidents. Packing and organizing the raw and finished materials inside the manufacturing section.

(3) Storing the raw materials at special warehouses equipped with A/C equipment to prevent the high temperature effect on refills particularly during summer season.

(4) Workers should strictly warn against using organic solutions such as toner in cleaning hands and clothes.

(5) Providing factory workers with their personal protection means such as:

a) Nozzles equipped with filters against dust and gases.
b) Earpieces and ear caps against high noise.
c) Protective eyeglasses and gloves.
d) Overalls and high neck shoes.

(6) Workers should undergo periodical medical check up.

1-10 Paint and Varnish Industry Activity

(1) Installation of high efficiency local ventilation systems to restrain the diffusion of gas and dust pollutants resulting from industrial processes, provided that such systems are linked with appropriate filters that suite the emerging pollutants ingredients.

(2) Installation of local control equipment at the unloading and opening places of lead titanium and other oxide in order to prevent the diffusion of pollutants to work atmosphere.

(3) Fitting covers to the raw materials tanks and mixers to restrain the diffusion of pollutants during addition, mixing and grinding processes.

(4) Continuous periodical maintenance should be carried out to all manufacture machines and equipment as well as to the noise control devices.

(5) The organic solutions workers should be provided with the gas nozzles equipped with filters against solutions pollutants.

(6) Providing personal cleaning means and water closets with all their requirements.

(7) Providing the workers with the personal protection means such as:

a) Nozzle with filters against dust and gas.
b) Overalls, gloves and high neck shoes.
c) Earpieces and ear caps against high noise.

(8) Workers should undergo periodical medical check up.

1-11 Insulators Industry Activity

(1) Providing local ventilation means on the machines, which produce gas pollutants.

(2) Providing mobile ventilation system to be used at the instable mixing and leveling points.

(3) Allocation of isolated place equipped with local ventilation equipment for the chemical mixing operations.

(4) Control of the filters connected with the chimney in order to ensure continuous discharge of gas pollutants.

(5) Carrying out continuous periodical maintenance of all manufacture and local sucking equipment to restrain dust and gas pollutants as well as the industrial noise coming out therefrom.

(6) Fluorocholor hydro carbonate “Freon” should not be used in insulators manufacturing and to be replaced by another compound, which does not have effects on environment especially on ozone.

(7) Liquid and solid wastes should be discharged gradually in an appropriate ways.

(8) Workers should be warned against standing at furnace for long time to avoid high temperature.

(9) Workers should be warned against smoking or having food and drinks at all sections of the plant. A special room must be allocated for this purpose.

(10) Workers should be provided with the following personal protection means:

a) Nozzles equipped with preventive filters against gas and dust.
b) Shoes, gloves and overalls.
c) Earpieces and ear caps to protect workers against industrial uproar.

(11) Workers should undergo periodical medical check up and audiography.

1-12 Activity of Medicines and Personal Care Compounds Industry

(1) Installation of pollutant control systems at all mix and manufacture machines connected to filters and a chimney in order to prevent the

diffusion of gas pollutants to the industrial and external environment.

(2) Raw materials tanks must be tightly closed to prevent the emission of gas and liquid pollutants to the venue of work and the external environment.

(3) High noise machines and work points should be isolated, and engineering solutions should be proposed in order to minimize uproar that emerge from such machines.

(4) Taking care of the periodic maintenance of the manufacture lines, machines and equipments and replacing the old ones with more advanced technologies in order to limit the spread of the industrial contaminants.

(5) Continuous cleaning and maintenance of the factory grounds with the necessity of using vacuum cleaners in cleaning the floor.

(6) Taking care of packing and organizing of the finished products and raw materials, and leaving pathways for facilitating workers movement and avoiding accidents.

(7) Storing the finished products and the raw materials within the warehouse specified therefore, which should be furnished with cooling and ventilation means that suit the nature of the stored materials.

(8) Providing workers with the personal protection means which they should use such as:

a) Nozzles equipped with filters against gas and dust.
b) Shoes, gloves and overalls.
c) Earpieces or ear caps to prevent industrial noise.

(9) Workers should have periodical medical check up and audiography.

1-13 Batteries Industry Activity

(1) Use of suitable control equipment to curtail the spread of gas pollutants especially the smoke of the harmful lead and the steam of sulfide acid, provided such equipment be provided with filters that suit the type of the pollutants, taking into account that regular periodical maintenance should be done to these equipment in order to maintain their efficiency.

(2) Installation of local ventilation equipment at the sulfide acid batteries charging section in order to prevent the diffusion of harmful gas pollutants.

(3) Installation of general ventilation means needed to refresh the atmosphere at all smelting sections to protect the workers against high heat taking into consideration that temperature inside the plant should not exceed the permitted limits.

(4) Carrying out the periodical maintenance for the manufacture, general and local ventilation equipment to limit the pollutants produced therefrom.

(5) Taking care of the plant cleanness through discharging the wastes gradually in order not to hinder work running.

(6) Workers should be strictly warned to take care of their personal cleanness and change their contaminated clothes continuously.

(7) Workers must not have food or drinks inside all factory sections.

(8) Workers should be provided with the following personal protection means:

a) Earphones or ear caps against high noise.
b) Preventive nozzles against gas, dust and vapor.
c) Leather vests, high neck shoes and gloves.
d) Protective eyeglasses to welding workers.
e) Workers should have periodical medical check up and audiography.

1-14 Lubricants Re-Manufacturing Activity

(1) Use of the most advanced gas and liquid pollutants control means to restrain the diffusion of the harmful pollutants to industrial and external environment.

(2) Installation of local ventilation means at the machines that produce gas pollutants harmful to environment.

(3) Local control and desperation equipment should be subject to periodical maintenance to maintain their capacity in desperation the containments and purifying the work atmosphere.

(4) Total close up method should be applied on operation lines to curtail the diffusion of harmful gases to work atmosphere.

(5) The chimney, which is connected to local ventilation equipment and exit of gases, should be between 3-5 meters high above the roofs of the buildings nearby the plant. Its diameter must be not less than half meter above the roof of the building.

(6) Preparing entrances and exits and maintenance of stairs to facilitate the escape of workers quickly in case of fire breaking out. Fire extinguishers must be provided inside the factory.

(7) Allocation of suitable place for storing industrial wastes (tar). Such containers must be tightly capped.

(8) Well-equipped warehouses should be allocated for storing the fills of the raw materials. The fills bags should be tightly twisted and kept on wooden stands above the ground. Such warehouses must be furnished with appropriate ventilation and cooling means.

(9) Workers must be warned against smoking inside work places, and a suitable corner should be allocated for this purpose.

(10) Workers must adequately take care of their personal cleanness. Water closets should be provided with personal cleaners means.

(11) Workers must have the following personal protection means:
a) Preventive nozzles with filters against dust.
b) Earpiece or ear caps against uproar.
c) Gloves, overalls and safety shoes.
d) Protect eyeglasses.

(12) Workers must undergo periodical medical check up and audiography.

1-15 Industrial Gases Manufacturing Activity

(1) Use of the most advanced local control means and technologies for limiting the diffusion of pollutants, which are harmful to health and environment.

(2) Providing the drums tests section with local ventilation system.

(3) Allocation of a cabinet equipped with local control systems for drums manufacturing operations.

(4) Periodic maintenance should be done pollutants control equipment to keep their efficiency in purifying the work atmosphere.

(5) Refills of Aston overflowing from filling operations at the drums filling section must be covered in order to prevent the spread of the gas pollutants.

(6) Covering the liquid wastes beds (hydroxide calcium) remained from the manufacturing of Acetylene, the discharging them in appropriate way.

(7) Fluoro chloro hydro-carbonate “Freons” must not be used in filling cooling gas tanks, and should be replaced with other gases unharmful to environment especially to ozone layer.

(8) Allocation of appropriately equipped warehouses for storing oxygen, Acetylene and cooling gas drums as well as other gases.

(9) Workers should use the following personal protection means:

a) Preventive nozzles with filters against dust.
b) Earphones or ear caps against noise.
c) Gloves, overalls and safety shoes.
d) Protective eyeglasses.

(10) Workers must have periodical medical check up and audiography.

Second: Engineering and Environmental Requirements of Wood Industries Sector

2-1 General Engineering and Environmental Requirements of Wood Industries

(1) Sufficient ventilation should be provided inside the factory, and the average rate of air charge in the plant and the production halls must be increased in the appropriate way.

(2) If welding or smith works or others are carried in the factory, the related environmental requirements should be applied.

(3) Covering the mobile saws and belts and other carpentry machines should be covered in order to avoid accidents.

(4) Replacement of old manufacturing lines with modern ones. Imported machines of modern technology should be installed for limiting environmental problems resulting from old machines.

(5) Adequate distance must be maintained between the various machines. Wooden pieces should be removed for smooth movement and to prevent accidents.

(6) Taking care of the packing of the finished products and raw materials used in manufacturing.

2-2 Specific Engineering and Environmental Requirements of the Wood Industries Sector

(1) Installation of local ventilation systems to the electrical saws, thickness and other manufacturing machines, which produce wood dust. Such machines must be of high efficiency to limit the spread of dust in the work atmosphere. The ventilation systems must be linked to dust accumulator.

(2) Periodical maintenance must be carried to the carpentry machines for raising their capacity of sucking dust.

(3) Painting works should be done in special room inside the factory and outside it.

(4) Painting rooms should be furnished with special ventilated cabinets of high capacity for sucking pollutants resulting from painting and accumulating them in special filters. They should be periodically maintained to ensure their efficiency.

(5) Allocation of isolated corner equipped with local control systems for painting wooden products with paste and other substances. Such place should be well ventilated for preventing the diffusion of painting pollutants.

(6) Periodical maintenance of local ventilation systems must be carried to keep their efficiency in sucking pollutants with periodical replacement of the filters related with them.

(7) Refrain from the use of organic solutions containing dangerous substances such as Benzyl, and should be replaced by less dangerous substances with the same industrial specifications.

(8) Replacement of the old carpentry machines, which produce high noise with more advanced machines which produce noise less than 85 dBA. Such machines should have periodic maintenance to control the uproar intensity within the permitted limits.

(9) High uproar machines must be isolated in a special chamber or within sound absorbent partitions. The base of machines must be flat and solid to prevent operation vibration. Also, rubber pillows should be installed below the machines to reduce noise emerging there from.

(10) Providing the factory with adequate lightening windows or holes.

(11) Increasing the lightening intensity especially at the places and machines, which require accuracy in the work through installing lighting means, which suit the activity type.

(12) Use of automatic vacuum cleaning of the plant floor to prevent the fly of dust in the work atmosphere.

(13) Taking care of the general cleaners of the factory with the necessity of discharging wastes resulting from manufacturing daily after end of work directly through putting them in the special containers outside the factory in order not to be an additional source of pollutants emission.

(14) Painting workers must be warned against the use of organic solutions (Toner) in hands washing due to their harmful effect on the skin.

(15) Taking care of personal cleanness of the workers who should wash after the end of work. Cleaning means should be furnished.

(16) Providing suitable place where workers may take food and drinks. Workers must not take food while working.

(17) Providing a room for clothes change furnished with wardrobes and personal belongings of the personnel.

(18) Workers at cutting sharing and smoothening machines must be furnished with ear caps to protect them during work.

(19) Painting workers must be furnished with the following personal protection means:

a) Nozzles equipped with filters against organic solutions vapor, and painting materials, with frequent change of filters.
b) Vests, gloves, eyeglasses.

(20) Workers of carpentry machines must be provided with the following personal preventive means:

a) Preventive nozzles against dust.
b) Gloves.
c) Protective eyeglasses for cutting and shearing workers.
d) Safety shoes.

(21) Workers who work under wood dust at the carpentry should undergo periodical medical check up and andiography periodically.

Third: Engineering and Environmental Requirements for Press Sector and Paper Industry

3-1 Paper Industry Activity

(1) Installation of general ventilation equipment at all the plant sections so that air change rate would be sufficient to refresh and improve work atmosphere.

(2) Allocation of a chamber for ink drums and colors washing equipped with local ventilation devices fitted on the basin same like at other factory sections for protecting workers from the solid and liquid pollutants.

(3) Use of less dangerous substances like white spirit in washing and cleaning printing machines instead of gasoline and other petroleum products.

(4) All industrial machinery should have periodic maintenance to reduce uproar intensity to the permitted limits.

(5) Providing adequate lightening at production sections with regular maintenance of the lighting equipment particularly the lamps of the warehouse.

(6) Packing the raw materials and the furnished products in appropriate way inside the plant with pathways for workers movement and to prevent vocational accidents.

(7) Storing raw materials and finished products on wooden bases to avoid insects and rats access thereto.

(8) Taking care of the factory cleanness and using vacuum cleaners in cleaning the factory's floor.

(9) Workers should be provided with the following protective means:

a) Protective nozzles with filters frequently changed.
b) Ear caps against high noise.
c) Long neck shoes.

(10) Workers should undergo periodical medical check up.

3-2 Printing Press Activity

(1) Installation of general ventilation equipment such as A/C units in order to refresh the atmosphere.

(2) Installation of local ventilation system at the processing section in order to suck out the chemical pollutants vapor from work atmosphere.

(3) Erecting a chimney between 3 to 5 meters above the roof of the building to be connected with air desperators fitted at the printing section.

(4) Carrying out the periodic maintenance of the general and local ventilation systems to provide suitable work atmosphere for the workers.

(5) Carrying out regular maintenance to printing machines in order to keep noise within the permitted limits.

(6) Covering the belts of the uncovered machines with preventive covers and providing the machines with safety devices to stop immediately at accidents occurrence.

(7) Replacement of old lead printing method by computerized printing machines and electronic photocopiers instead of the old ones.

(8) Replacement of organic solutions containing benzyl in cleaning presses machines with less dangerous substances such as white spirit.

(9) Re-use of the depreciated zinc boards and not discharging them by burying or treatment except upon consulting the Environment Public Authority.

(10) Extra unused paper is preferably sold to local companies instead of damaging it.

(11) Liquid wastes (ink-acids) should be collected in special containers, and should be discharged at places specified by the Municipality and not thrown in the drainage network.

(12) Providing people with the fire extinguishers.

(13) Allocation of suitable place where workers can change their clothes.

(14) Cleaning workers should spray the ground with water to prevent dust from diffusion in the work atmosphere, or they should use vacuum cleaners in cleaning the ground of the factory.

(15) Having meals and drinks or smoking inside the place of work are prohibited. Workers should wash their hands with water and soap after end of work immediately.

(16) Photocopying workers should wear dark eyeglasses to prevent glowing.

(17) Providing press workers which the following personal protection means:

a) Preventive earpieces against uproar.
b) Overalls.
c) Gloves and long neck shoes.
d) Nozzles equipped with filters especially for processing workers.

(18) Workers should undergo periodical medical check-up.

3-3 Newspapers and Publication Activity

(1) Installation of filters within the sucking equipment fitted on the heat dryer to absorb vapors and gases. Such filters should be furnished with absorbing substances and active coal granules as well as high efficiency. These filters should be maintained regularly and be changed when necessary.

(2) A chimney between 3 to 5 meters higher than the buildings roofs nearby the press should be fitted to curb the spread of pollutants to the neighborhood.

(3) Machines should undergo periodic maintenance in order to reduce noise to the permitted limits.

(4) Providing the safe and adequate lighting at the halls of production with regular maintenance and installation of reserve lighting in case of power cut.

(5) Refrain from the use of lend letters printing, and be replaced by computers due to their significant health harms.

(6) Replacing gasoline, which is used in cleaning machines from ink with less dangerous substance with the same efficiency such as white spirit.

(7) Refrain from releasing of liquids resulting from processing operations except after chemically neutralized to maintain hydrogen number within (pH=7).

(8) Removal of paper garbage continuously and regularly with taking care of the factory's general cleanness.

(9) Workers should be strictly warned against having any food or drinks at work sites, especially at the processing section.

(10) Workers should be warned against long exposure time to computer screens. They should have frequent breaks during work in order to avoid eyes fatigue.

(11) Providing the workers of newspapers printing the "main machine" with preventive earphones against high noise dangers.

(12) Photocopying workers must wear preventive dark eyeglasses against intensive glowing of photocopying.

(13) All personnel should undergo periodical medical check up.

3-4 Film Processing Activities

(1) Improving the general ventilation needed for refreshing work atmosphere through increasing the A/c units in production sections with continuous maintenance and repair.

(2) Installation of solutions control system on the operation machines. These equipments should be able to drive vapor out of the plant by 3 to 5 meters chimney higher than the building near the factory.

(3) Fitting plastic screen at the processing chamber.

(4) Continuous periodic maintenance of the pollutants control equipment and the used machines therefore.

(5) Preparing processing system for photocopying water in order to extract the silver melted in this water and to avoid discharging it in the public sewage.

(6) Refrain from releasing water containing chemicals to the public sewage except after treating it and neutralizing (pH) to prevent any effect on the public sewage network.

(7) Maintaining the general cleanness of the plant with quick discharge of the liquid and solid wastes and continuous washing of the production hall.

(8) Organized packing of the empty gallons and the boards of printing.

(9) Refrain from storing film processing water inside workplace. A special place should be allocated for these dangerous chemicals.

(10) Processing workers must be warned against the dangers of these chemicals.

(11) Workers must not to have drinks or meals at work places or inside the processing chamber.

(12) Workers should wash their hands with water and soap after end of work directly.

(13) Providing protective dark eyeglasses against strong lighting.

(14) Workers must undergo periodical medical check up especially eyes examination.

3-5 Soft Tissue Industry Activity

(1) Installation of general ventilation equipment adequate to refresh workplace atmosphere such as A/C units.

(2) Providing local ventilation systems on the soft tissue packing with regular maintenance therefore.

(3) Raw materials mixing through boiling operations should be carried in an isolated chamber to protect workers against high degrees of temperature.

(4) Allocating a special chamber for boiling chamber operation and control. This chamber must be air-conditioned, sound isolated, and suitable for control in order to protect the operator against high temperature.

(5) Carrying out periodical maintenance of the machines to control the noise intensity to (85) dBA.

(6) Use of best ways in treating water used in paper manufacture in order to be used again and to putrefaction of water.

(7) Finding and appropriate way for disposal of the remained boxes waste.

(8) Storage of chemicals and solution must be at a place isolated from other raw materials warehouses.

(9) Workers should not be present at the machines section unless they are equipped with earpieces against high noises.

(10) Workers should take care of their personal cleanness including hand washing with water and soap after work directly.

(11) Workers must use the following personal preventive means:

a) Earpieces especially for production workers section – overalls – safety shoes – gloves for all workers.
b) Preventive eyeglasses for scissors workers.
c) Nozzles with filters for the kneading machines and basins workers.

(12) Workers should undergo periodical medical check up regularly.

3-6 Nylon Bags Manufacturing Activity

(1) Providing a room equipped with local ventilation systems to keep washing basin of ink and colors drums as well as color printing equipment inside it, and also to protect other sections of the factory against gases and vapor. These systems should be fitted on the top of ink drums washing basin.

(2) Providing suitable control equipment inside press section to curb the diffusion of gas pollutants resulting from printing materials.

(3) Replacing of (benzene, kerosene, toner) and other petroleum products used in washing and cleaning of printing machines with less dangerous substance of the same efficiency like white spirit.

(4) Periodic maintenance of all plastic and nylon bags machines as well as printing machines in order to curtail the diffusion of noise intensity produced by these machines.

(5) Continuous regular maintenance of lighting equipment and change of the damaged ones.

(6) Packing and organizing the raw and the finished materials inside the plant, and leaving pathways for workers movement to avoid vocational accidents.

(7) Taking care of the factory's cleanness and applying safety system in storing raw materials and finished products.

(8) Workers must be furnished with the following personal protection means:

a) Nozzles equipped with anti-gas filters and should be frequently changed.
b) Preventive ear caps against high uproar.
c) Long neck shoes to protect workers against chemicals.

(9) Workers must undergo periodical medical check up.

3-7 Paper Filters Industry Activity

(1) Installation of general ventilation means on the sides of the production shed in order to maintain an appropriate temperature and humidity in the work atmosphere.

(2) Installation of local ventilation systems on the top of the furnaces to such the pollutants resulted from the industrial operations.

(3) Preparing cabinets equipped with A/C units at the places of product carton filling.

(4) Providing air-conditioned cabinet to offer healthy appropriate atmosphere for the personnel due to high heat and humidity resulting from processing and drying operations, which may have effect on workers health.

(5) The machinery should undergo periodic maintenance to limit noise intensity within the permitted level.

(6) Carrying out regular maintenance to lighting means to keep it in good condition.

(7) Providing workers with personal protection means such as overalls, shoes, gloves and earphones.

(8) Personnel should undergo periodical medical check up.

3-8 Cartons and Boxes Industry Activity

(1) Installation of A/C units at the sides of the production halls sufficient to suck out temperature, humidity and dust from work atmosphere.

(2) Increase of natural ventilation holes such as (windows, ceiling holes) to minimize heat intensity and entrance light intensity.

(3) Carrying out periodic maintenance of the machines to keep uproar intensity within the permitted limits.

(4) Taking care of the factory's cleanness with the necessity of getting rid of wastes resulting from production operations gradually.

(5) Trying to get use of the sealed carton waste as possible or driving them away in suitable ways.

(6) Providing a special chamber for ink boxes storage and never leaving them open besides printing machines.

(7) Furnishing workers with the following personal protection means:

a) Ear caps against uproar.
b) Overalls, gloves and longneck shoes.
c) Nozzles with anti-gas and dust filters for press workers.

(8) Workers must go to periodical medical check up.

3-9 Paper Covers Industry Activities

(1) Installation of high efficient control system of the processing chamber in sucking out the chemical vapor.

(2) Installation of local ventilation system at printing chamber to take out the materials vapor used in printing such as Methanol.

(3) Continuous maintenance of the control systems found on top of the processing basin in order to raise the efficiency of pulling out chemicals vapor used in processing.

(4) Replacing of methanol and kerosene used in cleaning printing machines with other ones of less danger and in the same specifications, like "White Spirit".

(5) Carrying out regular maintenance of the machines to keep noise level at 85 (dBA) for 8 hours.

(6) Workers should wash their hands with water and soap after the end of work directly.

(7) Workers must not eat at workplace. A restroom should be specified for this purpose.

(8) Providing workers with personal protection means such as overalls, shoes, gloves and earphones.

(9) Workers should undergo periodical medical check up.

3-10 Paper Plates Industry

(1) Isolation of plates picturing place from other parts of the plant equipped with local desperation equipment to prevent eh diffusion of pollutants to the workplace.

(2) Carrying out periodical maintenance of the manufacturing machines to keep noise within the permitted levels.

(3) Taking necessary precautions to avoid the pouring of chemicals such as acids and alkaline used in picturing operations on the factory's floor.

(4) Taking care of the factory leanness. Resulting wastes should be disposed of daily after the end of work.

(5) Disposal of solid wastes gradually at the public garbage containers.

(6) Isolating raw materials storage from finished products. Pathways should be free from any obstacles that may hinder workers movement inside the warehouse, and to avoid work accidents.

(7) Raw materials should be stored on wooden bases of 30 cm. above the ground. Warehouses should be furnished with insects traps.

(8) Workers must wash their hands with water and soap after work directly. A restroom must be specified where workers may have food at.

(9) Providing workers with personal protection means such as overalls, shoes, gloves and earphones.

(10) Workers must have periodical medical check up.

Fourth: Engineering and Environmental Requirements of the Metal Industry

4-1 Iron Industry Activity

(1) Installation ventilation systems on the whetting machine and the saw with periodical maintenance to these systems in order to preserve their efficiency in purifying workplace.

(2) Providing adequate control systems fitted on top of the washing basins in order to dispose of compounds vapor used in cleaning operation.

(3) Installation of suitable control systems on the top of each furnace in order to pull out largest diffusive smoke during unloading and smelting operation.

(4) Installation of local installation system consisted of hood, pipe and fan for sucking and filtering air before driving it out during welding and molding operations.

(5) Painting works should not be carried in an open place in order to avoid the diffusion of the organic solutions, which are harmful to environment. A special closed room must be allocated for painting equipped with local ventilation system of high efficiency in order to suck out vapors and solutions resulted from painting.

(6) Ventilation system inside the painting room should be furnished with special filters that purify air and reduce the concentration of the harmful organic vapor in the outside air.

(7) Welding, cutting or whetting operations must not be done inside the painting chamber in order to avoid fire or explosion occurrence.

(8) Regular maintenance of the local ventilation and control equipment to preserve their efficiency.

(9) Making sure that materials used for shearing or welding are free from any fatty or organic substances on their surface to avoid work accidents and prevent gas pollutants diffusion.

(10) Partitions must be placed around welding operations to protect workers against glaring resulting therefrom.

(11) Welding smoke pollutants should not exceed the permitted limits stipulated in this by-law.

(12) The organic vapor and colors ingredients inside the painting room must not exceed the permitted limits specified this by-law.

(13) Liquid overflows resulting from the industrial operations shall be controlled in order not to cause disorder in the ecological balance upon releasing them to the external environment. Such process should be done through periodic measures to ensure that rates would not trespass the values listed in this by-law.

(14) Finding the best engineering methods that curb the heat effect which furnace section workers are exposed to, to the acceptable limits that minimize their productive efficiency.

(15) Use of appropriate means that reduce the uproar intensity resulting machines operations in order to be at 85 (dBA) for 8 hours exposure a day.

(16) Carrying out the periodic maintenance to the equipment and machines for preventing an increase in noise intensity, and change of the damaged ones right upon damage occurrence.

(17) Preserving safe lighting level inside the factory through carrying out regular maintenance, and changing of the damaged one immediately upon damage occurrence.

(18) Disposal at the wastes of materials washing through suitable ways, and not release them to the public sanitary with treating them prior to getting rid of them.

(19) Maintenance of the electrical extensions, covering them, and replacing the damaged ones in order to avoid fires and accidents.

(20) Providing fire fighting equipment and the tools used in emergency cases which should be kept at an easily accessible place.

(21) Workers should not clean their hands with toner or organic solution. They must use water and soap for personal cleaning purposes.

(22) Workers should take care of their personal cleanness after work hours in order to get rid of the pollutants and the suspending sediments resulting from the industrial operations. Cloths should be changed after work hours.

(23) Providing guide signs to prevent damages and increase of environmental awareness of the workers.

(24) Workers must undergo periodical medical check up.

(25) Providing workers with the following preventive means:

a) Overalls and protective shoes.

b) Gloves and nozzles for welding, whetting and painting workers.
c) Protective eyeglasses and ear caps against high noise.

(26) Substances containing chlorinated hydrocarbon should not be used near heat, fire or electrical spark especially upon welding. Also, such substances must not be exposed to sunrays directly.

4-2 Aluminum Industry

(1) Installation of local ventilation means on aluminum acid washing basins to such out the diffusive vapor from washing operations.

(2) Use of appropriate control means and technologies to prevent dispersion of aluminum pieces.

(3) Placing fixed and mobile partitions in order to protect workers near shearing and whetting operation against the aluminum filings.

(4) Pollutants rate in the liquid wastes resulting from industrial operations should not exceed the permitted limits listed in this by-law. In addition to that, best mechanical and chemical treatment methods must be used in order to dispose of pollutants prior to releasing them to the external environment.

(5) Covering the walls opposite to the electrical saws with a substance that reduce rate of turmoil pollution.

(6) Isolation of noisy equipment such as electrical saws in places that prevent sound reflexion as possible or placing sound absorbing partitions to reduce the spread of uproar provided that these partitions should not be less than two meters high above the ground.

(7) Periodical maintenance should be carried to the machines so that noise intensity should not exceed 85 (dBA) for a period of exposure of not more than 8 hours daily.

(8) Regular maintenance should be carried the lighting equipment. Damaged lamps must be replaced to raise lighting level and efficiency thereof.

(9) Regular measurement operations should be performed to preserve the rate of the hydrocarbon and fluoride in the air within the allowed limits listed in this by-law.

(10) Taking due care of the general cleanness of the factory. Pathways and workplaces should be free from obstacles and remnants with a special place for collecting them and disposing them gradually to avoid accidents.

(11) Maintenance of the electrical extensions cover and replacement of the damaged parts in order to avoid accidents.

(12) Erecting sufficient number of iron stands for storage of raw materials provided that they should not be less than 30 cm. with spaces between them.

(13) Allocation of a suitable accessible place for storing manual kits.

(14) Leaving suitable spaces around machines to allow easy movement of the workers.

(15) Workers should take care of their personal cleanness after work hours to get rid of suspending pollutants.

(16) Preventing eating food inside work venue, and allocation of suitable place for that purpose.

(17) Providing guide signs that increase environmental awareness of the workers.

(18) Providing a special room for clothes change equipped with wardrobes.

(19) Workers of formation and preparation must be furnished with personal protection means which they should wear during work hours, such as:

a) Earpieces against high noise.
b) Protective eyeglasses against flying aluminum piece during shearing and formation operation.
c) Suitable wears and protective shoes for all workers.

(20) Workers should undergo periodical medical check up and audiography.

4-3 Industry of Home Utensils

(1) Installation of ventilation systems equipped with filters resistant to acids on the boiler used in cleaning products from grease after pressing and formation operation.

(2) Installation of local ventilation systems annexed with the (brushing-polish) machines of the product in order to prevent alkaline polishing substances.

(3) Providing sufficient number of A/C units in the polishing section to reduce the heat effect resulting from the drying furnace, with continuous maintenance and filter change thereof.

(4) Regular maintenance of the filters connected with the local ventilation system, which are installed on the drying furnace chimneys to preserve them efficient in purifying the work atmosphere from pollutants and acids that are harmful to environment.

(5) Periodical maintenance of the air sucking fans fitted on the top of the alkaline treatment basin and polishing section.

(6) Isolation of the organic solution used in greasy substances cleaning existing on the products at the polishing chamber away from any fire source in order to avoid accidents.

(7) The boiler should be tightly capped to avoid accidents.

(8) The ground must be resistant to erosion or reaction with acids especially at the washing chamber.

(9) Air compressor must be isolated in a separate room resting on rubber pillows to reduce the ground vibration and high noise resulting therefrom.

(10) Placing soundproof partitions around the noisy machines such as the compressor and the whetting machines to protect workers against high noise.

(11) Maintenance of machines continuously to preserve noise intensity within the permitted level.

(12) Regular maintenance of the lighting equipment, and replacement of the damaged ones to preserve lighting level within the acceptable levels inside the factory.

(13) Maintenance of the electrical extensions, covering and replacing the damaged ones in order to avoid accidents.

(14) Finding the best engineering methods to dispose liquid remnants resulting from the industrial operations in order not to cause disorder in the ecological balance upon discharging thereof.

(15) Measuring and neutralizing of the S Hydrogen of water resulting from the industrial operations.

(16) Accumulation of aluminum remnants gradually then getting use of them through recycling.

(17) Taking care of the general cleanness of the factory with disposal of wastes in appropriate ways and not in the public sewage in order not to cause harm to environment and public hygiene.

(18) Storing of acids in glass bottles stand on non-erosive bases. These bottles must be isolated in a separate corner at the factory.

(19) Packing the raw materials and the finished products with leaving pathway to facilitate workers movement.

(20) Workers must not put their hands in sodium solution and acid. They should be protective gloves and leather overalls when handling with those substances.

(21) Workers must pay attention to their personal cleanness after end of works with the provision of a special place for having meals.

(22) Providing a special room for cloths change furnished with wardrobes.

(23) Providing guide signs aiming at increasing workers environmental awareness.

(24) Workers must be provided with the following personal protective means:

a) Nozzles, gloves and eyeglasses for whetting, polishing and cleaning workers.
b) Special clothes and preventive nozzles for acid cleaning workers.
c) Anti-noise ear caps and preventive eyeglasses against dispersing pieces from industrial operations.

(25) Workers must undergo periodical medical check up and audiography.

Fifth: The Engineering and Environmental Stipulations for Construction Industries Sector

5-1 Manufacturing of Hollow Ceilings and Prefabricated Concrete Units Activity

(1) Installation of highly efficient general ventilation systems in the place of manufacturing in order to decrease the temperature and moderate business atmosphere.

(2) Appropriate control systems must be installed upon galvanization directly above zinc melting basin, provided that it must be connected to a filter in order to purify the emitting smokes before being spread in the places of work.

(3) Closed room must be allocated for painting. This room should be provided with highly efficient spot ventilation systems connected with 3-5 meters chimney above the roof of the building.

(4) Periodical maintenance of the spot ventilation system must be carried out in the painting cabinet. Further, filters should be replaced in closer intervals and it must be operated during painting works.

(5) Drainage system must be available in the floor of the cabinet to collect the materials resulting from painting.

(6) Special cabinet should be made for welding operation. This cabinet must be provided with spot ventilation system and movable partitions must be installed beside welding operations in order to prevent the exposure of the other workers of the factory to the sparks resulting from welding operations.

(7) The places allocated for welding, cutting, smithery and whetting must be provided with sufficient air-conditioning unit. Further, doors and windows must be left open to circulate air and to prevent the accumulation of the health harmful gases.

(8) Automatic mixing operations must be employed so that the employees may not suffer from skin diseases resulting from manual mixing operations.

(9) Air-compressing machine must be isolated in a private room supplied with sound reducers in order to decrease the noise witnessed by the worker of the premix concrete units production section.

(10) Periodical maintenance must be made for machines in order to maintain the limits of noise within the allowed limits.

(11) Stickers must be placed indicating the places of high noise.

(12) The severity of noise should not exceed the allowed limits (85dBA) for 8 hours of daily work.

(13) The factory must be maintained clean and solid waste must be disposed on timely basis.

(14) A place should be allocated for raw materials and produced materials. These materials should be arranged and organized, leaving appropriate corridors to enable the workers to move freely.

(15) Paint workers should be advised that they must not have any food or drinks or keep the same in the painting room.

(16) The thinner must not be used in cleaning the hands of the worker due to its dangerous effect on health.

(17) Workers must be advised that they should not come closer to evaporation room in order to avoid high temperature resulting from evaporation operations.

(18) Workers must be advised of the necessity of using earplugs upon getting access to the compressor. Further, the internal door of the room must be closed throughout the period of operation to prevent the exposure of workers to high noise.

(19) It is prohibited for any worker to get access to the place of work in case the machines are working, unless he provided with earplugs in order to protect him / her from unnecessary high noise.

(20) Earplugs must be provided and the workers must be advised of the necessity of using these plugs. Further, they should be instructed about the danger of high noise to their hearing.

(21) Medical examination and tests as well as audiometry must be carried for the workers who are exposed to high noise. The results must be recorded in a special file.

5-2 Manufacturing Cement Bricks and Tiles

(1) Appropriate control systems must be employed in order to restrict the emitting of dust resulting from manufacturing, provided that these systems must be supplied with appropriate filters, to be continuously cleaned and maintained.

(2) A number of highly efficient air-conditioning units must be installed in the ambient environment of business to purify the atmosphere from dust inside the production hall.

(3) Due to increase concentration of dust inside the area of manual mixing beyond the allowed limit, a matter that may expose the workers in this area to this dust and the pollution of the neighboring sections, and due to the fact that the workers mix these materials by hand, a matter that may cause them skin diseases; hence manual mixing operation must be replaced by automatic mixing operation to protect the workers from being expose to this dust. Further, the area where raw materials are mixed must be closed.

(4) The conveying belts and the places from which dust arises must be covered to limit the spread of dust.

(5) Continuous periodical maintenance of the presses, grinders, the machines that pull raw materials and all other machines must be made in order to decrease the severity of noise resulting from the same. Further, old machines must be replaced by new ones.

(6) The distribution of machines, especially press and printers in carefully selected and engineering designed areas will restrict the noise. Rubber pillows must be placed under the presses to limit the noise and vibration resulting from operating these machines.

(7) Stickers must be made indicating the places of high noise. Further, access to these places must be banned unless the protection systems are used.

(8) The factory must be cleaned and the floors must be washed on daily basis. Further, waste must be continuously removed from different places of work in order to avoid accidents.

(9) A tanker connected to a strainer to separate mud and cement sediments from water must be used before disposing these materials to the sanitary drainage network.

(10) Drainage systems of the water coming from the grinder and saws must be covered with metal covers in order to prevent accidents.

(11) Raw materials must be organized and arrange. Further, passages must be left to facilitate the movement of the workers inside the factory.

(12) All workers of the factory must be advised that they must not stay in the sieves area and beside the conveying belts.

(13) The workers of the automatic press must be replaced in order to restrict their exposure to high noise for long periods. Further, they should be advised of the necessity of using earplugs.

(14) The workers must be advised that they must not stay in the drying hall or near the door of the evaporation room in case of opening this door in order to protect them from being exposed to excess temperature and humidity.

(15) Personal protection uniforms must be provided for workers and they must be advised of using the same. These uniforms include:

a) Leather gloves for grinding machines workers, leather boots, aprons for mixing workers.
b) Ear plugs for protecting the workers of the pressing and grinding operations from high noise.
c) Masks provided with dust filters to protect concrete mixing workers from the emitting dust.

(16) Audiometry must be made every two years and the results must be recorded in a special register for this purpose.

(17) Periodical medical examination and tests must be made for all workers of the factory.

5-3 Asphalt Industries Business

(1) The asphalt factory must be at least 1 Km. far away from the residential and urban areas.

(2) Control system must be installed to dispose air pollutant resulting from asphalt industry, such as bag filter in order to restrict the emitting of dust, particularly small particles (10 micron) as it is harmful to health and environment.

(3) The height of the chimney should not be less than 12 meters from the roof of the neighboring buildings in order to restrict the spread of air pollutants to the nearby areas.

(4) The conveying belt must be covered and totally isolated in order to restrict the spread of harmful pollutants.

(5) Periodical maintenance must be made for the conveying ducts and belts that convey raw materials. Further, the cracked ducts and belts must be repaired.

(6) Continuous maintenance of the pollutants control system must be made. Further, used filters must be replaced in order to maintain the efficiency of the system and to restrict the spread of fine dust.

(7) Gravels transport tractor must be supplied with closed and air-conditioned cabinets to protect the workers of the tractor from high temperature and from being expose to harmful pollutant.

(8) Increasing the combustion temperature of the fuel used in heating the burner in order to limit the spread of black smoke in the work and the external environment.

(9) The floor of the factory must be cast and leveled to limit the emitting of dust during the entry and exit of trucks.

(10) The road connecting the factory to the public street must be asphalted and leveled.

(11) Covered or total gravels must not be stored in exposed areas. Further, appropriate stores must be allocated for this type of materials.

(12) The waste resulting from the manufacture of asphalt must be dumped in the places allocated for the same by Kuwait Municipality. These materials must not be dumped in places that constitute an additional source for emitting of pollutants.

(13) The worker of the factory must be supplied with personal protection devices, such:

a) Masks that provide protection from dusts and other masks that provide protection from gases.
b) Glasses that protect the ice from dust.
c) Ear plugs protect the ears from high noise.
d) Covers that protect the head and neck.
e) Safety boots.
f) Hand gloves to deal with asphalt product.

(14) The workers must be advised of the necessity of isolating work uniforms from their private cloths and the necessity of washing it on daily basis.

(15) Periodical medical examination and tests must be conducted to all workers of the factory.

5-4 Imports and Grinding Gravels Activity

(1) Dust control system must be employed by using water-sprinkling systems, sedimentation of dust arising during unloading or loading gravels in order to prevent the spread of this dust in the atmosphere.

(2) All necessary precautions must be taken to insure that the gravels will not fall in the sea during unloading or loading gravels in the ports. In case the gravels fall it must be immediately removed.

(3) A number of piers must be allocated for the anchorage of vessels loaded with gravels.

(4) Gravels must not be stored in the port except upon necessity and provided that the storage should be for a temporary period. Further, the stores must be isolated and prepared for this use.

(5) Due efforts must be made in order to prevent the emitting of any dust from the trucks during the transport of gravels on different roads. The gravels must be covered with tightly closed and effective cover.

(6) Appropriate and suitable means of transport must be used for the transport of gravels.

(7) All necessary precautions must be taken during transport in order to prevent the fall of gravels on roads and pavements of the port. The scatter of dust during loading the trucks must be avoided.

(8) Truck drivers and importers must be advised of strict and absolute compliance with the traffic rules and regulations. Further, they should observe the allowable weight for moving on roads.

(9) Importers gravels stores located at crusher locations or site locations must be far away from the residential areas so that it may not pollute these areas with fine dust.

(10) All conveying belts must be tightly closed in order to limit the emitting of dust during the operation of the crusher.

(11) Engineering Control System must be installed to control the emitting of dust coming from the industrial operations during crushing of gravels. In this respect the filters used for gathering fine dust, such as bag filters must be used in the crusher.

(12) The places where gravels are crushed must be far away from the residential areas in order to expose the citizens to fine dust that is harmful to health.

(13) The roads linking the crushers with the public road must be asphalted.

(14) The waste resulting from crushing operations must not be thrown in the desert or other areas except in the places allocated for the same by Kuwait Municipality. Further, the owners of the crushers should not leave the waste inside the plot so that it might not be an additional source for emitting of dust into the atmosphere.

(15) Raw gravels must be washed before being imported, if possible, or before crushing operations.

(16) The concentration of the suspended particles must not, in all cases, exceed the following ratios:

a) 90 microgram/m^3 in the atmosphere on annual average basis.
b) 350 microgram/m^3 in the atmosphere on daily average provided that this concentration must not be repeated twice within every 30 days.

(17) The severity of noise should not exceed 85 dBA, under any circumstances, for 8 hours working exposure per day.

(18) To advise all workers existing in the storage places of the importers that they should observe the use of personal protection methods.

(19) All workers must be advised that they should not stay near the crusher or the sieves except upon necessity.

(20) All precautions must be taken to protect the workers existing in the crusher and the places where the gravels are stored. Further, they must be supplied with the personal protection devices, such as:

a) Dust masks.
b) Eye glasses.
c) Earplugs to protect ears from high noise.
d) Helmets.
e) Safety boots.

(21) Periodical medical examination and tests must be conducted for factory workers.

5-5 Cement Industry Businesses

(1) Spot ventilation systems must be provided in the cement sacks packaging section. These systems must be highly efficient to withdraw the dust existing in the work atmosphere and to decrease concentration of the same to less than 10 mg. / m^3.

(2) Ventilation openings existing on the storage cells must be connected to appropriate number of filters.

(3) Periodical maintenance of the spot ventilation systems installed on the conveying belts must be effected.

(4) Annual periodical maintenance system of the electrical sedimentation machines and filters existing in the factory must be made in order to maintain its efficiency and operation in the required manner.

(5) The concentration of the dust emitting to the atmosphere after passing from the filters must not exceed 10 mg/ m^3.

(6) New designs must be used in manufacturing in order to decrease the percentage of dust coming from the industrial operation. In this respect dust recycling must be effected via the injection of the dust into the raw material along with the addition of some solidity retardants.

(7) Water sprinkling source must be provided to be used upon being directly exposed to cement dust.

(8) Appropriate solutions to get rid of NOx and SOx resulting from the burning of fuel during manufacturing process must be provided.

(9) Raw materials and fuel that contains the least percentage of silver must be used as an essential step to decrease the percentage of the gases emitting from industrial operations.

(10) The temperature inside the factory should not exceed the allowed limits in order to maintain public health.

(11) The noise inside the factory must be limited and it should not exceed the allowed limits (85 dBA) for 8 hours per day.

(12) Automatic sucking technique must be used in cleaning the floors of all sections of the factory.

(13) The workers engaged in this industry must be fully aware of the danger of the material, how to handle it, and the damages resulting from direct exposure to the same.

(14) The workers must be obliged to use personal protection devices on continuous basis during working hours, such as: Dust masks, gloves, safety boots, helmets, ear plugs.

(15) Periodical medical examination and tests must be conducted for the workers, especially relating to lung and skin diseases.

Sixth: Engineering and Environmental Stimulations for Engineering Industries Sector

6-1 Production of Fridges and Water Coolers Activity

(1) Installation of a number of exhaust fans in the production hall in order to renew the air inside the factory.

(2) Installation of movable ventilation systems on the locations where chemicals are poured.

(3) Carpentry machines that cut and soften wood must be supplied with appropriate spot ventilation systems, provided that the dust must be collected in special sacks.

(4) Carpentry section must be isolated from the remaining parts of the factory in order to prevent the spread of wood dust. Further, appropriate ventilation must be provided.

(5) Insulate material casting room must be isolated from the remaining parts of the factory. Further, appropriate ventilation must be provided.

(6) Carpentry machines must be isolated from the remaining parts of the factory in order to prevent the spread of the wood dust to the remaining parts of the factory.

(7) Closed room must be allocated for painting works. This room must be supplied highly efficient spot control systems. Further, air pushing fans must be operated during undertaking painting operations.

(8) Periodical maintenance of the spot control system existing in the painting cabinet must be made. Further, associated filters must be replaced on closer intervals.

(9) Water drainage systems must be provided in the paint works cabinet in order to collect the falling painting materials, in case a close control systems is used.

(10) The water collected from paint works cabinet must be treated before being disposed.

(11) Special cabinet for welding operations must be made and provided with sport ventilation systems.

(12) Movable partitions must be installed beside welding operations to prevent the other workers from being exposed to the sparkles resulting from welding operations.

(13) Welding places must be supplied with appropriate exhaust fans and the doors and windows must be left open in order to circulate air and prevent the accumulation of health harmful gases.

(14) Cutting and whetting machines must be isolated from the remaining sections of the factory in order to reduce high noise resulting from the operation of these machines.

(15) FCC containers (Ferrion gas) must be suitable and it must stand high internal pressures upon high temperatures.

(16) Ferrion gas must be used in well ventilated place in order to prevent the accumulation of high concentrates of vapor inside the atmosphere of work.

(17) Gas containers must be stored in cool and dry place away from being exposed to direct sunrays in order to avoid the dissolution of gas to acid components due to high temperature.

(18) Periodical maintenance of the machines must be made in order to maintain the severity of noise within the allowed limits.

(19) The severity of noise should not exceed the allowed limits (85 dBA) according to the hours of exposure, i.e. 8 hours of daily work – the working period of every shift.

(20) Lighting systems must be periodically maintained. Further, damaged lamps must be replaced to increase lightening in the different sections of the factory.

(21) The corridors of the mechanical maintenance unit must be evacuated from all metal and solid waste hindrance. Further, other places of work must be evacuated from waste to facilitate the movement of the workers and to prevent accidents.

(22) The factory must be cleaned and arranged in order to prevent the accumulation of raw materials and wastes resulting from manufacturing process. Further, solid waste must be removed.

(23) Raw materials and produced items must be arranged and organized inside the factory, leaving appropriate passages to facilitate the movement of workers.

(24) Caution must be observed in order not to inhale FCC vapors (Freon gas) even though for short period so as to avoid the accidents of faint.

(25) FCC should not contact skin, eye or garments in order to safe the workers suffering from the frozen of tissues, eye liquids or the removal of the skin fat strata.

(26) The thinner must not be used in cleaning the hands of the worker due to its dangerous effect on health. Further, ordinary personal cleaning materials must be used.

(27) Paint workers should be advised that they must not have any food or drinks or keep the same in the painting room.

(28) Toilets must be provided for workers and it must be maintained and kept clean.

(29) Personal protection devices must be used by workers. These uniforms include:

a) Appropriate mask for industrial operations and the pollutants.
b) Ear plugs for protecting the workers of the pressing and grinding operations from high noise.
c) Eye glasses.
d) Hand gloves.
e) Overalls.
f) Safety boots.

(30) Periodical medical examination and tests must be conducted for all workers of the factory.

6-2 Production of Air-Conditioning Units and Central Air-Conditioning Machine Activity

(1) Providing necessary public ventilation in the different departments of production in order to cool work atmosphere.

(2) Installation of air withdrawal system on Trichloroethane cleaning basins and continuous maintenance of these systems to increase its efficiency as well as to replace Trichloromethane with Trichloroethane.

(3) To allocate close room for painting and to provide this room with highly efficient spot control systems along with the operation of exhaust fans during painting operations.

(4) Periodical maintenance of the spot control system at paint cabinet along with replacement of the associated filters on short intervals.

(6) Providing drainage system in the floor of the paint cabinet to collect the dropping paint materials, in case of using closed control system.

(7) Treatment of the water collected from paint cabinet before disposal.

(8) Construction of special cabinets for welding operations provided with spot ventilation systems.

(9) Installation of movable partitions beside welding operations to prevent the exposure of other workers of the factory to the sparks resulting from welding operations.

(10) Providing welding places with appropriate exhaust fans along with opening doors and windows to circulate air and to prevent the accumulation of the gases that are harmful to health.

(11) Welding operations must not be conducted near the basins allocated for cleaning steel tools as phosgene dangerous substance may result due to the existence of Trichloroethylene that is used in cleaning.

(12) Isolating cutting and whetting machines away from the remaining sections of the factory to reduce high noise resulting from operating the same.

(13) Periodical maintenance of the machines so that the severity of noise should not exceed the allowed limits.

(14) Giving due care to general cleaning in the factory, particularly the floor and maintenance work shop.

(15) Arranging and organizing the raw materials and the produced materials inside the factory. Further, appropriate passages must be left to facilitate the movement of workers and to prevent the accumulation of raw materials and the waste resulting from manufacturing operation that may cause accidents.

(16) Evacuation of the passages inside mechanical A/C maintenance unit from all steel hindrance and solid waste through collecting the waste in special containers till disposing the same.

(17) Observing sound applicable conditions relating to handling, storage, transport and packaging of CFC containers that are used in filling A/C systems and fridges. This can be made by observing the following recommendations:

a) It must be made sure that CFC containers are appropriate and can bear with internal pressures at high temperatures.
b) Containers must be stored in cool and dry place away from fire or direct sunrays.
c) Freons gas must be used in good ventilated place to prevent the concentration of the vapor resulting from the gas in the work atmosphere.

d) Due care must be taken in order to prevent the inhalation of CFC vapors and compounds even though for short periods in order to avoid fating.
e) Due care must be taken to prevent the existence of any flame or hot objects in the place where Freons gas is used in order to prevent the breakup of vapor to acid components and consequently pollution of the ambient atmosphere.
f) CFC compounds must not contact skin, eyes or garments. So skin protecting materials, gloves, protecting garments must be used in order to avoid liquid materials or that harmful to eyes or skin.

(18) All workers should be advised that they must not eat or drink any food or drinks or keep the same inside the place of work or in the paint room.

(19) The thinner must not be used in cleaning the hands of the worker due to its dangerous effect on health.

(20) Personal cleaning materials must be provided and workers must be advised of the necessity of washing hands with water and soap and they must take a shower after work.

(21) Toilets must be provided for workers and it must be maintained and kept clean.

(22) Medical examination and tests must be conducted to all workers of the factory, particularly when they are newly engaged. Further, periodical medical examination must be made every year for paint workers and the workers who are exposed to the vapor of Trichloroethylene. Results of the medical examination must be kept in records and should be prepared for this purpose.

(23) First aid kits must be provided with necessary tools and materials. The kit must be opened and it should not include other things rather than first aid materials.

(24) The materials that contain Chlorinated Hydrocarbon must not be used near the sources of heat, fire or any electrical spark, particularly upon conducting welding operations. Further, it must not expose to direct sunrays.
(25) Workers must be provided with personal protection devices and they must be advised of using it continuously during work, such as:

a) Gloves for the workers who transport steel sheets and those who maintain A/C units.
b) Masks appropriate for the industrial operations and the types of pollutants existing in the ambient atmosphere. These masks must be provided with filters with regard to the workers who are exposed

to the vapors coming from Freons gas during filling A/C units with gas and the vapors of Trichlorofluoromethane.

c) Glasses for lathe workers in the maintenance workshop.
d) Earplugs for protection from noise, particularly for the workers engaged in cutting, whetting and welding operations.
e) The workers must dress in overalls.
f) Safety boots must be used.

(26) Initial and periodical medical examination must be conducted for all workers.

6-3 Steel Moulds and Steel Reinforcement Manufacturing Activity

(1) Necessary general ventilation must be provided using exhaust fans at the top of the mould and steel works factory. Further, many side openings must be made to increase the efficiency of general ventilation system.

(2) Special cabinets must be made for welding operations and it must be provided with spot ventilation systems, either fixed or movable.

(3) Special cabinets should be made for welding operation. This cabinet must be provided with spot ventilation system and movable partitions must be installed beside welding operations in order to prevent the exposure of the other workers of the factory to the sparks resulting from welding operations.

(4) The walls of manufacturing shed must be provided with appropriate exhaust fans at the places that are allocated for welding in order to purify the atmosphere from pollutants. Further, windows and doors must be left open to circulate air and to prevent the accumulation of gases that are harmful to health.

(5) Cutting and whetting machines must be isolated from the remaining sections of the factory in order to reduce high noise resulting from the operation of these machines.

(6) Periodical maintenance of all machines, including steel extrusion machine, wires cutting machine, meshes cutting machine, meshes welding machine and vibrators that produce high noise in order to decrease the level of noise resulting from the same to the allowed limits.

(7) The factory must be kept clean, so raw materials and wastes of production must not be left accumulated as the same may cause accidents.

(8) Raw materials and produced items must be arranged and organized inside the factory, leaving appropriate passages to facilitate the movement of workers.

(9) Workers must be advised that they shouldn't eat or have any drink inside the place of work. Further, a place for eating must be provided to keep and maintain their health.

(10) Special cupboards must be provided so that the workers keep their garments in the same.

(11) Enough toilets must be provided for workers and it should be maintained.

(12) Workers should be advised that they shouldn't approach or get access to the compressor room unless in case of necessity. If they are obliged to do so earplugs must be used and the internal door of the room must be closed throughout the period of operation to prevent the exposure of the workers of the factory to high noise.

(13) Personal protection devices, such as:

a) Earplugs must be used to protect the ears, specially in whetting, cutting etc. operations. Further, all workers who are exposed to high noise must use these plugs and they must be advised of the danger involve in this noise.
b) Protecting garments, such as aprons, gloves, masks, glasses etc. must be used.
c) Appropriate masks and safety boots must be used.
d) The workers engaged in cutting insolent materials – upon production of fire proofing doors – must be provided with masks to protect them from the dust of the glass fibers.

(14) The materials that contain Chlorinated Hydrocarbon must not be used near the sources of heat, fire or any electrical spark, particularly upon conducting welding operations. Further, it must not be exposed to direct sunrays.

(15) Periodical medical examination and tests must be conducted for all workers of the factory.

6-4 Galvanized Activity (Coating steel items with a coat of zinc)

(1) Closed control system must be installed to withdraw the vapors coming from zinc melting basin during galvanizing operations.

(2) Providing necessary general ventilation to cool work atmosphere.

(3) Providing air-conditioned room with glass walls to supervise the workers from the same.

(4) The factory must be kept clean and the accumulation of raw materials and production waste that may cause accidents must be prevented.

(5) Raw materials and produced items must be arranged and organized inside the factory, leaving appropriate passages to facilitate the movement of workers.

(6) Personal protection devices, such as:

a) Aprons, safety boots, helmets, glasses and gloves.
b) Masks provided with special filters for galvanization workers and other filters that protect from the dust resulting from cleaning and abolishing the product, must be provided and the workers must be advised of using it.

(7) The materials that contain Chlorinated Hydrocarbon must not be used near the sources of heat, fire or any electrical spark, particularly upon conducting welding operations. Further, it must not expose to direct sunrays.

(8) Periodical medical examination and tests must be conducted for all workers of the factory.

6-5 Guiding Boards Manufacturing Activity

(1) Providing necessary general ventilation in the different sections of production to cool the ambient atmosphere.

(2) Installing exhaust fan at the developing room provided with a filter to collect gases and a pipe connected with 3-5 high chimney above the roof of the building in order to prevent the spread of harmful gases inside the developing room.

(3) Closed room provided with highly efficient spot control systems must be allocated for painting. Further, exhaust fans must be operated during painting operations.

(4) Periodical maintenance of the spot control system at paint cabinet along with replacement of the associated filters on short intervals.

(5) Providing drainage system in the floor of the paint cabinet to collect the dropping paint materials, in case of using closed control system.

(6) Treatment of the water collected from paint cabinet before disposal.

(7) Construction of special cabinets for welding operations must be provided with spot ventilation systems.

(8) Installation of movable partitions beside welding operations to prevent the exposure of other workers of the factory to the sparks resulting from welding operations.

(9) Providing welding places with appropriate exhaust fans along with opening doors and windows to circulate air and to prevent the accumulation of the gases that are harmful to health.

(10) Isolating cutting and whetting machines from the remaining sections of the factory to reduce high noise resulting from operation of the same.

(11) The severity of noise must not exceed the allowed limits according to the hours of exposure.

(12) Periodical maintenance of the machines so that the severity of noise must not exceed the allowed limits.

(13) Raw materials must be organized and arranged. Further, passages must be left to facilitate the movement of the workers inside the factory.

(14) The factory must be kept clean and raw materials as well as production waste, such as paint containers, inks ...etc. must not be left and it should be soundly disposed. Further, solid waste must be timely disposed.

(15) Inks must not be disposed in the drainage network, rather it must be collected in containers, then disposed.

(16) The thinner must not be used in cleaning the hands of the worker due to its dangerous effect on health.

(17) Paint workers should be advised that they must not have any food or drinks or keep the same in the painting room.

(18) Enough toilets must be provided for workers and it must be maintained.

(19) Workers must be advised of the necessity of using personal protection devices such as:

a) Masks provided with appropriate filters for the industrial operations and the existing pollutants.
b) Earplugs, especially for the workers engaged in cutting, whetting and welding operations.

(20) Glasses, gloves, overalls and safety boots must be used.

(21) Periodical medical examination and tests must be conducted for all workers of the factory.

6-6 Chassis and Vehicle Accessories Manufacturing Activity

(1) Providing necessary general ventilation in the different sections of production to cool the ambient atmosphere.

(2) Closed room provided with highly efficient spot control systems must be allocated for painting. Further, exhaust fans must be operated during painting operations.

(3) Periodical maintenance of the spot control system at paint cabinet along with replacement of the associated filters on short intervals.

(4) Providing drainage system in the floor of the paint cabinet to collect the dropping paint materials, in case of using closed control system.

(5) Treatment of the water collected from paint cabinet before disposal.

(6) Constructing special cabinets for welding operations provided with spot ventilation systems.

(7) Installation of movable partitions besides welding operations to prevent the exposure of other workers of the factory to the sparks resulting from welding operations.

(8) Providing welding places with appropriate exhaust fans along with opening doors and windows to circulate air and to prevent the accumulation of the gases that are harmful to health.

(9) Isolating cutting and whetting machines from the remaining sections of the factory to reduce high noise resulting from operation of the same.

(10) It must be made sure that there are no grease or organic materials are existing inside the tanks to be cut or welded in order to avoid explosion or poisoning.

(11) Periodical maintenance of the machines, including smethery machines on continuous basis, so that the severity of noise must not exceed the allowed limits.

(12) Periodical maintenance of lighting system and replacement of the damaged lamps to maintain the level of lighting in the different sections of the factory.

(13) Severity of lighting must not exceed the allowed limits (85 dBA) according to the daily hours of exposure, which are 8 hours of daily works, the period of daily shift.

(14) The factory must be kept clean and raw materials as well as production waste must not be left to avoid any accidents.

(15) Raw materials must be organized and arranged. Further, passages must be left to facilitate the movement of the workers inside the factory.

(16) Welding workers must not enter huge tanks for welding operations unless it is provided with highly efficient ventilation system to withdraw vapors and gases harmful to health.

(17) The thinner must not be used in cleaning the hands of the worker due to its dangerous effect on health.

(18) Paint workers should be advised that they must not have any food or drinks or keep the same in the painting room.

(19) Enough toilets must be provided for workers and it must be maintained.

(20) Workers must be advised of the necessity of using personal protection devices such as:

a) Masks provided with appropriate filters for the industrial operations and the existing pollutants.
b) Earplugs, especially for the workers engaged in cutting, whetting and welding operations.
c) Glasses.
d) Gloves.
e) Overalls.
f) Safety boots.

(21) Periodical medical examination and tests must be conducted for all workers of the factory.

6-7 Boilers Manufacturing Activity

(1) Providing production hall with necessary general ventilation in the different sections of production to cool the ambient atmosphere.

(2) Closed room provided with highly efficient spot control systems must be allocated for painting. Further, exhaust fans must be operated during painting operations.

(3) Periodical maintenance of the spot control system at paint cabinet along with replacement of the associated filters on short intervals.

(4) Providing drainage system in the floor of the paint cabinet to collect the dropping paint materials, in case of using closed control system.

(5) Treatment of the water collected from paint cabinet before disposal.

(6) Constructing special cabinets for welding operations provided with spot ventilation systems.

(7) Installation of movable partitions besides welding operations to prevent the exposure of other workers of the factory to the sparks resulting from welding operations.

(8) Providing welding places with appropriate exhaust fans along with opening doors and windows to circulate air and to prevent the accumulation of the gases that are harmful to health.

(9) Isolating cutting and whetting machines from the remaining sections of the factory to reduce high noise resulting from operation of the same.

(10) Periodical maintenance of the machines, including smethery machines on continuous basis, so that the severity of noise must not exceed the allowed limits.

(11) Giving due care to general cleaning in the factory and preventing accumulation of the raw materials and the production wastes to avoid any accidents.

(12) Raw materials must be organized and arrange. Further, passages must be left to facilitate the movement of the workers inside the factory.

(13) The thinner must not be used in cleaning the hands of the worker due to its dangerous effect on health.

(14) Paint workers should be advised that they must not have any food or drinks or keep the same in the painting room.

(15) Enough toilets must be provided for workers and it must be maintained.

(16) Workers must be advised of the necessity of using personal protection devices such as:

a) Masks provided with appropriate filters for the industrial operations and the existing pollutants.
b) Earplugs, especially for the workers engaged in cutting, whetting and welding operations.

c) Glasses.
d) Gloves.
e) Overalls.
f) Safety boots.

(17) Periodical medical examination and tests must be conducted for all workers of the factory.

6-8 Spark Plugs Manufacturing Activity

(1) Providing production hall with necessary general ventilation in the different sections of production to cool the ambient atmosphere.

(2) Installation of spot ventilation systems and pollutants control systems on:

a) Lathing machines.
b) Cleaning machine that uses 1,1,1-trichloromethane.
c) Cleaning basins – organic solvents treatment basins.
d) Presses with insolents.

Periodical maintenance of these systems must be continuously conducted and the associated filters must be continuously changed.

(3) Closed room provided with highly efficient spot control systems must be allocated for painting. Further, exhaust fans must be operated during painting operations.

(4) Periodical maintenance of the spot control system at paint cabinet along with replacement of the associated filters on short intervals.

(5) Providing drainage system in the floor of the paint cabinet to collect the dropping paint materials, in case of using closed control system.

(6) Treatment of the water collected from paint cabinet before disposal.

(7) Constructing special cabinets for welding operations provided with spot ventilation systems.

(8) Installation of movable partitions besides welding operations to prevent the exposure of other workers of the factory to the sparks resulting from welding operations.

(9) Providing welding places with appropriate exhaust fans along with opening doors and windows to circulate air and to prevent the accumulation of the gases that are harmful to health.

(10) Isolating cutting and whetting machines from the remaining sections of the factory to reduce high noise resulting from operation of the same.

(11) Periodical maintenance of the machines, including smethery machines on continuous basis, so that the severity of noise must not exceed the allowed limits.

(12) Giving due care to general cleaning in the factory and preventing accumulation of the raw materials and the production wastes to avoid any accidents.

(13) Raw materials must be organized and arranged. Further, passages must be left to facilitate the movement of the workers inside the factory.

(14) The thinner must not be used in cleaning the hands of the worker due to its dangerous effect on health.

(15) Paint workers should be advised that they must not have any food or drinks or keep the same in the painting room.

(16) Enough toilets must be provided for workers and it must be maintained.

(17) Workers must be advised of the necessity of using personal protection devices such as:

a) Masks provided with appropriate filters for the industrial operations and the existing pollutants.
b) Earplugs, especially for the workers engaged in cutting, whetting and welding operations.
c) Glasses.
d) Gloves.
e) Overalls.
f) Safety boots.

(18) Periodical medical examination and tests must be conducted for all workers of the factory.

6-9 Electrical Tools and Connections Manufacturing Activity

(1) Providing production hall with necessary general ventilation in the different sections of production to cool the ambient atmosphere.

(2) Industrial operation of rasin isocyanides filling section and stabilizer section must be isolated and appropriate ventilation systems must be provided on the machines that are used in manufacturing.

(3) Periodical maintenance of the ventilation systems that are installed on cables covering and isolating machines as well as for ventilation systems at rasin and isocyanides filling section and stabilizer section.

(4) Closed room provided with highly efficient spot control systems must be allocated for painting. Further, exhaust fans must be operated during painting operations.

(5) Periodical maintenance of the spot control system at paint cabinet along with replacement of the associated filters on short intervals.

(6) Providing drainage system in the floor of the paint cabinet to collect the dropping paint materials, in case of using closed control system.

(7) Treatment of the water collected from paint cabinet before disposal.

(8) Constructing special cabinets for welding operations provided with spot ventilation systems.

(9) Installation of movable partitions besides welding operations to prevent the exposure of other workers of the factory to the sparks resulting from welding operations.

(10) Providing welding places with appropriate exhaust fans along with opening doors and windows to circulate air and to prevent the accumulation of the gases that are harmful to health.

(11) Isolating cutting and whetting machines from the remaining sections of the factory to reduce high noise resulting from operation of the same.

(12) Periodical maintenance of the manufacturing machines, so that the severity of noise must not exceed the allowed limits.

(13) Stabilizer section should not be manually cleaned, rather automatic sucking machine must be used to prevent the pollution of the place with lead dust.

(14) Giving due care to general cleaning in the factory and preventing accumulation of the raw materials and the production wastes to avoid any accidents.

(15) Raw materials must be organized and arranged. Further, passages must be left to facilitate the movement of the workers inside the factory.

(16) The workers must not stay beside the furnaces for a long period unless they are dressed in personal protection uniforms in order to protect them from being exposed to the heat resulting from the furnaces and from CO and CO_2.

(17) The thinner must not be used in cleaning the hands of the worker due to its dangerous effect on health.

(18) Paint workers should be advised that they must not have any food or drinks or keep the same in the painting room.

(19) Enough toilets must be provided for workers and it must be maintained.

(20) Workers must be advised of the necessity of using personal protection devices such as:

a) Masks provided with appropriate filters for the industrial operations and the existing pollutants.
b) Earplugs, especially for the workers engaged in cutting, whetting and welding operations.
c) Glasses.
d) Gloves.
e) Overalls.
f) Safety boots.

(21) Periodical medical examination and tests must be conducted for all workers of the factory.

(22) The materials that contain Chlorinated Hydrocarbon must not be used near the sources of heat, fire or any electrical spark, particularly upon conducting welding operations. Further, it must not be exposed to direct sunrays.

6-10 Smithery Activity

(1) Installation of highly efficient exhaust fans at the top of the ceiling of the factory to reduce the concentration of the fine suspended dust and gases existing in the ambient atmosphere of the factory.

(2) Periodical maintenance of the ventilation system of the factory to guarantee its continuous efficient work.

(3) Welding workers must not enter into huge tanks for welding operations unless it is provided with highly efficient ventilation system to withdraw vapors and gases harmful to health.

(4) Closed room provided with highly efficient spot control systems must be allocated for painting. Further, exhaust fans must be operated during painting operations.

(5) Periodical maintenance of the spot control system at paint cabinet along with replacement of the associated filters on short intervals.

(6) Providing drainage system in the floor of the paint cabinet to collect the dropping paint materials, in case of using closed control system.

(7) Treatment of the water collected from paint cabinet before disposal.

(8) Constructing special cabinets for welding operations provided with spot ventilation systems.

(9) Installation of movable partitions besides welding operations to prevent the exposure of other workers of the factory to the sparks resulting from welding operations.

(10) Providing welding places with appropriate exhaust fans along with opening doors and windows to circulate air and to prevent the accumulation of the gases that are harmful to health.

(11) Isolating cutting and whetting machines from the remaining sections of the factory to reduce high noise resulting from operation of the same.

(12) Periodical maintenance of the manufacturing machines, so that the severity of noise must not exceed the allowed limits.

(13) Providing appropriate and safety lighting suitable for this activity.

(14) Giving due care to general cleaning in the factory and preventing accumulation of the raw materials and the production wastes to avoid any accidents.

(15) Raw materials must be organized and arranged. Further, passages must be left to facilitate the movement of the workers inside the factory.

(16) Leveling the floor of the factory and to prevent the occurrence of any accidents.

(17) The thinner must not be used in cleaning the hands of the worker due to its dangerous effect on health.

(18) Paint workers should be advised that they must not have any food or drinks or keep the same in the painting room.

(19) Enough toilets must be provided for workers and it must be maintained.

(20) Workers must be advised of the necessity of using personal protection devices such as:

a) Masks provided with appropriate filters for the industrial operations and the existing pollutants.
b) Earplugs, especially for the workers engaged in cutting, whetting and welding operations.

c) Glasses.
d) Gloves.
e) Overalls.
f) Safety boots.
g) Periodical medical examination and tests must be made for all workers of the factory.
h) The materials that contain Chlorinated Hydrocarbon must not be used near the sources of heat, fire or any electrical spark, particularly upon conducting welding operations. Further, it must not be exposed to direct sunrays.

6-11 Metal Pipes Manufacturing Activity

(1) Installation of control systems to control production waste and to withdraw Celica dust and gases that are spread in the factory.

(2) Providing general ventilation by using exhaust fans to be installed at the top part of the ceiling of the factory to cool the ambient atmosphere of the factory.

(3) Periodical maintenance of the ventilation system of the factory to guarantee its continuous efficient work.

(4) A system for withdrawing the dust from pipes cleaning room must be installed and this system must be periodically maintained to preserve its efficiency.

(5) Closed room provided with highly efficient spot control systems must be allocated for painting. Further, exhaust fans must be operated during painting operations.

(6) Periodical maintenance of the spot control system at paint cabinet along with replacement of the associated filters on short intervals.

(7) Providing drainage system in the floor of the paint cabinet to collect the dropping paint materials, in case of using closed control system.

(8) Treatment of the water collected from paint cabinet before disposal.

(9) Constructing special cabinets for welding operations provided with spot ventilation systems.

(10) Installation of movable partitions besides welding operations to prevent the exposure of other workers of the factory to the sparks resulting from welding operations.

(11) Providing welding places with appropriate exhaust fans along with opening doors and windows to circulate air and to prevent the accumulation of the gases that are harmful to health.

(12) Isolating cutting and whetting machines from the remaining sections of the factory to reduce high noise resulting from operation of the same.

(13) Periodical maintenance of the manufacturing machines, so that the severity of noise must not exceed the allowed limits.

(14) Sand blasting may not be used in cleaning metal pipes and it should be replaced by steel blasting in order to avoid pollution of the ambient atmosphere of the factory.

(15) Providing appropriate and safety lighting suitable for this activity.

(16) Giving due care to general cleaning in the factory and preventing accumulation of the raw materials and the production wastes to avoid any accidents.

(17) Raw materials must be arrange and organized. Further, passages must be left to facilitate the movement of the workers inside the factory.

(18) The thinner must not be used in cleaning the hands of the worker due to its dangerous effect on health.

(19) Paint workers should be advised that they must not have any food or drinks or keep the same in the painting room.

(20) Sufficient toilets must be provided for workers and it must be maintained.

(21) Workers must be advised of the necessity of using personal protection devices such as:

a) Masks provided with appropriate filters for the industrial operations and the existing pollutants.
b) Earplugs, especially for the workers engaged in cutting, whetting and welding operations.
c) Glasses.
d) Gloves.
e) Overalls.
f) Safety boots.

(22) Periodical medical examination and tests must be made for all workers of the factory.

(23) The materials that contain Chlorinated Hydrocarbon must not be used near the sources of heat, fire or any electrical spark, particularly upon conducting welding operations. Further, it must not be exposed to direct sunrays.

6-12 Shipbuilding and Repair Activity

(1) Providing the place of galvanization with a system for withdrawing the vapors resulting from cleaning and galvanization operations.

(2) Installation of spot ventilations system associated with cutting and polishing machines along with periodical maintenance of these systems to guarantee withdrawal of the dust resulting from these operations.

(3) Closed room provided with highly efficient spot control systems must be allocated for painting. Further, exhaust fans must be operated during painting operations.

(4) Periodical maintenance of the spot control system at paint cabinet along with replacement of the associated filters on short intervals.

(5) Providing drainage system in the floor of the paint cabinet to collect the dropping paint materials, in case of using closed control system.

(6) Treatment of the water collected from paint cabinet before disposal.

(7) Constructing special cabinets for welding operations provided with spot ventilation systems.

(8) Installation of movable partitions besides welding operations to prevent the exposure of other workers of the factory to the sparks resulting from welding operations.

(9) Providing welding places with appropriate exhaust fans along with opening doors and windows to circulate air and to prevent the accumulation of the gases that are harmful to health.

(10) Isolating cutting and whetting machines from the remaining sections of the factory to reduce high noise resulting from operation of the same.

(11) Periodical maintenance of the manufacturing machines, so that the severity of noise must not exceed the allowed limits.

(12) Sand blasting may not be used in cleaning metal pipes and it should be replaced by steel blasting.

(13) Providing appropriate and safety lighting suitable for this activity.

(14) Giving due care to general cleaning in the factory and preventing accumulation of the raw materials and the production wastes to avoid any accidents.

(15) The thinner must not be used in cleaning the hands of the worker due to its dangerous effect on health.

(16) Paint workers should be advised that they must not have any food or drinks or keep the same in the painting room.

(17) Sufficient toilets must be provided for workers and it must be maintained.

(18) The workers engaged in galvanization must be obliged to wear gas masks.

(19) Workers must be advised of the necessity of using personal protection devices such as:

a) Masks provided with appropriate filters for the industrial operations and the existing pollutants.
b) Earplugs, especially for the workers engaged in cutting, whetting and welding operations.
c) Glasses.
d) Gloves.
e) Overalls.
f) Safety boots.

(20) Periodical medical examination and tests must be conducted for all workers of the factory.

Seventh: Engineering and Environmental Stipulations for Garage, Car Washing and Greasing Stations Sector

7-1 Auto Repair Garages Activity

(1) All sections of the garage must be provided with comprehensive ventilation system so that the air inside the garage should be continuously renewed during the appropriate period of time. Further, there should be fans to cool the atmosphere in the summer in order to save the workers from exhaust and fatigue.

(2) Periodical maintenance of the spotted ventilation systems in all cabinets of the different sections of work. In this respect the filters associated to vapors withdrawal system must be cleaned and renewed. Furthermore, air must be periodically pumped to maintain the efficiency of the systems and its ability to purify work atmosphere from pollutants of the industrial operations.

(3) The level of severity of noise in the garage should not exceed 85 (dBA) during 8 hours of daily work.

(4) Providing necessary industrial and natural lighting all over the garage, especially in the lathe room.

(5) Creating special hall for paint works, provided that it should be separate and tightly closed from the remaining sections of the work. Within this room a place for preparing paints and another place for spraying paints, third place for preparing vehicles with paste and another section for car polish must be allocated.

(6) Exhaust fan should be installed, provided that it should be associated to the spot ventilation system and provided also it should be connected with a stack of three meters high above the roof of the garage.

(7) A room within electricity workshop should be made to prepare the water of batteries and to mix water with sulfuric acid. This room should be completely isolated from auto-electricity repair workshop.

(8) Work places should be supplied with a table and a board above which manual tools should be arranged in an accessible and save money.

(9) Gas cylinders must be fixed in a manner that prevent fall of the same on the ground or it must be placed in rooms allocated for this purpose.

(10) Movable welding partitions and preventive barriers should be fixed on the built of the lathe.

(11) Appropriate means should be created to withdraw the vapors resulting from the dilution of the sulfuric acid within batteries maintenance and charge unit. In this respect highly efficient ventilation systems proportionate with the size of the room must be installed to withdraw the vapors resulting from the dilution of the sulfuric acid.

(12) The conveying belts should be covered with protective covers.

(13) All waste lubricants of the garages must be collected in special containers.

(14) Machine parts should not be cleaned with organic solvents containing dangerous benzene and it should be replaced with lesser dangerous substance, provided that cleaning should be carried out in places supplied with appropriate ventilation systems to withdraw the vapors.

(15) All workers, particularly paint workers, should be advised that they must not eat or drink or store the same in the different places of work inside the sections of the garage. Further, a room should be allocated as restroom for the workers and this room should be provided with a canteen for light meals.

(16) Guiding stickers must be placed on all dangerous machines indicating that this machine is dangerous and how this danger can be avoided.

(17) Personal protection devices should be provided and used by all workers of the garage, such as:

a) Gas masks for welding workers, other masks relating to the withdrawal of organic solvents for paint workers, provided that these masks must be highly efficient and it must be continuously cleaned and its filters must be replaced on short intervals.
b) Leather gloves for paint workers, and the worker engaged in washing the machines and welding to protect their hands from being expose to grease and lubricants.
c) Protective gloves, aprons and safety boots for all workers.
d) Glasses for whetting workers to protect them the materials resulting from whetting operations.
e) Electric and oxygen welding workers should be provided with protective shields and glasses and they should be advised of the necessity of using the same.
f) Earplugs to protect the welders and smith crafts and whetting workers from the noise resulting in smithery and plumbing section.
g) Toilets with hand washing basins must be provided to the workers to wash their hands from the traces of the manufacturing operations, particularly in the paint section.

h) Dressing rooms with cloth cupboards must be provided, keeping in view that these garments must be continuously cleaned from lubricants and grease that may result in skin diseases.

(18) Periodical medical examination and tests should be conducted for all workers, particularly the workers who are exposed to professional diseases, namely smithery workers and the workers who are exposed the paint and welding vapors. Furthermore, the audiometry should be made for them.

(19) The materials that contain Chlorinated Hydrocarbon must not be used near the sources of heat, fire or any electrical spark, particularly upon conducting welding operations. Further, it must not be exposed to direct sunrays.

7-2 Auto Wash and Greasing Stations Activity

(1) Periodical maintenance of all spot ventilation systems in all different sections of the work.

(2) Providing necessary industrial and natural lighting all over the garage, especially in the lathe room.

(3) Providing the machines that are used in cladding vehicle carpets with a system for withdrawing dust.

(4) In case the plot is allocated as auto-washing and greasing station, no welding and painting operations be carried inside the same. Further, no chemicals should be stored in its stores. Furthermore, used lubricants must not be disposed in the public drainage network and the plot should be used for the purpose it is allocated for.

(5) Car consumable items should be properly stored.

(6) Providing and continuously maintaining lubricants separation systems at car washing stations to guarantee the efficiency of these stations.

(7) Solid waste must be timely and properly dispose in accordance with the stipulation of the municipality.

(8) Drainage canals inside the station must be continuously maintained so that it should be always utilizable. Further, used lubricants resulting from maintenance operations and replacement of engine lubricants must not be disposed in the public drainage network, rather it must be properly dumped.

(9) The rooms should be cleaned and passages should be cleared from all hindrances and solid wastes resulting from the repair and replacement

of motor parts and it should be dumped in the place allocated for this purpose.

(10) The floors of the station must be rough and leveled to prevent slippery. Further, periodical cleaning of the same must be observed using steel and industrial detergents so that it should always remain free of grease.

(11) The workers of the station should be advised that they should not use benzene or diesel while washing the hands to remove lubricants or grease as such materials may cause irritations and it may be harmful to the efficiency of the respiratory system.

(12) A room should be allocated as restroom for the workers and this room should be provided with a canteen for light meals. Further, workers should be advised of the necessity of washing their hands with water and soap before eating these foods.

(13) Personal cleaning items must be provided for workers and they must be advised of the necessity of washing their hands with water and soap after completion of work.

(14) A room should be allocated for first aids and it should be provided with first aid kit containing a complete set of medicine, bandages and disinfectants.

(15) Stickers must be placed on the dangerous machines indicating different occupational hazardous that may be suffered by the workers of the car washing and greasing machine. Further, methods of avoiding these hazards must be indicated.

(16) Due care must be given to the cleanness of the sanitary facilities, so that it must be always suitable for use. Further, the number of showers and toilets must be increased proportionate with number of workers. Furthermore, it should be provided with industrial detergents, towels and creams that may be used after painting works.

(17) Personal protection devices must be provided and used by all workers, such as safety boots, overalls, gloves and masks provided with filter to protect the workers from the occupational diseases.

(18) Periodical medical examinations and tests must be conducted for all workers of the factory, particularly washing and greasing workers.

Eighth: Engineering and Environmental Stipulations of the Foodstuffs Industries Sector

8-1 General Environmental Stipulations for Food Sector

(1) All walls of the factory and the raw materials stores must be covered with tiles at height, not less than three meters. Further, all walls and ceilings of all sections of the factory must be painted. The floors must be covered with tiles having suitable slope to allow the drainage of different waters resulting from the industrial operations and from cleaning the tools, motors and floors to circular manholes to prevent the blockade of these manholes.

(2) The size and design of the factory must be suitable for the type of the operations that are necessary for food manufacturing purposes and the number of the workers engaged in the work. The severity of lighting and humidity always be maintained.

(3) Appropriate control technologies and means be used in the places where raw materials are grinded and mix to restrict the emitting of gas and solid pollutants to the industrial and external environment.

(4) To isolate the industrial operations that result in gas or solid harmful pollutants away from other foodstuff manufacturing operations.

(5) Production date and validity period of the product must be printed on prominent place on the cover of the can so that it must be clear and legible.

(6) The machines, vessels and tools used in production and manufacturing operations as well as keeping, transporting and packaging foodstuffs must be made of antirust source such as stainless steel to protect the foodstuffs of the pollutants. Further, it should be continuously cleaned and not exposed to microbes and flies.

(7) Replacement of manual packaging operations, if any, with other mechanical operations.

(8) The space below the doors of entry and exist must be tightly closed. Further, these doors must be provided with double hinges to keep continuously closed. Furthermore, all spaces surrounding A/C systems, ventilation openings and exhaust fans in different sections must be covered with narrow meshes to prevent the entry of insects, dust and strange objects to production halls and in order to maintain the safety of the foodstuffs.

(9) Installation of plastic curtains at the main entrance of the factory and at the doors of the production units to prevent the entry of insects and

flies when these doors are opened during working hours. Further, the doors must be kept closed during manufacturing operations. Furthermore, the windows must be provided with stainless narrow meshes.

(10) All sections of the factory and the places where raw materials are unloaded and packed must be provided with traps for flying insects and rodents. Furthermore, it must be periodically maintained and continuously cleaned.

(11) Asbestos sheets may not be used in covering the ceilings of the factory or making partitions are asbestos fibers are dangerous to the health of the workers and the manufactured foodstuffs.

(12) All production units of the factory must be provided with sufficient number of plastic containers that can be easily cleaned and tightly closed to collect solid waste resulting from different production operations and to soundly dispose the same. Further, it should not be left inside manufacturing sheds to avoid awful smells and microbes.

(13) The severity of lighting inside the places of work must be appropriate for the type of the preparatory and productive operations. Periodical maintenance of the lighting systems should be carried and damaged lamps must be replaced to increase the level of lighting at different places of production.

(14) Appropriate engineering methods and means must be used to restrict the noise resulting from operating the machines that are used. Further, periodical regular maintenance of these machines must be made to guarantee that the level of noise should not exceed the allowed limit (85 dBA) for 8 hours of daily work, taking into account that periodical maintenance must be made for the machines and old machines must be replaced by new ones.

(15) Gas connections to cooking ranges, furnaces and ovens must be checked and exposed electric connections must be covered. Further, all electric connections in the A/C ducts must be isolated to prevent fire, explosives and occupational injuries.

(16) Fresh water filters that are used in manufacturing operations must be continuously cleaned and replaced whenever necessary.

(17) To supply the rooms where industrial detergence are made, including acids and necessary alkaline substances that are used for washing the pipeline and production line equipment with general ventilation system to improve work atmosphere.

(18) Sound healthy means must be applied to disposal of liquid waste which must be treated before disposal.

(19) Factory sections must be provided with sound drainage networks to dispose the water used in cleaning production line machinery and floor of the factory. Further, it should be periodically cleaned, maintained, its covers should be replaced and tightly closed to prevent the spread of smells and insects in the production halls and to avoid any damage that could befall the same.

(20) Adjustment of the electrical connection and the wires should be put in pipes. Further, electricity box should have tightly closed cover.

(21) All sections of the factory must be supplied with all necessary guiding boards indicating the hazardous places (conveying belts, cylinder stores).

(22) Foodstuff stores stipulations must be maintained.

(23) Due care must be given to cleaning water tanks, water filters along with replacement of the water filter that are continuously used in the production operations.

(24) The door of the chilling room must be made of antirust material and it should be supplied with internal handle to enable opening the same from inside. Further, it should be provided with warning bells that can be operated from within the room in case of emergency.

(25) The temperature of the storing room should be suitable for the foodstuffs that are to be preserved.

(26) Refrigeration or frozen rooms must be supplied with instruments to measure temperature and humidity.

(27) All workers of the factory must dress in the prescribed uniform. Further, there must be a distinction between food and cleaning workers. Furthermore, unified uniform should be allocated for the workers who are engaged in cleaning the floors and they should be advised not to interfere in the production operations. Moreover, another uniform should be allocated for production workers to easily identify them (they are to be supplied with overalls having color contrary to that of the cleaning workers).

(28) The workers must be obliged to care for their personal cleanness before starting work and after completion thereof. They must wash and dry their hands before getting access to the places where food is prepared. Further, they must cut their hairs and their nails to prevent the spread

of microbes. Further, they should be advised that they must not touch the product with hand.

(29) Dressing room should be allocated for the workers to change their clothes therein. Room must be supplied with cupboards to enable the workers to keep their personal belonging therein. The worker must be advised that they must not keep their clothes in the places of work.

(30) A restroom must be allocated for the workers where they can have rest and food.

(31) Toilets having healthy specifications (supplied with siphons, exhaust fans) must be provided. These toilets must be continuously kept cleaned and necessary detergents and disinfectants must be used. Further, it should be supplied with necessary towels and soap, provided that toilets must not be opened to the places of work and drainage network must be covered, clean and permanently suitable for work.

(32) The factory must be supplied with first aid kits that should contain medicine, disinfectants and bandages.

(33) All workers must be supplied with personal protection devices, such as:

a) Helmets and white overalls, boots, disposable gloves for the workers who handle the food product.
b) Aprons and leather boots.
c) Masks that can provide protection from dust to the workers who are engaged in unloading and mixing foodstuffs such as grains and flour.
d) Earplugs for all production workers.

And they must be obliged to dress in the same throughout the period of work.

(34) Medical examinations and tests must be conducted for all workers of the factory. Further, chest examination must be made to make sure that they are free of infectious diseases. Furthermore health certificate must be renewed and health card must be affix on the chest of the workers throughout their period of work.

8-2 Flour Mills Activity

(1) General environmental stipulations of the food sector must be observed.

(2) Spot ventilation systems must be provided for manufacturing machinery and it must be periodically maintained to guarantee its efficiency in withdrawing flour dust.

(3) Periodical maintenance of all machines to restrict noise resulting from the same.

(4) Factory floors must not be manually cleaned, rather must be cleaned by using vacuum cleaners to clean the floors of the packaging section and in order to prevent the spread of flour dust in the work atmosphere.

(5) Workers must be obliged to put on earplugs upon access to generators room, provided that the period of exposure should not exceed the allowed limits.

(6) The preventive measures and particular stipulations relating to the use of insecticides must be applied. Further, strict system must be applied upon spraying the stored grains. Furthermore, filters must be used before the spread of these insecticides to the ambient atmosphere.

(7) The workers must be supplied personal protection devices, such as:

a) Ear Muffs for the grinding mill workers.
b) Helmets for all workers of the mill, particularly the workers who are engaged in packaging one Kg. capacity sack.
c) Special masks for the workers of the mill to protect them from the dust resulting from grinding operations.

(8) Periodical medical examinations and audiometry test must be made for the workers who are exposed to fine dust in order to find out any skin or lung diseases.

8-3 Confectionary, Biscuits and Bakery Industries Activity

(1) General environmental stipulations of the food sector must be observed.

(2) Sugar must be grinded in closed machines associated with a system for withdrawing the resultant fine sugar dust.

(3) Appropriate means that restrict the exposure of workers to temperature must be provided (A/C units or central A/C). These systems must be continuously operated and periodically maintained to remain efficient and so that temperature should not exceed 25^{o}C.

(4) Spot ventilation systems must be provided for ovens and it must be periodically maintained to raise its efficiency in the withdrawal and disposal of the gases that pollute the atmosphere. Further, the associated filters must be cleaned or periodically replaced.

(5) Tightly close and isolate the conveying belts of the confectionary and biscuits. Further, it should be cleaned upon the completion of every shift.

(6) The electric oven must be isolated in an appropriate place provided with a chimney to avoid any damage or fire.

(7) The vessels used in manufacturing (paste, mixing and fermentation vessels) must be cleaned daily before starting production and after completion of the same. Further, the damaged vessels must be periodically replaced.

(8) The water used in preparing confectionary or bread must be continuously clean.

(9) Vacuum cleaners must be used in cleaning the places where unloading operations, grinding and packaging operations take place in order to prevent the spread of flour dust in the ambient atmosphere.

(10) Production lines, floors and walls must be permanently kept clean through washing it with detergents and appropriate disinfectants that are suitable for foodstuff in order to prevent product pollution.

(11) Organic raw materials, such as fats and oils that required low temperature must be kept in fridges.

(12) No hindrances must remain in the passages or in the places where raw materials are handle.

(13) Insect and rodent traps must be installed and appropriately distributed to cover different sections of the factory, particularly in the silos room.

(14) The stipulations of storing compressed gas cylinders must be observed to avoid any damage or explosion.

(15) Oven workers must be replaced within the same shift in order to prevent their exposure to thermal fatigue, (particularly during summer).

(16) Periodical medical examinations and tests must be conducted for all workers.

8-4 Chips, Snacks, Popcorn and Cotton Candy Activity

(1) General environmental stipulations of the food sector must be maintained.

(2) Installation of spot ventilation systems supplied with filter and exhaust fan above the cookers and chips ovens to dispose the resultant vapors, provided that it should be supplied with 2-3 meters high chimney, above the roof of the building and the neighboring buildings. Furthermore, exhaust fans must be installed to purify the production hall.

(3) Periodical maintenance of the spot ventilation systems, which are installed in the places where gas pollutants are emitting to restrict the vapors of frying oils in the ambient atmosphere.

(4) Production halls must be provided with A/C units to control the temperature, especially in the frying room and to maintain appropriate temperature that suite the nature of business and the workers.

(5) Production machinery and the vessels that are used as frying pans must be made of stainless steel. The vessels that are made of any material liable to rust must not be used.

(6) Periodical replacement of the frying work on short intervals. The oil must not be filtered to be used once again in order to avoid the concentration of frying waste and its harmful impact on the product. Frying oil should be properly disposed away from the drainage network.

(7) Production machinery and lines as well as manufacturing equipment, such as popcorn, chips and cotton candy manufacturing equipment should be kept clean on periodical basis and the unsuitable vessels must be replaced by new ones.

(8) Sound methods must be observed to dispose the waste of washing potatoes and frying oils. These materials must not be disposed in the drainage network.

(9) The floors of the production hall must be continuously kept clean and the water that is used in washing must be timely disposed to prevent the spread of fungi and bacteria.

(10) Raw materials of expired validity must be disposed and it must not be used in the industry or stored.

(11) Air-condition store must be allocated for raw materials and products. No items should be stored at the entrance of the factory or in the corridor.

(12) Foodstuff storing conditions must be observed.

(13) Periodical medical examinations and test must be conducted for all workers of the factory.

8-5 Canned Food (Canning Tomato and Legumes) and Foodstuff Packaging Activity

(1) General public environmental stipulations of food sector must be maintained.

(2) Fixing local ventilation systems (provided with filters) on the welding machines to draw vapors and gases rising from welding process as well as making regular maintenance to them.

(3) Fixing spot ventilation system (provided with filters) on preservative stabilizing oven to paint the cans and making regular maintenance on it to guarantee its quality in drawing vapors and smokes and preventing them from spreading in the working atmosphere.

(4) It is necessary to connect the spot ventilation systems fixed on the different production lines, such as boilers and welding processes, to chimneys that must not be lower than the building root (3-5 m.). Vapors are draws through it to the external air.

(5) Isolating the places where preparation and cooking processes are done, from other industrial processes in the production hall via screen.

(6) Isolating grading and washing phases in different production units buildings from packaging and sterilization phases to prevent food substances pollution. Packaging processes (such as tomato sance packaging unit) must be isolated a way from the general passage leading to production divisions by setting black glass screens as usual, to protect the safety of food product.

(7) Packaging food must be carried under high temperature (sterilization to prevent canned food bacterial pollution).

(8) Replacing the method of sterilizing foods and canned foods with ionized radiation when using steam sterilizer or boiling water sterilization. Acidic foods (such as tomatoes and fruits) are subjected to 100^{o}C degree of temperature for 30 minutes, while non-acidic foods (such as dry legumes and vegetables except for tomatoes) are subjected to 120^{o}C degree of temperature for 30 minutes.

(9) After sterilizing foods they are temporarily kept frozen in refrigeration where temperature is between (0^{o}C-8^{o}C) degrees centigrade.

(10) It is necessary to write date of production date and expiry on the products.

(11) Avoid using diesel fuel in operating boilers and using electricity instead, to avoid the rising of pollutants to industrial and outer environment.

(12) Avoid discharging oil from boilers or grease from workshop unless after separating them by adding oil separator.

(13) The production hall must have ground sinks (with semi circular section to make cleaning easier and to prevent blocking in discharging drainage water). These sinks are sieves to hinder wastes, and grounds must be sloping to the drainage place and not sliding to make cleaning it easier.

(14) It is prohibited to discharge washing water unless after balancing its hydrogen factor.

(15) It is necessary to separate the warehouse of the materials used to spraying cans (locker) from the rest of the factory and produced materials.

(16) Providing workers in the food canning department with ear plugs and conducting ear scanning test for them to discover any early disability in hearing.

(17) Providing special masks to the workers of painting department to protect them from harmful effects of chemical materials.

(18) Periodical medical tests and analyses for all the factory workers.

8-5 Soda Water, Soft Drinks and Juice Activity

(1) General environmental requirements of food sector must be maintained.

(2) Providing suitable ventilation i.e. Air-conditioning units, to improve general ventilation in the working atmosphere.

(3) Providing general and spot ventilation systems in the unit of bottles washing and regular continuing maintenance, to increase its efficiency in drawing industrial cleaner vapors (such as caustic soda).

(4) Commitment to use closed automatic system and spot ventilation systems on the following production site lines:

a) Ink printing on cans.
b) Spraying the can from inside with isolating materials.
c) Washing cans with chemicals.

Taking into account to make regular maintenance to it.

(5) Using chimneys that must not be lower to the building roof, from (3-5) meters. These chimneys are:

a) Drying ovens provided that vapors should pass through high quality filters before discharging them into the outer air.
b) Boilers chimneys.

(6) Mixing and packaging process must be done automatically, and workmen's hands must not touch the foods to avoid subjecting such foods to pollution.

(7) Performing regular maintenance to all mechanical parts and the places of connection between carbon dioxide gas tankers and its generating source in the gas preparation unit, as well as providing masks for workers to use them, when it is necessary.

(8) Providing regular maintenance for all machines in different manufacturing departments to limit high noise.

(9) Appropriate engineering methods must be used to overcome the noise resulting from the fraction of the bottles and from stacking the filled up bottles inside the boxes at the end of the production life.

(10) Necessary precautionary measures must be taken to prevent the leakage of the harmful ammonia gas. Maintenance engineer and technicians must be strictly instructed to test the places where this gas may leakage.

(11) Closed pipes having safe valves must be used to maintain chlorine that is injected in the water, which is used in washing the cans. Further, the percentage of the chlorine must be according to the internally accepted percentage.

(12) The leakage of steam from steam joints to pasteurization system must be avoided.

(13) The pipes existing in the preparation room and that used in feeding sugar melting tank with fresh water must be made of stainless steel to prevent the pollution of water.

(14) Syrup preparation room must be supplied with a table made of stainless steel to put the raw materials thereon.

(15) All vessels that are used in the industrial operations must be made of stainless steel.

(16) Juice and sugar and non-sugar liquid vessels must be covered during working hours and after completion of work to prevent it from being pollutant with microbes, dust and harmful to health materials.

(17) The tanks that are used in preserving concentrated syrup must be supplied with appropriate filters to filtrate the syrup, provided that it should conform to filters specifications and it should be periodically maintained on daily basis before starting production. Furthermore, the filters must be continuously maintained.

(18) Continuous examination of the water that is used in manufacturing operations to make sure that is suitable for use. Further, water filters that are used in preparing the syrup must be continuously maintained.

(19) Walls and floors all over different sections of the factory must be cleaned and manholes must be tightly closed.

(20) Plastic rolls that are used in manufacturing cups should be carefully cleaned and no roll may be opened unless upon use.

(21) Packaging bottles must be cleaned by washing it with boiled water and good sterilization.

(22) Uncirculated water that is used in washing bottles must be separated from the drainage network and it must be collected in special containers to properly dispose. It must be free from any oils or grease through treatment of the same and equalizing the PH factor of the same.

(23) The prescribed periodical maintenance of the water treatment unit must be made on time to maintain its productive efficiency.

(24) Permanent stickers must be placed on the raw materials keeping vessels indicating name and type of the material that is used, name and type of the preserved material, production and expiry dates.

(25) Production and expiry dates must be affixed.

(26) The cartoons containing the products must be properly packed and stored in special rooms.

(27) Highly efficient laboratory must be provided to continuously examine juice samples throughout the stages of mixing and packaging to make sure that it conforms to the required specifications.

(28) Health stipulations regarding sugar inventory, must be observed. Further, sugar packed sacks must be stored on wooden bases above the ground and away from walls. Furthermore, preventive precautions must be taken against rodents and insects. Moreover, the doors and windows must be tightly closed.

(29) The orange juice that is preserved by frozen must be pasteurized before being frozen, provided that frozen should be made at (–30^{o}C).

(30) Other raw materials and products (canned and pasteurized juice) must be stored in tightly closed refrigeration rooms having appropriate temperature to preserve these materials.

(31) Chemicals that are used in manufacturing, such as (citric acid, sodium benzoate, chlorine, caustic soda, ...etc) must be properly stored away from the place that is allocated for storage of foodstuffs, such as sugar and concentrated juice, provided that the temperature should not exceed 25^{o}C.

(32) The workers who are engaged in examining the bottles by light torches or electric lamps must be replaced on appropriate intervals to release eye tension due to being exposed to highlighting for long periods.

(33) The workers who are engaged in packaging soft drink cans must be obliged to use earplugs for protection from high noise resulting from packaging machines throughout the period of work.

(34) Packaging workers must be replaced on short intervals during the same shift proportionate with the noise they are exposed to.

(35) The hands of the workers must be cleaned and sterilized before starting packaging operation.

(36) Dust masks must be provided for the workers engaged in unloading sugar sacks.

(37) Periodical medical examinations and tests must be conducted for all workers of the factory.

8-7 Mineral Water Packaging Activity

(1) General environmental stipulations of the food sector must be observed.

(2) Providing necessary general ventilation to improve and cool work atmosphere.

(3) Installation of spot ventilation systems at plastic bottles manufacturing room to prevent the increase of ozone and to reduce the concentration of gas to the allowed limits.

(4) Periodical maintenance of the spot ventilation systems and replacement of the associated filters on continuous basis.

(5) The pipes and accessories dedicated for gathering as well as tanks and tools used in the production (especially washing and packaging accessories) must be made from materials suitable for water and that can prevent leakage of strange materials.

(6) Production must be made in accordance with the health stipulations provided for under the relevant standard specifications.

(7) Plastic covers must be sterilized before being placed on the bottles.

(8) Laboratory supplied with the latest equipment and systems that are necessary for daily bacteriological and chemical analysis of every sample of the produced water before and after packaging must be established. Initial tests of the water treatment unit must be made, provided that highly efficient technicians must be engaged in this laboratory.

(9) Upon packaging water in plastic bottles a certificate from an approved laboratory must be submitted indicating that these containers have been tested under different temperatures (up to $70^{o}C$) and that the bottled

water does not extract the poisonous materials, such as the components of the heavy substances, from the walls of these containers.

(10) All operations of the factory must be suspended till the removal of pollution if water is polluted during production.
(11) Periodical medical examinations and test must be conducted for all workers of the factory.

8-8 Ice Creams and Dairy Products Industry Activity

(1) General environmental stipulations of the food sector must be observed.

(2) Installation of highly efficient spot ventilation system at cooling compressor section of the ice cream production factory to prevent the spread of ammonia vapors in the work atmosphere.

(3) A separating must be left between production hall and the entrance. Further, internal partitions must be made in the production hall.

(4) Manual machinery used in manufacturing ice cream must be replaced by other automatic machinery to prevent pollution.

(5) Covering the un-produced ice cream conveying belts with transparent plastic cover to protect ice cream from pollution till reaching packaging machine.

(6) Family size ice cream packs should be covered with plastic cover before packaging prevents it from being pollutant with dust.

(7) Mixing room should be supplied with tightly closed stainless steel containers instead of the plastic ones that are used in keeping raw materials that are necessary for preparation. Further, labels should be affixed in the containers indicating name and type of the material used.

(8) Periodical and continuous maintenance of the ammonia tank valves to control the same and prevent any leakage of the ammonia that may affect the health of the workers and the safety of the food product.

(9) Thermostat and temperature gauge must be installed inside the mixer instead of the manual thermometer.

(10) Warning system must be installed in the refrigeration room and it must be supplied with an external thermometer to indicate a temperature.

(11) Mixers and cream mixer must be kept clean after mixing. Further, the moulds that are used in the production operation must be kept clean in addition to continuous sterilization of the clothes that are used in straining water from the foodstuff.

(12) Water filters should be cleaned and the filters that have fiber core should be replaced with filters having pottery core.

(13) All production and preparation lines must be subject to washing and sterilizing before and after manufacturing using detergence and appropriately concentrated disinfectants. Further, these lines must always kept on good condition through fixing a system for cleaning and sterilizing all tools and services that are continuously used in manufacturing.

(14) Prescribed periodical maintenance of osmosis water treatment unit on time to maintain its productive efficiency.

(15) Foodstuff storage stipulations must be observed. Further, plastic containers having tightly closed covers must be provided to keep sugar and milk powder. These containers must be placed on 30 cm. high foundations.

(16) Preventing the combat of flying insects using insecticides and replacing this method by traps and air curtains that combat flying insects.

(17) Chiller workers must be advised of dressing the garments that can protect them from cold before entry to the chilling room in order to avoid Hypothermia.

(18) Compressors section workers must be provided with anti-gas masks.

(19) Periodical medical examinations and tests must be conducted for all workers of the factory.

8-9 Ice Industry Activity

(1) General environmental stipulations of the food sector must be observed.

(2) Providing spot ventilation system above the place where gas is filled up in order to withdraw the gas in case Freon gas concentrations increased beyond the allowed limits during filling up operations.

(3) Pipes and valves through which ammonia passes must be permanently checked to make sure of its safety and validity.

(4) Periodical maintenance of the ice moulds must be continuously made. Further, suitable metal should be selected for these moulds to prevent rust and to be easily cleaned. It is provided however, that it must be tightly closed using clean covers that do not give access to dust and strain materials that may pollute ice moulds.

(5) Wooden sheets and bases that are used in ice moulds manufacturing room must be maintained and the damaged items must be continuously replaced.

(6) Periodical maintenance of the filters that are used in purifying fresh water that is used in manufacturing ice. Further, it must be continuously cleaned and the central filters must be replaced and periodically cleaned. Furthermore, refrigeration basin water must be replaced twice per week.

(7) Providing sufficient lighting inside ice stores and maintenance of lamps as well as continuous replacement of the damaged lamps.

(8) Application of appropriate engineering methods to restrict the noise resulting from operating the machinery and equipment. Further, appropriate time schedule must be arranged for maintenance operations, taking into account replacement of the equipment and machinery which its age expired with new ones.

(9) Manual ice grinding machine must be isolated (and fixed in a particular place along with installing sound proof) and rubber pillows must be placed under the machine to limit the noise.

(10) The walls of the store must be lined with white Porcelain to facilitate cleaning and to prevent the pollution of ice in keep its cleaning during production and packaging operation.

(11) Doors of the storage room as well as the doors of refrigeration rooms and ice store (wherein produced ice moulds are kept) must be automatically operated and provided with handles from inside to facilitate manual opening of the door from inside the room.

(12) Ice storage rooms must be provided with warning system (electric bell) that can be used upon any emergency, provided that must be connected with factory supervisor room and all electric connections must be well insulated.

(13) Technical supervision on the factory must be entrusted to a specialized technician to make sure of implementing all necessary technical and health stipulations that are necessary for the production of ice moulds in good condition and suitable for human consumption as well as being on conformity with the technical and health stipulations. Further, this technician will supervise and ensures the implementation of all instructions giving to the workers in this respect.

(14) Chiller and refrigeration rooms workers must be obliged of dressing personal protection garments that can protect them from Hypothermia resulting from severe cold:

a) Leather aprons and overalls.
b) Leather gloves.
c) Leather boots.
d) Wool jackets and leather garments.

(15) Periodical medical examinations and tests must be conducted for all workers of the factory.

8-10 Perfumery Oils, Rose Water and Orange – Flower Water Production Activity

(1) General environmental stipulations of the food sector must be observed.

(2) Providing necessary general ventilation to improve work environment.

(3) Installation of spot ventilation systems at production sections to withdraw the vapors of the solvents during manufacturing operations and conducting periodical maintenance of the same and for general ventilation system existing in the hall to maintain it continuously efficient.

(4) Checking the safety of the hoses that are used in the withdrawal of the ethyl alcohol from the drums to make sure that there are not any holes or openings wherefrom ethyl alcohol can leakage.

(5) Making sure that the containers containing ethyl alcohol are tightly closed.

(6) Obliging workers to take necessary precautions upon dealing with ethyl alcohol. Further, protective systems must be used upon transporting or withdrawn ethyl alcohol.

(7) Periodical medical examinations and tests must be conducted for all workers of the factory.

8-11 Honey Manufacturing and Packaging Activity

(1) General environmental stipulations of the food sector must be observed.
(2) Providing necessary general ventilation to improve work atmosphere.
(3) Plastic containers must conform to the standard specifications.
(4) Standard specifications relating to foodstuff labels, particularly production and validity date must be applied.
(5) Containers must be washed and dried using hot air (no paper tissue, ...etc. should be used).
(6) A place should be allocated for washing the containers and hot water must be continuously provided.

(7) The conditions of storing foodstuff containers must be observed and these containers must be kept in closed place to preserve its cleanness and suitability for use.

8-12 Coffee Beans and Mixed Nuts Grinding and Roasting and Spices Packaging Activity

(1) Providing necessary general ventilation to improve work atmosphere.

(2) Installation of spot ventilation systems to improve work atmosphere (such as A/C units), provided that the temperature of the production hall should not exceed 25^{o}C.

(3) Using spot ventilation system above roasting ovens and to associate filters with these ovens to purify air, provided that these systems must be connected with 3 meters high chimneys above building roofs. Regular periodical maintenance of these systems must be made to ensure withdrawal of the vapors that may result during roasting the mixed nuts.

(4) Providing special tables for drying salted mixed nuts. These nuts must not be placed on the floor of the production hall.

(5) Allocating place for cooling the roasted coffee beans, and in case that cooling vessels are available, the covers of these vessels must be tightly closed.

(6) Wooden boxes used for keeping grinded spices must be lined with galvanized iron.

(7) A place must be allocated for storage of raw materials away from the production hall where grinding and roasting operation is carried out.

(8) Production and expiry dates must be written on all products.

(9) Production hall must be kept clean and waste (such as damages sacks) must be continuously removed from its floor.

(10) Periodical medical examinations and tests must be conducted for all workers of the factory.

8-13 Cutting, Manufacturing, Packaging and Freezing Meat Activity

(1) General environmental stipulations of food sector must be maintained.

(2) The walls of the production halls must be covered with porcelain and the floor must be liquid proof. Further, all production sections of the factory must be ceiled to guarantee that meat will not be exposed to

dust and ambient atmosphere during being transported from the places of cutting to the places of drying.

(3) Installation of spot ventilation systems to improve work atmosphere (such as A/C units), provided that the temperature of the production hall should not exceed 25°C.

(4) Installation of spot ventilation systems on the electric ovens existing at the hall, provided that these systems must be connected with 3 meters high chimney above the roof of the building. Further, the periodical maintenance must be made to guarantee withdrawal of the gases and vapors resulting from the oven.

(5) Maintenance of the industrial air-conditioning and ventilation systems and making sure of its efficiency (particularly vapor withdrawal systems at meat cooking room) to remove gas pollutants, such as (NH_3-CO_2-CO-H_2S) resulting from the business of the meat factories.

(6) Creating isolated and separate places inside the factory as follows:

a) Separate room for melting meat (melting ice from the frozen meat).
b) Separate place for cutting and preparing meat for manufacturing.
c) Separate place for manufacturing and packaging manufactured meat.
d) Places for drying and manufacturing pastrami.

(7) Employment of ventilation system provided with coal filters to absorb odors resulting from pastrami above manufacturing tables.

(8) Meat should be chilled before being manufacture so that it is always maintain at low temperature ranges between 7°C and 0°C to prevent the growing of microbes.

(9) Meat should not be completely melted or left for a long period before being manufactured (as the manufactured meat are often frozen due to the lack of fresh meat) so that the tissues may not proteolyses and to avoid the growing of bacteria.

(10) Daily cleaning of the factory must be observed to prevent the accumulation of fat materials and to avoid slippery accidents workers. Further, the rooms and corridors of the factory as well as tools and equipment must be spread and daily cleaned using infectants.

(11) Health conditions regarding removal of waste must be observed. Therefore, all waste resulting meat manufacturing inside factory halls and the waste resulting from cleaning daily operations must be collected inside tightly closed containers and timely disposed to prevent the spread of odors and the growing of insects.

(12) Creating special room for dumping that can be tightly closed before subsequent transport and damage of its contents.

(13) Liquid waste and fat remains may not be disposed in the drainage system. Further, drains must be supplied with traps for catching fats and meat manufacturing waste. Furthermore, liquid drainage canals inside the factory must be continuously cleaned.

(14) Separate store for raw foodstuff that is used in manufacturing must be provided. Further, another store for produce products (prepared meat, minced meat, burger, murtadilla) must also be provided representing chilling rooms or refrigeration rooms (freezers) suffice for keeping the materials inside. However, the following stipulations must be observed:

a) Meat ready for manufacturing must be kept in special fridges away from other items that may cause direct or indirect damage due to odors or pollution, such as fish and goods having odor.
b) Refrigeration room must be free of odors and the frozen materials must be proportionate with the size of the refrigeration room and refrigeration system.
c) Meat should be stored inside refrigeration room in a manner that does not prevent the circulation of air and the meat must be away from the walls and floor of the room.
d) Warning bells must be installed in the meat storage fridges and it must be periodically maintained along with replacement of the damaged bells.

(15) Final burger product must be stored in chilling room of temperature ranging between $1^{o}C$ and $-1^{o}C$.

(16) Burger meat that wanted to be frozen must be stored in freezers of temperature ranging between $-20^{o}C$ and $-40^{o}C$. The most appropriate temperature for storage is $-30^{o}C$.

(17) Semi dry Murtadilla (luncheon) must be packed in appropriate packages allowing leakage of humidity, while other type (canned Murtadilla) must be packed in metal cans, which does not include lead due to the danger of this material to health.

(18) Luncheon should be stored and kept in $2^{o}C$ chilled rooms.

(19) Necessary periodical maintenance must be made for refrigeration systems existing inside refrigeration rooms as well as compressors. Further, damaged parts must be replaced to avoid the leakage of ammonia.

(20) It is essential that every factory must have a laboratory to control the quality of production. This laboratory will be responsible for measuring the following:

a) Percentage of fat in the product.
b) Percentage of Soya protein in the product.
c) Periodical control and supervision of the products based on daily samples of the production.

(21) The following data must be available on the imported meat boxes:

a) Type of meat (beef, mutton, chicken).
b) Country of origin.
c) Slaughtering and validity dates.

(22) Product labels must contain:

a) Type of meat (beef, mutton, chicken).
b) Production and validity dates.

(23) Packaging materials used with prepared meat should not contain any polymers, such as (polyvinyl chloride, polypropylene) as it is dangerous to public health.

(24) The temperature at packaging, unloading and loading area should not exceed 10^{o}C.

(25) Workers of the chilling rooms will be illustrated that they must dress in wool garments to protect them from cold. Further, they should wear leather boots before entry to the chillers to avoid hypothermia.

(26) Earplugs be provided to the workers who are working on the compressors of the chilling rooms and meat saws, to protect them from high noise resulting from operating these compressors and to use the same continuously on duty.

(27) To provide the workers who are engaged in manufacturing the foodstuff with helmets, masks, white aprons, disposable plastic gloves to protect the foodstuff from being pollutant.

(28) To advice workers to take care of their personal cleanness, such as (cutting their hair and nails).

(29) Cleaning workers must dress in uniforms having different color than that of the manufacturing workers. Further, cleaning workers must not be allowed to take part in the manufacturing operation or to touch the foodstuff.

(30) Periodical medical examinations and tests must be conducted for all workers of the factory.

8-14 Cutting and freezing fish and shrimps activity

(1) Providing necessary general ventilation to improve work environment.

(2) Precautionary measures must be taken to prevent the leakage of ammonia. In this respect periodical maintenance of the gas compressors and other compressors must be made and damaged parts must be replaced by new one.

(3) Continuous cleaning of the production hall and all chilling rooms and freezers as well as the room allocated for sorting, repackaging and wrapping frozen fish as well as all equipment that are used in all stages of packaging. Further, floors, walls and equipment must be washed with detergents to make sure that it is completely clean before starting packaging operation.

(4) Drainage channels inside shrimps and fish packaging factory must be cleaned and the resultant waste must be collected inside tightly closed containers and dumps.

(5) Rotten frozen fish must be disposed and placed in cartoons to be transported to the dumping places allocated by the Municipality.

(6) Periodical maintenance of the compressors so that noise should not exceed the allowed limits.

(7) Workers restroom must be in a place far away from production sections of the factory.

(8) Strictly advising the workers engaged in sorting and repackaging frozen fish to use leather gloves in order to not contact fish and to protect them from cold.

(9) Advising the workers that they should not enter in the compressors room unless upon necessary and to use earplugs during maintenance operations of the machinery. Further, the workers who are working near to the compressors associated to the chillers should use earplugs.

(10) Lift workers engaged in the chilling room and freezers should dress in protective garments to protect them cold before entry to the chilling room in order to avoid Hypothermia.

(11) Ice factory workers must be provided with gas protection masks and it must be periodically examined to make sure of its validity and it must be replaced if necessary.

(12) The stipulations pertaining to main holes, if any, should be observed. Therefore, drainage networks in the production hall must be controlled and a method for separating solid wastes from sewers must be developed. Further, main holes must be cleaned and maintained so that it conforms to the required technical stipulations and in order that it will not be a reason for pollution.

(13) Periodical medical examination and tests must be conducted for all workers.

Ninth: Leather Tanning and Manufacture of Animal Waste Section

9-1 Introduction

The activities that deal with the circulation of animal waste are characterized by awful smell, a matter that results in many environmental complaints that are difficult to find reasons of these complaints.

Therefore, putting and locating these industries in any industrial area must take some environmental considerations into account. These considerations are pertaining to avoiding the transfer of pollutants from one industrial establishment to another as well as the effect on the quality of the products that are circulated or stored in the establishment.

9-2 Environmental Stipulations Pertaining to Location

(1) The factories that are practicing tannery business and which depend on animal waste as raw material as well as other factories and industries that result in awful smells and harmful gases must be located in places far away from residential areas and other vital installations, such as Al Shaqaya area and there must be enough space between these factories and any other gathering, either residential or industrial. Further, the direction of wind must be taken into account upon allocating the industrial installations.

(2) Special places must be allocated for this type of business (melting fats) in order to be consistent with the other concerned activities, such as chicken enclosures, fodder industry, organic fertilizers industry which are result in similar gas pollutants.

(3) The location must be protected by a set of windshields inside and outside the factory. In this respect ever green trees can be planted around the factory with the widths of 5 meters, if possible to reduce the severity of awful smells and its impact on the neighboring areas if the wind blows, provided that the trees must be high and standing high temperature.

(4) The owners of these factories must construct concrete or brick fence having appropriate height along these factories to assist in preventing the separate of awful smells to the external environment.

9-3 General Environmental Stipulation for the Industrial Sector

(1) The floors must be liquid proof to prevent accidents caused by slippery and resistant to disinfectants (such as cement tiles). Further, it must be slope to prevent the accumulation of water and to facilitate drainage.

(2) The internal walls must be liquid proof, resistant to cracks. Further, the walls of the rooms must be covered with porcelain or similar material of not less than 3 meters high in order to prevent the material from being stuck to the wall and rotten and to prevent the awful smells as well as to facilitate cleaning the walls.

(3) Ceilings must be made of a material resistant to rust and cracks. Further, it must be convex at the place of contacting walls. Further, ceilings must be provided with insolent material to keep cool inside.

(4) Appropriate control means and technologies must be installed to restrict the spread of gas pollutants and awful smells to the industrial and external environments, provided that a comprehensive and detailed study must be made on the quantity of pollutants and raw materials of the animal waste which are daily used before installation of the control systems.

(5) Pollutant gases control system must be supplied with highly efficient filters to filtrate these pollutants, provided that the control system must be connected to 5 meters chimney above the roof of the neighboring building.

(6) Installation of sufficient means for cooling the atmosphere, such as air-condition units in order to purify the air so that the temperature inside the rooms should not exceed 20^{o}C.

(7) Rooms must be provided with the necessary industrial lighting. Further, the windows may not be opened as it is designed for natural lighting only.

(8) All tools and equipment in use must have smooth surface and it must be anti-corrosion.

(9) The existence of basins lined with ceramic or stainless steel must be in the preparation rooms. These basins must have sufficient size, having circular edges to facilitate cleaning and prevent the sedimentation of waste. Moreover, there must be water supply and it must have underground drains having circular angles or semi-circular drains in order to avoid the accumulation of sedimentation resulting from treatment. These drains must be covered with iron mesh.

(10) Drainage lines in the preparation halls must have semi-circular angles to avoid the accumulation of waste and to facilitate cleaning.

(11) There must be stores provided with appropriate ventilation and refrigeration systems to store animal fats. Further, these flammable fats must not be stored in the open yards.

(12) General cleaning of the factory must be observed. The places of work (floors, walls and manufacturing halls) must be continuously cleaned and continuously washed by water and appropriate industrial disinfectants. Further, liquid wastes must be safely and soundly disposed.

(13) Solid waste resulting from the production must be collected in closed containers and must be properly disposed on daily basis to reduce the emergence of awful smells. Further, these industrial wastes must not be accumulated inside or outside the factory so that it might not be a source for these smells.

(14) Appropriate means must be used to prevent the entry of dust, insects and rodents inside the building. Therefore, the windows and doors must be covered with strong mesh. Furthermore, the doors of the production halls and the entry and exit of rooms must be provided with two consecutive doors provided with rotating hinges to facilitate the closure of these doors.

(15) Sufficient number of rodent and flying insect traps must be installed in different production halls.

(16) Continuous periodical maintenance of the operation lines machinery and replacement of the inefficient machinery with modern ones to assist in preventing the pollutants that affect external and industrial environment.

(17) The level of noise resulting from production machinery must be controlled so that it does not exceed (85 dBA) for 8 hours of daily exposure, i.e. the daily shift.

(18) The efficiency of the pollutants control systems must be periodically inspected in order to find out any default in the efficiency of these systems to repair the same as soon as possible.

(19) Due care must be given to personal cleanness of the workers after completing their works. In this respect sufficient number of toilets, according to the number and sex of the workers, must be provided. The toilets must be open to production halls and it must be provided with water, soap and showers.

(20) A special room must be provided for workers to change their clothes and due care must be given to washing work uniforms to keep it always clean.

(21) All workers of the factory must be strictly advised of the necessity of personal cleanness and the change of their clothes before leaving the factory after daily hours.

(22) A restroom must be provided for workers to have food and drinks in. Further, they must be advised of washing their hands before eating and they must not have any food or drinks inside the places of manufacturing.

(23) All workers of the factory must be provided with personal protection devices and they must be advised of using the same throughout their period of work:

a) Masks that provide protection from gases and vapor. These masks must be provided with filters containing active coal for protection from harmful to health smells and gases.
b) Rubber boots and leather gloves and aprons for all cooking workers and all workers engaged in extraction of animal fats.
c) Earplugs for all workers of the factory.

(24) Periodical medical examinations and tests must be made for all workers of the factory on periodical basis to make sure of their safety. Further, first aid must be provided in the factory and the workers must be trained on using the same upon necessity.

9-4 Leather Industry (Shoes and bags) Activity

(1) Installation of means for refreshing the atmosphere, such as exhaust fans all over the production hall and spot ventilation systems near the machinery that manufacture soles, smoothing and sewing machines to restrict the spread of pollutants resulting from these operations.

(2) Periodical maintenance of the exhaust fans and spot ventilation systems that are associated to manufacturing machinery must be periodically made to maintain its efficiency of withdrawing gas pollutants resulting from the industrial operations.

(3) The filters associated to ventilation system that is used inside spray and polish cabinets, which use organic solvents, must be continuously maintained and replaced.

(4) Vacuum cleaners must be used to suck the dust resulting from different operations.

(5) The workers must be provided with personal protection systems, namely:
a) Gas masks.
b) Overalls and boots.
c) Earplugs for protection from noise.
d) Masks for organic solvents for the workers engaged in spray and polish operations.

(6) Periodical medical examinations and tests must be made for all workers of the factory.

9-4 Leather Tanning Activity

(1) The environmental stipulation relating to location must be observed.

(2) The general environmental stipulations of the industrial activities must be observed.

(3) The installation must be far away from the residential areas, i.e. at an industrial area to restrict its negative impact on the neighboring populated area (the distance between the factory and populated areas must be more than 2 KM).

(4) Construction and building specifications must be approved.

(5) Engineering designs, taking into account the nature of business and the safety of the transport of persons and materials must be approved.

(6) The building of the management must not be constructed above manufacturing lines directly in order to restrict exposure to health risks resulting from gas and solid pollutants.

(7) Means for refreshing atmosphere must be installed in the production hall such as exhaust fans and ceiling fans. The number of these fans must be engaged in the manual sorting room of the wool to improve ventilation therein. Moreover special filters must be installed to purify air and absorb odors from the hall.

(8) Production lines must be provided with spot ventilation systems and modern chemical methods must be used for treatment of fat waste and other solid waste.

(9) Natural dry of wool (at open air) must be replaced by using special equipment for drying and an appropriate place must be allocated to dry the wool. This place must be provided with appropriate control systems to withdraw and purify air.

(10) Manufacturing lines must be replaced with other new lines in case that the machinery used are old due to the fact that gas pollutants resulting from practicing this business, i.e. NH_3 and H_2S gases has corrosion characteristics that effect equipment and air-conditioning systems.

(11) Dangerous chemicals must be replaced with other less dangerous substances, if possible.

(12) Necessary precautions must be taken to reduce the level of physical pollutants, i.e. noise and vibration.

(13) Appropriate methods regarding lighting, ventilation heating, humidity and chemical pollutants control methods must be employed to control chemical pollutants within the maximum allowed limits, whether the pollutants are gases, vapors, smoke or dust.

(14) Good water resources must be provided with great and sufficient quantities being an essential factor in this industry.

(15) All wastes must be treated and disposed. In this respect a plant for treatment of used water may be constructed to restrict the damage that may endanger agricultural, fish and animal wealth due to the pollution of fresh water as a result of the used water coming from tanning factories.

(16) Strainers must be made to withhold solid wastes.

(17) pH of the water resulting from the industrial operations must be treated to become 7 before disposal of this water.

(18) The efficiency of the water that is treated in the water treatment units must be checked before disposal.

(19) Liquid flow levels during leather tanning operations must be as indicated in the following table:

Parameter	Maximum Value
pH	6-9
BOD	50 mgll
COD	250 mgll
Total Suspended Solids	50 mgll
Oil and Grease	10 mgll
Sulfide	1.0 mgll
Chromium (hexavalent)	0.1 mgll
Chromium (total)	0.5 mgll
Nitrogen (NH_4-N)	10 mgll
Phosphorus (total)	2 mgll
Coliform	400 Most Probable Number / 100 ml

(20) General cleaning inside the section of the tanning factory must be continuously observed during operation period and manufacturing wastes must be timely disposed after completing the work and it should not be left for more than 24 hours to prevent the spread of microbes and awful smells.

(21) Appropriate measures must be taken to maintain the cleanness of the installation, particularly floors. Further, waste and used water must not be accumulated. Moreover, the external yard of the factory must be kept clean so that it might not be a source for awful smell that may affect the neighboring area.

(22) Appropriate stores for chemicals and leather must be provided.

(23) Health and service facilities, ...etc. must be provided.

(24) A room must be allocated for first aid in the factory.

(25) Occupational safety and health requirements must be provided to maintain the workers and their productive ability, including fire fighting methods in accordance with the nature of business and the available resources.

(26) Necessary precautions must be taken to protect the workers from the hazards of the machinery and barriers must be installed at the places of risks.

(27) The workers must be aware of the occupational risks and they must be trained to follow sound and safety methods and how to use and maintain personal protection devices.

(28) Workers must be vaccinated with appropriate vaccines to protect them from infectious diseases that may be transferred from animals to them.

(29) The workers must be advised that they must not dispose tanning waste and leather remains as well as chemicals outside the factory.

(30) Personal protection devices must be provided with sufficient number, namely:

a) Rubber gloves and leather boots for the workers who carry leather. They must be advised that they must not touch their faces unless they have washed their hands.
b) Washable leather gloves and masks and overalls made of waterproof material for the workers who are engaged in mixing chemicals, such as calcium.

(31) Periodical medical examination and tests must be made for all workers of the factory.

9-6 Production of Fodder Protein and Animal Fats Activity

(1) The environmental stipulation relating to location must be observed.

(2) The general environmental stipulations of the industrial activities must be observed.

(3) The walls of the factory must be lined with ceramic or similar material of not less than 3 meters high to prevent the materials from being stuck with the walls and consequently rotten resulting in awful smells and to facilitate cleaning of walls.

(4) The raw materials from the waste of slaughtering houses must be manufactured in daily basis. Quantities of this material (animal waste and remains) may not be received or stored grater than the daily productive capacity of the manufacturing stages inside the factory to prevent it from being rotten or having awful smell.

(5) The place where raw materials are received must be provided with cooling units to be operated throughout the period of work in order to restrict awful smells.

(6) A room must be allocated for freezing the waste, in case it is necessarily stored, so that the raw materials may be returned to this room in case of breakdown of the factory in order to restrict the pollution of the internal and external environment of the factory.

(7) All stages of manufacturing, including circulation and transport of raw material, cooking, grinding and squeezing must be automatically and closely made so that no vapors or smells may emit to the external environment. All these stages must be supplied with systems for withdrawing smells, provided that all these systems must be connected to odors treatment unit and it must be periodically maintained.

(8) The height of the chimney connected with spot ventilation system that is installed on the manufacturing lines as well as the height of the chimney that is installed on chlorine treatment unit should not be less than 4-5 meters above the roof of the neighboring buildings.

(9) Must be made sure that awful smells treatment unit is functioning continuously and it must be periodically maintained to keep its efficiency.

(10) Strainers must be made to withheld and remove floating solid waste resulting from washing unit.

(11) Bypass system must be created in case of emergent breakdown of any industrial operation to avoid the break down of the remaining manufacturing stages including the materials and to transport the manufactured materials to the refrigeration room or to another industrial stage.

(12) No manual wash of the waste may be allowed as it may result in the spread of polluted and dirty water inside the factory. This method must be replaced by an automatic tightly closed method. Further, the remains of washing raw materials may not be left on the floor of the factory and it must be hiegenically disposed, taking care of the general cleanness of the factory. Further, the floors and walls must be daily washed after completion of the work and it must be sterilized following washing.

(13) Appropriate stores must be allocated for storage of the products, including fodder, and other materials, taking into account that this material may not be stored in the external yard of the factory.

(14) The workers of the factory must be provided with personal protection devices, such as:

a) Rubber gloves.
b) Anti-slippery leather boots.
c) Leather overalls and aprons.
d) Masks provided with filters for protection from harmful gases and vapors.

(15) Periodical medical examinations and tests has to be conducted for workers.

9-7 Manufacturing Animal Remains (Melting fat and intestines of the animals) Activity

(1) The environmental stipulation relating to location must be observed.

(2) The general environmental stipulations of the industrial activities must be observed.

(3) While designing production hall the ceiling must be about 8 meters high to benefit from the quantity of the renewed air by means of central air-conditioning machines and exhaust fans.

(4) The walls of the factory must be lined with ceramic or similar material of not less than 3 meters high to prevent the materials from being stuck with the walls and consequently rotten resulting in awful smells and to facilitate cleaning of walls.

(5) The raw materials supply to the factory must not exceed the capacity of the factory that is daily manufactured.

(6) Raw materials must be frozen rather than being cooled and it must be placed in special reception tanks to keep it from being rotten upon the receipt of great quantities of the same.

(7) Raw materials may not be manually transported during different stages of manufacturing; rather it must be automatically transported.

(8) Raw materials must be withdrawn from reception tanks to other manufacturing operations automatically by means of tightly closed conveying belt along with the installation of ventilation systems on the belt to withdraw the odors. Further, these systems must be connected to odor treatment tower.

(9) All stages of manufacturing, including cooking, grinding and squeezing must be automatically and closely made, provided that spot control systems must be installed to restrict the spread of pollutants and provided that these systems must be connected to odor treatment system.

(10) The efficiency of the odor treatment system must be checked and it must be continuously operated and periodically maintained to keep its efficiency.

(11) Bypass system must be created in case of emergent breakdown of any industrial operation to avoid the break down of the remaining manufacturing stages including the materials and to transport the manufactured materials to the refrigeration room or to another industrial stage.

(12) The height of the chimney connected to odor treatment system must not be less than 5 meters above the roof of the neighboring buildings.

(13) All tools employed in preparation of intestines must have smooth anti-corrosion surfaces.

(14) Fat products must be free of any bacteriological or chemical pollutants. This can be inspected by checking samples of the same before circulation.

(15) An undertaken must be obtained that no medical vapors or frozen meat will be produced.

(16) Highly efficient additional drains must be available in the reception rooms and production halls. Further, gathering tank and fat trap must be available before disposing wash water to the drains in order to guarantee the safety of the disposed water.

(17) In case there is a manhole and gather tank, the contents of the same must be quickly disposed to avoid the dissolution of its contents, provided that the depth of the sanitary manholes should not exceed 1.5 meters in accordance with the stipulations of the Ministry of Public Works.

(18) Waters resulting from condensation operations in the cooking unit must be treated by equilibrating the pH factor before disposal in the drainage network.

(19) Solid waste must be soundly disposed through collecting the same into closed containers.

(20) Raw materials must be separated from produced materials so that raw materials must be frozen at appropriate temperatures. Produced oil drums must be kept in separate chilled store at appropriate temperature. The temperature of the production rooms should range between 20-25^{o}C.

(21) Detergents, disinfectants and insecticides must be maintained in separate store.

(22) The workers of the factory must be provided with personal protection devices, such as:

a) Vapor masks.
b) Water proof leather gloves, particularly for the workers who are engaged in cleaning the intestines to protect their hands from contacting animal remains and consequently being infected with skin disease.
c) Waterproof leather overalls and aprons.
d) Protective boots (medical boots).

(23) Periodical medical examinations and tests must be conducted for all workers of the factory. Results of the examination must be kept in special record.

Tenth: Engineering and Environmental Stipulations of the Slaughter Houses and Animal Fodder Manufacturing Sector

10-1 Manufacturing Animal Fodder Activity

(1) General ventilation systems, such as air-conditioning units must be provided to refresh and improve the atmosphere.

(2) Production lines of the company must be automatic and the manual method of unloading the sacks of concentrated substances, if any, must be replaced with a mechanical method to restrict the spread of dust in the business atmosphere.

(3) Grinding and mixing machinery must be tightly closed to prevent the spread of dust, provided that it should be supplied with special system for collecting the dust.

(4) Spot ventilation systems must be installed on the top of every mill to withdraw the dust of the materials that are used in manufacturing fodder (such as maise, soya beans, barley) and concentrates (such as vitamins, bones, dried fish). Periodical maintenance of these systems must be made and the filters must be replaced.

(5) Periodical maintenance of different mills, mixers, grinders to guarantee that noise will not exceed the allowed limit.

(6) The shed of the factory must be arranged and raw materials as well as produced materials must be stacked and passages must be left to facilitate the movement of workers.

(7) The workers must use dust masks and these masks must be renewed on short intervals to maintain their health from being exposed to the dust of the raw material. Further, earplugs must be used.

(8) Periodical medical examination must be conducted for all the workers.

10-2 Poultry and Bird Farms Activity

A- Poultry Incubation Centers:

(1) Incubation centers must be 2 KM away from the nearest residential or industrial area or another incubation center, poultry farm or slaughterhouse.

(2) The walls of all workplaces must be lined with porcelain. The floors and ceilings must be made of liquid proof material so that it can be easily

cleaned and disinfected (the floors of the factory must be covered with ceramic rather than tiles.

(3) The foundations of the building must be rodent and insect resistant and construction materials must stand temperature, rains and it must be fireproof.

(4) The buildings must be flies resistant by using strong mesh on the windows and doors. Further, every entrance should have two consecutive doors with automatic hinges to be always kept closed.

(5) A room must be allocated formaline sterilizing the eggs that are prepared for incubation, provided that it must be supplied with a system for controlling temperature and humidity. The keys of the control system must be outside the room. The room must also be supplied with sufficient ventilation systems, such as A/C units, appropriate spot ventilation systems having high efficiency to withdraw the gases that remain after fumigation to dispose harmful chemical vapors that are used with fumigation, particularly formaline vapors.

(6) A room should be allocated for keeping eggs after sterilization. This room should have the capabilities of controlling temperature and humidity. Further, eggs may not be exposed to air currents.

(7) A room should be allocated for incubation. This room should be provided with filter and water cooler for the water supplied to the incubation units. Further, ventilation systems must be provided in accordance with specifications. The room and incubation units must be washed by disinfectants.

(8) A room must be allocated for hatching away from incubation room. Special passage must connect both rooms. This room must be provided with sufficient ventilation systems and exhaust fans to withdraw the smells resulting from incubation operation. The room must be periodically washed with disinfectants to get rid of odors and pollutants resulting from incubation operation.

(9) A room should be allocated for sorting. The temperature of this room should not exceed 25^{o}C and its humidity is about 55%. Further, it should be provided with movable tables to facilitate cleaning and sterilization.

(10) A room should be provided for washing the tools used in the incubation operation. This room must be provided with sufficient number of washing basins lined with porcelain. These basins should have appropriate sizes. Further, cool and hot water as well as sanitary drainage system must be provided.

(11) Appropriate place must be provided for vaccinating the one day old checks before distribution, if necessary.

(12) Appropriate places must be allocated for:

a) Collecting the chicken, which exhausted its productive capacity.
b) Special pit must be allocated for gathering the waste of chicken enclosures (dry waste and the remains of egg gathering unit). This pit must be 25 meters away from any building. The floor and walls of the pit must be liquid proof and it must be covered with tightly closed plastic cover to prevent the spread of flies.

(13) The floors of all production units in the company must be cleaned and washed with disinfectant to get rid of harmful microbes and to maintain the floors of the production and work places clean and having suitable slope to dispose the liquid waste and washing water. Further, necessary precautions must be taken upon washing and sterilizing chicken sheds with chemicals. The percentage of the disinfectant solution (Alkyl Dimethyl Benzyl Ammonium Chloride), which is used in disinfecting the farms must be checked so that it might not be a source for chemical pollution.

(14) Empty packages of the disinfectants and detergents must be disposed on timely manner and it must not be left inside the place of work.

(15) Ventilation systems of the farms and chicken sheds must be operated and its efficiency must be checked following cleaning and washing the incubation unit with industrial disinfectants and detergents after every hatching of checks and before the entry of the hatching workers.

(16) Electric bell must be installed inside the refrigeration room, provided that it must be connected with the room of the factory supervisor to seek his assistance upon any emergency.

(17) The doors of the incubation units must be maintained and tightly closed to prevent the leakage of Formaldehayd gas, heating and awful smells outside the incubations.

(18) Suitable healthy method must be created to dispose solid wastes resulting from incubation operations (egg shells, hatching remains and damaged eggs) after collecting the same in tightly closed plastic sacks to be transported in vehicles that will be provided by the owner of the center for transportation to the places allocated by the Municipality for this purpose.

(19) Liquid waste may not be disposed into rain drains; rather it must be disposed in the places allocated for the same by Kuwaiti Municipality.

(20) Fresh water tank must be located away from dry or liquid waste.

(21) Fertilizer pit must have cement floor and wall. The fertilizer may not be stored for more than four days and it must be disinfected with insecticides to prevent the spread of flies and insects.

(22) Checks that are prepared for distribution must be packed in disposable carton boxes that may not reused once again. The empty egg cartons must be stacked on wooden or metal bases to prevent it from being damaged by rodents and insects.

(23) There must be a veterinary clinic and laboratory under the supervision of a veterinary doctor to vaccinate the checks and to examine as well as treat chicken.

(24) First aid kits must be provided as well as harmful gas rescue methods.

(25) Disinfectants, insecticides, rodent poisons, traps, spray and disinfections machinery must be provided after obtaining the approval of Agriculture Department and Preventive Health Center.

(26) The center should have a tightly closed vehicle having sufficient ventilation for transporting checks. Further, appropriate place must be provided for disinfecting the car.

(27) Health stipulations must be provided in the out building of the incubation center, including management buildings, workers restroom. Further, potable water and toilets proportionate with the number of workers must be provided.

(28) Fire fighting stipulations must be observed.

(29) Private cupboards must be provided for workers proportionate with their number.

(30) Upon carrying out sterilization operations it must make sure that the skin has no injuries. Further, hands must be washed properly after these operations.

(31) Production room must be evacuated from worker upon fumigation and after removal of the sterilization material due to the existence of a percentage of formaldehyde in the production room.

(32) The workers engaged in spraying disinfectants and other insecticides as well as those engaged in cleaning the farms and incubation workers must be obliged to use personal protection devices to protect them from chemicals (specially when formaldehyde is used), namely glasses, gas masks supplied with filters.

(33) Fumigation workers must be provided with personal protection devices, such as masks and gloves to protect them from the vapors of formalin gas, which is used in sterilization operations during taking the sterilized eggs out from the fumigation room.

(34) The workers who are engaged in cleaning and disinfecting check cages by Isan should use protective gloves throughout the period of their duty.

(35) The workers must be provided with uniforms, helmets and boots.

(36) Periodical medical examinations and test must be made for the workers who are engaged in spraying disinfectants and other insecticides as well as cleaning workers on regular periodical basis to make sure that they are free of infectious diseases. Further, they should be periodically vaccinated.

B- Chicken Slaughter Houses Associated to the Farms:

(1) Slaughtering of chicken in the breading farms is prohibited unless in the cases that required slaughtering all chicken due to disease or preventive reasons or when the farms have contracts to supply huge quantities of slaughtered chicken to public or private institutions.

(2) Special places should be provided for slaughtering away from breading farms in accordance with the health conditions.

(3) The floor must be of cement tiles and the walls must be covered with ceramic to 2-3 meters high.

(4) The foundations of the building must be rodents and flies resistant by using strong mesh on the windows and doors. Further, every entrance should have two consecutive doors with automatic hinges to be always kept closed.

(5) The buildings should have sufficient ventilation and lighting systems.

(6) The size of the chicken reception hall must be proportionate with the size of work. Further, this hall must be opened to the slaughtering room through big window for handling chicken. Further, 30 cm. high above the floor steel foundations must be prepared to put the cages on it.

(7) The room where the chicken is slaughtered must be open to preparation room via handling window. Further, suitable size basins lined with ceramic having metal funnels and water supply source must be provided.

(8) Slaughtering room must be supplied with hot water that is necessary for removal of feather. It is preferable to install one boiler or more, according to the requirements. Further, 40-50 cm. deep stainless steel

basin must be installed. Furthermore, one electric system or more must be created for removal of feather along with necessary maintenance.

(9) Preparation room should be provided with air-conditioning units so that its temperature must be 20-25°C maximum. Further, it should be provided with marble tables, one basin on more having water supply source with a filter and cooled to 4°C.

(10) Sufficient number of metal hangers must be provided. These hangers must be arranged in a manner that guarantees the removal of water from chicken after cleaning and for a sufficient period of time before distribution.

(11) Water supply source and healthy drainage methods must be provided. Further, waste must be disposed by collecting it into tightly closed containers.

(12) Storage and distribution room must be kept at lower than 10°C.

(13) Fire fighting stipulations must be observed.

(14) The workers must be provided with personal protection devices, such as uniforms, gloves and boots. Further, they should be strongly advised of using these devices.

(15) Periodical medical examinations and tests must be made for all workers before appointment and periodically after that to make sure that they are free of infectious diseases. Further, they must be periodically vaccinated.

10-3 All kinds of Chicken and Cattle Slaughtering Houses Activity

A- Stipulations for Chicken Slaughtering Houses:

(1) The walls of the slaughtering house should be claded with porcelain up to the ceiling. Further, the floors should be covered with solid rough waterproof material to prevent accidents and its slope must be increased to prevent the accumulation of water.

(2) All rooms must be supplied with air refreshers, including ceiling fans, A/C units so that the temperature should not exceed 20°C, provided that the air-conditioning unit should have high efficiency.

(3) A basin lined with ceramic or stainless steel basin must be provided in the slaughtering room. The basin must have enough size and its angles should be circular to facilitate cleaning and to prevent waste sedimentation. Further, it should be supplied with water supply source and underground drains having circular angles or drainage channels

having semi-circular angles to prevent the sedimentation of waste resulting from slaughtering operation. These drains must be covered with metal mesh.

(4) Slaughter house sections must be provided with special units for filtrating the air from awful smells and it must be periodically maintained to make sure of its efficiency.

(5) A room should be allocated for slaughtering the chicken, provided that must be supplied with filtrated water supply and chilled to 4°C.

(6) A room should be allocated for chilling, provided that its temperature should not exceed 10°C and its doors should be provided with spring and it must be continuously closed.

(7) A room should be allocated for gathering waste, provided that its temperature should not exceed 10°C and its doors should be provided with spring and it must be continuously closed.

(8) The pollutant areas should be completely separated from the clean areas in the slaughterhouse after chilling, packaging and wrapping room. The workers should not be allowed to move freely in these areas. It is preferable that the workers of each section should be distinguished with special uniform and special containers, tools and means of transport should be allocated for every area. Further, hand washing basins should be available at proper places.

(9) The entrances and exits of the slaughtering house should be provided with two consecutive doors having spring, provided that the area of the corridor should be suffice for the transport of wheelbarrow. Separate distribution exit must be determined away from the entry door of the live chicken.

(10) Liquid waste must be dumped inside the pit on periodical basis in order to avoid awful smells and to avoid the spread of flies, insects and harmful microbes. It is provided, however, that this waste must be hygienically disposed.

(11) To reduce the awful smells emitting from the waste container following the slaughtering of the chicken. In this respect the containers might be tightly closed and the waste must be disposed on daily basis.

(12) Sewage resulting from slaughtering houses must be soundly treated before being disposed in the drainage network.

(13) Periodical medical examination and tests must be conducted to all workers.

B- Cattle Enclosure and Sheep Slaughtering Houses Stipulations:

(1) The enclosures where the animals are kept before being slaughtered must be paved and it must cleaned, washed and disinfectant after getting every group of animals to be slaughtered.

(2) The area of the enclosures must be suitable and it should be calculated based on 6 square feet per every sheep and 30 square feet per every cow.

(3) The floor of the enclosures must be liquid proof and sloped to facilitate drainage.

(4) The enclosures must be shaded with water proof material and it should have sufficient water supply and lighting.

(5) The area where sick animals are kept must be separated from the area where animals are being examined before being slaughtered.

(6) Animal dung must be used as natural fertilizer.

(7) The floor of the slaughtering house must be liquid proof and it must be rough to prevent accident resulting from slippery. Further, it should be resistant to disinfections materials (such as cement tiles) and it must be slope to prevent the accumulation of water and to facilitate the drainage of water.

(8) The floor of the slaughtering house must be liquid proof and crack resistant. The walls of the rooms should be covered with porcelain or similar material of not less than three meters from the ground to prevent the stuck of any material and the emitting of any awful smells and to facilitate the cleaning of walls from waste. Further, the connection line of the walls with the floor and the ceiling must be convex to facilitate washing and cleaning.

(9) The ceilings of the slaughtering house must be of anti-rust material, crack resistant and convex at the line of connection with the walls. The ceilings must be provided with heatproof material to maintain the rooms cool.

(10) Purification systems must be installed to purify air from awful smells. These systems may be sufficient air-conditioning units to ventilate the place and purify the air, provided that the temperature of the rooms should not exceed 20^{o}C. Further, highly efficient exhaust fans must be provided in the slaughtering hall and in both rooms where intestines and stomach are kleen.

(11) The efficiency of the air purification units must be checked and it must be periodically maintained. Further, air-condition units and exhaust fans must be periodically maintained to increase its efficiency.

(12) All tools and equipments used must have smooth anti-corrosion surfaces.

(13) Basins lined with ceramic or stainless steel basin must be provided in the preparation rooms. The basin must have enough size and its angles should be circular to facilitate cleaning and to prevent waste sedimentation. Further, it should be supplied with water supply source and underground drains having circular angles or drainage channels having semi-circular angles to prevent the sedimentation of waste resulting from slaughtering operation. These drains must be covered with metal mesh.

(14) Drainage network in the slaughtering hall must have semi-circular angles in order to avoid the accumulation of waste and to facilitate cleaning.

(15) There must be preparation rooms and it must be provided with filtrated cooled water supply of $4^{o}C$.

(16) There must be a room for collecting waste. This room must be provided with cooling units to restrict the spread of awful smells till dumping the same in the places allocated by the Municipality.

(17) There must be a unit for collecting leather. This unit must be cool and the leather must be disposed quickly on timely basis.

(18) There must be a refrigeration room for keeping the product and a warning bell must be installed inside this room.

(19) There must be places for storing fertilizer sacks, fat drums and animal proteins that are used as chilled fodder for animals.

(20) Due care must be given to the entrance of the central slaughtering room (particularly the entrance of the slaughtering room), provided that it must be well ventilated, tightly closed to prevent the access of dust, insects, rodents, birds ...etc. Further, the openings existing around the doors must be closed and air curtains must be installed for doors to prevent the entry of dust and to maintain the temperature inside the slaughtering hall. The area of the corridors must be sufficed for the passage of wheelbarrow.

(21) Due care must be given to the cleanness of the slaughtering house, all equipment, tables and tools which should be cleaned several times in the day. The slaughtering hall must be continuously kept clean. Further,

solid and liquid waste must be removed and periodically disposed to restrict the emitting of an acceptable smells inside the slaughtering house and in the populated places as well as to the surrounding environment and so that it should not be a source for insects and rodents.

(22) Sufficient number of rodent and flying insect traps must be installed all over slaughtering and preparation halls.

(23) Exhaust fans must be installed in the bathrooms. Toilets must be provided with towels and necessary cleaning materials.

(24) A veterinary doctor must be continuously available to examine the sheep, camels and other types of cattle before being slaughtered to make sure that it is free of diseases and to supervise the slaughtering operation.

(25) Due care must be given to the control over the workers of the slaughtering house. They must be medically fit and they must wear gloves, masks and helmets.

(26) Periodical maintenance of the drainage lines of the slaughterhouse to guarantee its efficiency and that it is not blocked. The drains must be sloped and it must be connected to the manholes and tanks to prevent the emitting of smells, if any. Further, the contents of the tanks must be disposed to avoid awful smells.

(27) Periodical medical examinations and tests must be conducted for all workers.

C- Stipulations for Preparation Rooms for Carcass by-Products Such as (fats intestine and stomachs)

(1) The volume of receiving and treating wastes rooms shall commensurate with work volume and the quantity of animals wastes elementary materials used daily.

(2) Cooling units shall be constructed to receive elementary wastes subject to rottenness and gather them in suitable quantities to decrease the spread of bad odor. The same shall be on condition that these wastes shall be put in separate tankers (according to kinds thereof: intestines, skin or fats). These tankers must prohibit gas spread. Elementary materials may be returned to them if the factory stopped or broke down. This is in order limit spread inside and outside the factory and to lessen pollution of internal and external factory environment.

(3) Preparation rooms shall be open directly on slaughter hall in presence of special separate holes for skin, intestine and stomachs to transfer them

to treatment rooms. They shall be carried on special stop with specifications that suits with the slaughterhouse power in order to be collect outside slaughter hall and to be transported as soon as possible to their manufacturing places.

(4) The ground shall have no absorbability or liquid permeability and shall not be smooth to prevent accidents due to sliding. It also shall be antiseptic resistant (such as cement tiles). Ground sloping shall be increased to prevent water accumulation and to make water bypass easier.

(5) Internal walls shall not be liquid permeable and shall be resistant to cracks. Room walls shall be covered from the external side with a layer of porcelain or a similar material the height of which shall be not less than 3 m. from the ground in order to prevent material stacking to it and accordingly rotting and the odor emission. In addition to make walls cleaning easier.

(6) Ceiling shall be made of a stainless material resistant to cracks and can care in the area of connection with walls. Ceilings shall be provided with a heat proof material to keep coolness inside.

(7) Providing air purification sets so as to purify air from bad odor especially in intestine preparation and treatment rooms. The same shall be air conditioners sufficient for place ventilation. The room temperature shall not exceed 20^{o}C. Moreover side fans shall be provided to withdraw air from inside with high efficiency in order withdrawal.

(8) Ensuring that air purification from bad odors units are working efficiently. This shall be done through periodically maintenance for air conditioners and fans to increase their efficiency for odor withdrawal.

(9) All equipment and tools shall be smooth and corrosion resistant.

(10) Providing basins coated with ceramics in preparation rooms. They may be made of stainless steel. The same shall be in a volume sufficient for work volume. The angles thereof shall be circular to make cleaning easier and to prevent wastes accumulation. Such basins shall be provided with a water source and shall be bypassed to ground drains the angle of which shall be circular, or to hemispherical sewerage channels so as not to allow sediments resulting from treatment and shall be covered with iron net.

(11) Intestine preparation and treatment rooms shall be provided with marble tables and with a basin or more. The basin volume shall be suitable and coated with ceramics and be supplied with a filtered water source. The water shall be cooled to 4^{o}C approximately and shall be bypassed to sanitary drainage.

(12) Hot water necessary for intestine preparation and treatment rooms shall be provided. It would be better to install a heater or more according to work volume. In addition a basin or more shall be installed. The same shall be made of stainless steel and in 40-50 cm. depths and with the width sufficient to work volume.

(13) The boiler chimney shall be at least 12 meters in the intestine preparation and treatment room. Vapor release pipe shall be connected to the nearest point of ground sewerage, in order to decrease vapor emission, which disturbs the near factories and companies.

(14) The temperature degree in the cooling room specified as a store for manufactured materials in (10^{o}C). Doors of such rooms shall be provided with a spiral spring. They shall be kept continually closed to keep it cool and prevent flies entering.

(15) Specifying a way out for distribution away from the slaughterhouse entrance.

(16) Manual washing and waste removal shall be replaced by a automatic way as this manual way results into polluted water and wastes spread inside the factory. The automatic way shall have a closed and controlled system.

(17) A new bypass system shall be created to avoid other manufacturing phases stopping with their contents of materials in case of sudden breakdown. This can be made by transferring the manufactured materials to cooling room or to other industrial phase.

(18) Washing water bypass system shall be able to remove floating sold materials resulting from the washing unit. It is suggested to seek the Ministry of Public Works assistance in designing a net to detain such wastes before bypassing the healthy water.

(19) A container with a cover, or more than one, must be provided to collect manufacturing process wastes from time to time.

(20) No materials, such as forage or other materials, shall be stored in the odor area of the factory, which lies on the public street so as not to disturb citizens due to bad odors. Suitable store must be defined for such products.

(21) Works are not allowed to move between the polluted areas of the slaughterhouse and clean areas behind cooling, canning and packaging room. It is preferable to distinguish workers of each department with a uniform and to specify containers tools and means of transportation for each area as well as to provide basins for hands washing in each phase.

(22) Periodical medical examinations and tests must be conducted for all workers.

Eleventh: Engineering and

Environmental Stipulations of Stores Sector

11-1 General Engineering and Environmental Stipulations of the Stores Sector

(1) In all store suitable light, whether natural or artificial shall be provided.

(2) Heaters or burners appliances should not be used inside the store in order to avoid fire.

(3) It is necessary to store materials in wooden iron shelves that must be not less than 30 cm. light from the land materials shall not be accumulated directly on earth.

(4) No industrial activity shall be practiced inside the store.

(5) Broken or spoiled materials should not be kept, inside the store with valid stored materials.

(6) Materials that may react with moisture heat or other materials shall be stored in an isolated and suitable room.

(7) Due attention be paid of store cleanness and arrangement to make cleaning easier and to prevent the growing up of insects and rodents inside the store.

(8) It is necessary to provide means of protection against insects, rodents and dust especially at the store entrances.

(9) It is necessary to specify an independent store to cleaning tools, antiseptics and insecticides.

(10) It is necessary to provide fire fighting tools in a reachable place to get it easily if it is needed.

(11) Providing alarm system to warn in case of emergency.

(12) It is necessary for workmen to conform to using personal protection tools such as gloves and masks during their work at the store.

11-2 Environmental Stipulations of Food Substances Stores

(1) It is necessary to provide food substances stores with cooling means along with a thermometer to keep the temperature degree suitable for stored food substances nature.

(2) It is necessary to perform periodical maintenance for cooling sets and ventilation systems to ensure its efficiency in preserving foods.

(3) Cooling and freezing room shall be provided with a reserve electric dynamo that automatically starts when the light went off.

(4) Elementary material stores shall be sufficient for storage so as to avoid stored materials accumulation.

(5) Store walls shall be painted with an ooze proof isolating material.

(6) It is important to comply with correct health stipulations in elementary materials storage in order to save enough shelves and metal stands. These shelves shall be made of a stainless material to put bags on them, so as to be away from the ground in 30 cm. and from wall in 30 cm. It is necessary to ensure that the bags of raw materials are closed firmly on storage.

(7) Cleaning materials, gas discs and maintenance tools shall be stored in special sites away from stored food substances. A separate store thereof shall be specified.

(8) Produced substances stores shall be provided with air conditioning units, which shall be continually on. Cooling rooms shall be provided with an automatic ventilation system. Good ventilation shall be supplied inside the corridors.

(9) Conducting regular maintenance for store doors which shall be firmly closed.

(10) The store temperature degree shall suit the nature of stored food substances, for example mineral water and juices shall be kept at maximum 25^{o}C whereas sweets, e.g. chocolate shall be kept in temperature degree between (3^{o}C) and (8^{o}C).

(11) The store shall be provided with flies and insects traps with suitable lightening.

(12) Performing regular maintenance for the store air-conditioners to preserve the stored substances from damage.

11-3 Environmental and Engineering Stipulations of Chemical Materials Stores

(1) Materials shall be stored inside special buildings designed and constructed for such purpose or in open areas near operation areas or away from it, according to the stored materials circumstances or its usage frequency rate.

(2) It is necessary to observe that chemicals shall be stored in packages resistant to break ruin and corrosion, which shall be firmly closed to prohibit air and vapor leakage. They shall be easy to open as well.

(3) It necessary to continually inspect chemical packages and ensure that they are free of corrosion, stain or leakage. Ruined packages shall be removed and if something is poured, it shall be cleaned immediately. A record for ruined materials and the way to clean them up shall be kept.

(4) Special containers for broken glass removed shall be provided.

(5) In cognate material shall not be stored with each other. Further, a record that shows cognate and in-cognate materials shall be made to make chemicals arrangement easier.

(6) Building and areas of storage shall be specified and determined. All open storage areas shall be fenced.

(7) It prohibited to store any substance in a random way or to scatter them on places such as roads, work places, offices, open areas or operation areas.

(8) Different materials shall be stored in different places so that these places shall be separated from each other either inside the store premises or in open storage areas. For example, oxidized materials shall be separated in isolated and dry areas away from other chemicals especially inflammable substances. Acids and alkaline shall be put in separate areas to prevent accidents.

(9) Paperboard, wood and packaging materials must be removed from the storage area immediately after evacuating them.

(10) Dealing with chemical substances storage requires putting some signals to show the kind of storage material suitable for such material as well as suitable cautions if the material was poured and how to deal with such material in such circumstances.

(11) The store shall be equipped with fire fighting system, which shall be regular tested.

(12) It is important to choose fire-fighting substances that suit the nature of stored materials nature. Water shall not be used to extinguish fires resulting from materials that may react with water.

(13) Fire alarm system shall be provided in sensitive areas and shall be regularly tested.

(14) Water showers shall be provided in order to be used in case materials were poured on people or in cooling packages in case of emergency.

(15) Personal protection equipment shall be provided for store workers, such as gloves overalls, safety shoes and masks provided with filter.

11-4 Engineering and Environmental Stipulations for Storing Ordinary and Safe Chemicals

(1) Areas shall be enclosed with fences and shall be free of any waste wood or paperboard used for packaging chemicals or any other wastes.

(2) Materials shall be stored carefully and in a safe way by arranging the boxes in a straight way to prevent falling or cutting the lower part.

(3) On storing heavy things, they shall be put in a way that prevents falling:

(4) It is not allowed to all to store things above safes or cupboards ...etc.

(5) Materials bags shall be arranged in a perpendicular layers. Bags shall not be extended till the corridors so as not to hit any thing and be spoilt.

(6) Stored materials shall be covered to be protected from atmospheric effects. Covers shall be of the thickest kind so as not to be inflammable.

(7) It is necessary to provide side corridors inside the store to facilitate adding or withdrawing materials safely.

(8) It is necessary not to put any obstacle in the corridors where fire alarm devices or fire fighting, safety, or emergency equipment or electric panels or electric control panels exist.

(9) All stored materials, whether inside store premises or store areas, shall be defined and specified by signals or explanatory signs.

(10) Suitable extinguishers shall be provided and put in a reachable place.

(11) Periodical medical examinations and tests must be conducted for all workers.

11-5 Engineering and Environmental Stipulations for Storing Dangerous Materials

A- Inflammable Materials Storage Stipulations

(1) Container or package volume shall not exceed the allowed limits, which shall be determined by the chemical material inflammability degree.

(2) The area shall be clean from any flame sources or electric sparks as well as heat sources. It is necessary to store them in places with good ventilation.

(3) Not to return the remaining materials of the chemicals to its original packages after use.

(4) Inflammable liquids, such as gasoline, fuel oil, tinctures, or thinner etc. must be stored in special containers. The same must be labeled to show the container contents and that they are inflammable. Such containers must be kept in places designed and specialized to that purpose.

(5) Suitable refrigerators must be used in storing volatile materials.

(6) It is necessary to provide and use color enlightening provided that all sets and extensions must be fire proof to avoid electric sparks that may put the stored material on fire.

(7) It is necessary to specify an independent store for liquids that have flashpoints lower than (32 m.). Further, such liquids must be put in firmly closed packages.

(8) There must be containers in big packages storage areas. The length thereof shall not be less than 15 cm. to contain liquids if they are poured. Packages must not be completely full.

(9) Smoking must be prohibited inside the stores or when inflammable materials are handled.

(10) Workers of such stores must be aware of fire risks, which may result from chemicals and how to prevent and fight such fire.

B- Solvents and Poisonous Materials Storage Stipulations

(1) Such materials must be stored inside special containers and distinguished with labels to show the material name, toxicity degree and danger as well as the necessary precautions to be followed during using and handling such materials or even thereof containers.

(2) The containers of such materials must be put in places designed and specified for this purpose.

(3) Poisonous materials must be stored in a way that prevents thereof spread if they are poured or in case of leakage. They must be stored in a safe area and to prevent people's entry into it under any circumstances.

(4) Chemical substances must not be subject to direct sunrays or site heat.

(5) The stores of such materials shall be provided with respiratory system protection equipment protection gloves and safety glasses.

(6) The workers in such stores must know how to use such material and how to protect themselves against expected risks.

(7) Before transporting or circulating such materials, it is necessary to read all instructions written on the containers carefully and ensure that all necessary precautions were applied.

C- Compressed Gases Storage Stipulations

Gases are usually stored and pressure in discs, either in the liquid state or gaseous state. Most gases have dangerous properties such inflammability and have negative impacts on human being and the environment. Some of them are poisons and others are suffocating, so that great attention and caution must be given during compressed gases storage. Such gases include oxygen, hydrogen, narcotic gases and acetylene. Such gases must be subject to the following stipulations:

(1) Cylinders must be painted with different colors according to its contents and with standard colors in force.

(2) Each cylinder must be tied and must be written on it whether it is empty or full. They must be separated from each other too.

(3) The name of the material inside the cylinder must be written with paint and must be clear on the cylinder body also.

(4) Oxygen cylinders must not be stored inside the premises and in the same room with the cylinders of acetylene or foul unless it was completely isolated from each other by a fireproof screen.

(5) Acetylene is unsuitable on 15 pound / inch pressure and is subject explosion due to any shock unless it was dissolved in acetone. So acetylene cylinders must be stored or used in a vertical stand to avoid acetone loss.

(6) Acetylene cylinders contain safety plugs at the top. These two plugs are torn one 210 F, so it is necessary to avoid any hot bodies falling on these cylinders. No welding works or burning shall be made besides the cylinders.

(7) Cylinders must be stored in a vertical way and be tied with chains. It is completely prohibited to roll cylinder horizontally on earth. They must be transported in special cars for this purpose.

(8) The protecting cover must be put above the cylinder valve to protect it from damage.

(9) Neither the controller nor the value protecting cover shall be removed from the cylinder, unless it was inside the special car. It important to keep the protecting covers tied on the cylinder in case the meters were not used.

(10) Stored cylinders valves must be closed whether they are empty or full.

(11) Neither oil nor fats must be use in connecting the cylinders.

(12) It is prohibited to try to search for leakage source by matches or other flames. Foam test must be use to find leakage source. When leakage source is found in a closed place cylinders shall be directly moved into an open area away from heat source or direct light. Necessary precautions shall be taken on dealing with them.

(13) Inflammable and poisonous gases must be stored above ground level. It is prohibited to store them in pavements.

(14) Gases that may react with each other shall be separated or isolated from each other in a sufficient distance.

(15) The way to the cylinders must be plain of any obstacles in order to be closed quickly in case of emergency.

(16) Workers who use compressed gases must be aware of storing and circulating rules and their emergency procedure.

(17) Periodical examination and tests must be conducted for all workers and their results must be kept in special records to be detected if it is needed.

Appendix No. (3-1)

Maximum Limits Allowance for Occupational Exposure to Chemical Substances

The following terms set under this Appendix shall have the meanings as explained against respective terms:

Maximum limits for allowed levels (TLV's): Is the level of chemical substances concentration in the work environment which do not lead to health damages of workers being exposed to them during the working shift determined daily and for a working period extending to tens of years, divided up into four types:

1- **Average concentration in 8 hours (TWA)**: This is the average concentration level calculated for exposure during 8 working hours to which the worker may be exposed for a period of 40 hours weekly and for the period of his full service years, without such exposure having adverse effects on health.

2- **Average concentration on the short term (STEL)**: This is the average level calculated for 15 minutes which may not be exceeded in any case during the working shift, and exposure should not exceed 15 minutes for four intervals during the daily working shifts (8 hour) provided the interval between each period is at least one hour.

3- **Ceiling:** This is the concentration level specified for some substances remarked for their severe immediate effects on health as a result of their poisonous- numbing- irritation qualities.

4- **Health or life risk concentration level (IDLH)**: This is the criterion for determining the maximum levels for the concentrations of chemical substances remarked by health dangerous poisonous specifications at which exposure to their value may constitute a direct danger on the life or health of individuals or those being exposed.

This criterion is applied in the circumstances of the abnormal and severe exposures as an evidence proof and is not correlated with the levels specified for the maximum exposure limits. The quantity value for this criterion are considered the maximum tolerated levels for exposure during a duration specified at 30 minutes without such exposure causing any effects on the safety and health of exposed persons.

Pollutants concentration measuring unit: These units are used to define the concentration levels of pollutants in the work environment. They are volume units (p.p.m) or weight units (mg/m^3) calculated on the basis of one part per million in the volume of one cubic meter of breathing air or milligram per cubic meter of air. Both units are used for measuring by a standard air pressure of (760) mm mercury at various temperature degrees. The conversion between the two units may be carried according to the air temperature by using the following formulas:

(I) In case of air temperature of 20 degrees Celsius

$$\frac{\text{Molar weight of substances}}{24.04} \times \text{ppm} = \text{mg/m}^3$$

$$\frac{24.04}{\text{Molar weight of substances}} \times \text{mg/m}^3 = \text{ppm}$$

(II) In case of air temperature of 25 degrees Celsius:

$$\frac{\text{Molar weight of substances}}{24.44} \times \text{ppm} = \text{mg/m}^3$$

$$\frac{24.44}{\text{Molar weight of substances}} \times \text{mg/m}^3 = \text{ppm}$$

Reference to skin: Some substances, which are present in the work environment have the reference (skin) mentioned next to them, due to the absorption of intact skin to them without having an external effect on it.

Exposure to a mixture of substances: This is the exposure of employees to a mixture of chemical substances at work, and such mixture is composed of various materials with regard to their effect on the various organs of the body, and may be considered as separate exposures in this case. However, in some instances the effect of various materials may be consistent for the same organ. In this case, the final effect may be considered as the total of the effects of both substances on the same organ. In rare cases, the final effect is more than mere gathering between the effects of materials and in this case, there is a relationship between the substances, as one of them double up the effects of the other. Such cases are considered the most hazardous situations to which the employees may be exposed and require special care upon estimating the exposure level.

Exposure to a mixture of materials include two types of effects as follows:

1- **Effect of more than one substance on the same organ** : the joint effect is calculated as follows:

C1/T1+C2/T2+C3/T3+...CN/TN = 1

Where (C) is the concentration level of the substance, and (T) is the tolerance level. In case of the additional total exceeds one whole number (1) then there is exceeding of the tolerated limit.

2- **Effect of more than one substance on separate organs**: Calculating the effect is as follows: (C1/T1=1.C2/T2=1.C3/T3=1)

Aerosols: This includes materials suspended in the air and their molar size range from 0.1 to 50 micron, and may be divided into inhalable dusts which exceed 10 microns, and respirable dusts which are less than 10 micron. They also include the fumes, which are very small in size and their size may be 1 micron and result from the condensation of steams from melting metals with an oxidization rate, in addition to coal smoke resulting from incomplete burning of carbonic materials such as coal and fuels of various petroleum derivatives, in addition to the fog and mist.

Chemical Carcinogens: These materials are divided into five categories as follows:

A1- Substances with confirmed effect in causing cancer in humans, which include for example:

(Arsenic compounds – asbestos types – 4-aminodiphenyl)

A2- Likely substances: these substances are carcinogenic for laboratory animals only at concentrations close to those, which may be available to the work environment. As for epidemic studies on humans, they are insufficient to confirm their ability to cause cancel and include for example: (benzol- formaldehyde- chromium- chlorodimethyl ether.)

A3- **Animal carcinogens**: These materials are carcinogenic to laboratory animals at very high concentrations only which are not expected to occur in the working environment under normal operation conditions. The epidemic studies did not confirm the likelihood of humans being affected by these substances, which include for example (heptachlor-dichlorobenzene-perchloroethylene.)

A4- Unclassified substances for humans or animals and there are no sufficient studies and details allowing the classification of such substances at the present time.

A5- Unlikely substances: numerous studies proved the non likelihood of these materials to cause cancer.

Reducing the exposure level to these substances to the least possible level should be taken into consideration. In addition, protective measures, which reduce as much as possible being exposed to them, should be applied. Further, the levels for some substances under the (A1) category has not been specified on the basis of full control over them, although some levels for another part of A1, A2 and A3 have been specified and should be strictly complied with.

Appendix No. 3(1)
Maximum Limits Allowance for Occupational Exposure to Chemical Substances

Maximum Limits Allowed for Occupational Exposure to Chemical Substances								
Chemical Name	Exposure level				Hazardous concentration on health and life	Reference measurement methods	Recommendations to select the type of mask, maximum concentration for use	Health effects
	Within 8 hours		Within a short period					
	mg/m^3	ppm	mg/m^3	ppm				
Acetaldehyde A3	180	100	270	150	Carcinogenic 2000 ppm	Oxidization cylinder, toluene, gas chromatography system with flame ionization detector (FID)	At any remarkable concentration: use mask No.53/mask No.47 Escape: use mask NO.19/mask No.51	Ear, nose and throat irritation, central nervous system failure, dermatitis
Ethanoic Acid	25	10	37	15	50 ppm	Mineral coal tube, formic acid, gas chromatography system with flame ionization detector	-250 ppm: use mask No.44/34 - 500 ppm: use mask No.2/52/45/19/40 - 1000 ppm: use mask No.46 - Emergency: mask No.53/47 - Escape: use mask No.19/51	Eye, nose and throat irritation, dental decay
Non Aquatic Ethanoic Acid	20	5	20	5	200 ppm	Bubbly, detector, visual rays analyzer	125 ppm: use mask No.44/34 - 250 ppm: use mask No.2/52/45/19/40 - 1000 ppm : use mask No.46 - emergency: use mask No.53/47 - escape: use mask No.19/51	Eye irritation, cornea, cornea edema, dermatitis
Acetone A4	1800	750	2400	1000	2500 ppm	Stone coal, methylene chloride/methanol, gas chromatograph with flame ionization detector	- 1000 ppm : use mask No.7/34/43/50 - 12.500 ppm: use mask No.19/52/45 - 20.000 ppm : use mask - use mask No.46 - emergency: use mask No. 53/47 - escape: use mask No.19/51	Eye, throat and nose irritation, dizziness and nausea, dermatitis
Acetonitrile A4	70	40	105	60	500 ppm	Mineral coal tube, methylene chloride/methanol, gas chromatograph with flame ionization detector	- 200 ppm : use mask No.7/43/50 - 500 ppm : use mask No.44/34 - 1000 ppm : use mask No.19/52/45/2 - 4000 ppm : use mask No.46 - escape: use mask No. 19/51	Eye irritation, convulsion, numbness, comma and shock, tissue deoxygenating

Acrolein Skin. –A4	0.25	0.1	0.8	0.3	2 ppm	Oxidization tube, toluene, gas chromatograph with flame ionization detector	- 205 ppm : use mask No.44/34 - 5 ppm : use mask No.2/19/52/45 - emergency: use mask No.53/47 - escape: use mask No.19/51	Eye and skin irritation, lung edema, respiratory system diseases
Acrylamide Skin- A3	0.03	-	-	-	60 mg/m^3	Silica gel filter/tube, methanol, , gas chromatograph with flame ionization detector	- at any remarkable concentration: use mask No.53/47 - escape: use mask No.19/51	Eye and skin irritation, inability to coordinate voluntary muscular movements
Acrylonitrile Skin- -A2	-	1.0	-	10.0	8 ppm	Mineral coal tube, acetone/carbon sulfide, gas chromatograph with flame ionization detector	- at any remarkable concentration: use mask No.53/47 - escape: use mask No.19/51	Eye irritation, suffocation
Aldrin Skin.- A 3	0.25	-	-	-	25 mg/m^3	Filter/bubbly, isooctane, gas chromatograph with flame ionization detector	At any remarkable concentration: use mask No. 53/47 Escape : use mask No. 23/51	Vomiting, nausea, dizziness, convulsion and shivering
Alkyl alcohol Skin	5.0	2.0	10.0	4.0	20 ppm	Filter/bubbly, isooctane, gas chromatograph with flame ionization detector	50 ppm : use mask No. 44/34 - 100 ppm : use mask No. 2/19/52/45/40 - 150 ppm : use mask No. 46 - emergency: use mask 53/47 - escape : use mask No. 19/51	Eye skin, and respiratory system irritation, lung edema, dermatitis
Aluminum compounds	2.0	-	-	-	500 ppm	Filter, nitric acid, elements absorption spectrum estimation gauge by use of flame	--	Irritation
Aluminum (powder)	5.0	-	-	-	Unknown	Filter, nitric acid, elements absorption spectrum estimation gauge by use of flame	--	Irritation
Ammonium oxide A4	10.0 total dust 5.0 inhaled dust	-	-	-	Unknown	Weight/ filter	--	Irritation
Ammonia	18.0	25.0	27.0	35.0	300 ppm	Silica gel, water, visual spectrum analyzer	- 250 ppm : use mask No.12/43/50 - 500 ppm: use mask No. 38/52/45/24/5/44 - emergency: use mask NO.53/47 - escape : use mask No.24/51	Irritation
Ammonium chloride (fumes)	10.0	-	20.0	-	Unknown	Filter, water, ions chromatograph	-	Eye, skin and respiratory system irritation

Amyl acetate	525	100	-	-	1000 ppm	Charcoal tube, carbon disulfide, Gas chromatograph with flame ionization detector	- 1000 ppm : use mask No.34/7/43/50 - 2500 ppm : use mask No.44 - 4000 ppm : use mask No.19/52/45 - emergency: use mask No.53/47 - escape : use mask No.19/51	Irritation
Aniline Skin - A3	8.0	2.0	-	-	1000 ppm	Silica gel, ethanol, gas chromatograph with flame ionization detector	at any remarkable concentration: use mask NO.53/47 escape: use mask No.19/51	Drop of tissue oxygen
Antimony and its components	0.5	-	-	-	50 mg/m^3	Filter, acid, elements atomic absorption spectrum gauge	12.5 mg/m3: use mask No.31/44 25 mg/m3 : use mask No.27/39/49/52/45 80 mg/m3: use mask No.48 emergency: use mask No.53/47 escape: use mask No.27/51	Irritation
Antimony hydride (stibin)	0.5	0.1	-	-	5 ppm	Silica gel, hydrochloric acid, visual spectrum analyzer	- 1000 ppm : use mask No.34/7/43/50 - 2500 ppm : use mask No.44 - 4000 ppm : use mask No.19/52/45 - emergency: use mask No.53/47 - escape: use mask No.19/51	Lung cancer, lung change
Arsenic A1	0.01	-	.002	-	5 mg/m^3	Filter, acid, elements atomic absorption spectrum gauge	At any remarkable concentration: use mask No.53/47 Escape : use mask No.18	Lung and skin cancer
Arsine	0.2	0.05	.002	-	2 ppm	Mineral coal tube, nitric acid, substances atomic absorption system without flame, supplied with the graphite analyzer	At any remarkable concentration: using mask No.53/47 Escape : us mask No. 24/51	Arsine
Asbestos A1	Fibers/cubic centimeter of air 0.1 for fibers < 5.0 micrometer				Unknown	Filter, acetone / triacitine, microscope	At any remarkable concentration : use mask No. 53/47 Escape : use mask No.51/27	Asbestos disease, lung cancer
Asphalt (Fumes) A4	-	-	5.0	-	Unknown	Filter, benzene, weight	At any remarkable concentration : using mask No.53/47 Escape : us mask No. 24/51	Irritation, skin burns

Barium (Self compounds) A4	0.5	-	-	-	50 mg/m^3	Filter, water, elements atomic absorption spectrum gauge	- 12.5 mg/m^3 : use mask No. 31/44 - 25 mg/m^3 : use mask No.27/39/49/52/45 - 250 mg/m^3 : use mask No.46 - emergency : use mask No.53/47 - escape : use mask No. 27/51	Irritation of the eye and upper respiratory system, skin burns, pulse weakening, muscular convulsion, heart constriction
Benzene Skin – A1	-	0.1	-	1.0	500 ppm	Mineral coal tube, carbon disulfide, gas chromatograph with flame ionization detector	At any remarkable concentration: use mask NO.53/47 Escape : use mask No.19/51	Eye, nose and respiratory system irritation, bone marrow decline, unstable and slow movement, skin irritation
Benzene Skin – A1	-	-	-	-	Unknown	Filter, silica gel, detector, fluid chromatograph with ultra violet rays detector	At any remarkable concentration : use mask No.53/47 Escape : use mask No. 27/51	Anemia, liver diseases, urethritis, dermatitis
Beryllium and its compounds A1	0.002	-	.005	-	4 mg/m^3	Filter, acid, substances atomic absorption system without flame, supplied with the graphite analyzer	At any remarkable concentration: use mask No.53/47 Escape: use mask No.27/51	Respiratory system diseases, weakness and exhaustion, dermatitis
Boron oxide	10.0	-	-	-	2000 mg/m^3	Filter, weight	50 mg/m3: use mask No.14 - 250 mg/m3 : use mask No.31/44 - 500 mg/m3: use mask No. 52/45/27/39 - 5000 mg/m3: use mask No. 46 - emergency mask No. 53/47 - escape: use mask No. 27/51	Nose irritation, conjunctivitis, dermatitis
Boron trifluoride	-	-	3.0	1.0	25 ppm	Unavailable	10 ppm : use mask No.43/50 - 25 ppm : use mask Mo.44 - 50 ppm : use mask No.52/45 - 100 ppm : use mask No.46 - emergency : use mask No.53/47 - escape: use mask No.24/51	Nose and skin irritation, eye burns, nosebleed
Bromine	0.7	0.1	2.0	0.3	2 ppm	Filter, ions chromatograph	- 2.5 ppm : use mask No.44/38 - 5 ppm: use mask No. 5/24/52/45/42 - 10 ppm : use mask No. 46 - emergency: use mask No. 53/47 - escape : use mask No. 24/51	Headache. Cough, lung edema, dizziness, nausea, nosebleed
Butadiene A2	-	1.0	-	5.0	2000 ppm	Mineral coal tubes, methylene chloride, gas chromatograph with flame ionization detector	At any remarkable concentration: use mask No.53/47 Escape: use mask No.24/51	Eye, nose and throat irritation, mild headache, sleepiness

Butylamine Skin	-	-	15.0	5.0	200 ppm	Silica gel, methanol, gas chromatograph with flame ionization detector	50 ppm: use mask No. 12/50/43 125 ppm : use mask No.38/44 -250 ppm : use mask No. 5/24/52/45/42 -2000 ppm : use mask No. 46 - emergency : use mask No. 53/47 - escape: use mask No. 24/51	Eye, nose and throat irritation, headache skin reddening and burns
Butyle compounds	36.0	10.0	1.8	0.5	500 ppm	Filter, hydrochloride acid/ 1,2 dichlorethane, gas chromatograph with light flame detector for sulfide, nitrogen or phosphorus	- 5Ppm : use mask No. 43/50/7 - 12.5 ppm : use mask No. 44/34 - 25 ppm : use mask No. 52/45/2/40/19 - 500 ppm : use mask No.48 - 1000 ppm : use mask No.46 - emergency : use mask No. 53/47 - escape : use mask No.19/51	Lung irritation, damage in the kidney and liver -
Butyle toluene	60.0	10.0	12.0	20.0	100 ppm	Mineral coal tube, carbon disulfide, gas chromatograph with flame ionization detector	-250 ppm : use mask No. 44/34 -500 ppm : use mask No. 2/19/52/45 -1000 ppm: use mask No.46 emergency: use mask No. 53/47 escape: use mask No. 19/51	Skin and eye irritation, nose and throat dryness, failure in the central nervous system and decline in bone marrow
Cadmium (fumes) A2	.005	-	-	-	9 mg/m3	Filer, acid, elements atomic absorption spectrum gauge	At any remarkable concentration: use mask No. 53/47 Escape: use mask No. 27/51	Lung edema, cough, respiration tightness, headache, anemia, muscular pain
Calcium oxide	2.0	-	-	-	25 mg/m3	Filer, acid, elements atomic absorption spectrum gauge	-10 mg/m^3: use mask No.14 -50 mg/m^3: use mask No.33/44 -100 mg/m^3: use mask No.27/52/45/39 250 mg/m^3 : use mask No. 48 emergency : use mask No.53/47 escape: use mask No.27/51	Eye and upper respiratory tract irritation, dermatitis
Camphor A4	2.0	2.0	-	-	200 mg/m3	Mineral coal tubes, methanol/carbon bisulphate, gas chromatograph with flame ionization detector	- 50 mg/m3: use mask No.44/36 - 100 mg/m^3: use mask No.4/22/41/52/45 - 200 mg/m3: use mask No.46 - emergency: use mask No.53/47 - escape: use mask No.23/51	Eye, skin and mucus membranes irritation, convulsion, headache, loss of smelling sense

Carbon monoxide	40.0	35.0	-	-	1200 ppm	Gas collection bags, probe	-350 ppm: use mask No.43/50 -875 ppm : use mask No.44 -1500 ppm : use mask No.52/45/24 -emergency: use mask No.53/47 escape: use mask No.24/51	Headache, nausea and dizziness, fainting and heart attack
Carbon tetrachloride Skin- A2	12.6	2.0	12.6	2.0	200 ppm	Mineral coal tubes, methanol/carbon bisulphate, gas chromatograph with flame ionization detector	At any remarkable concentration: use mask No.53/47 Escape : use mask No.19/51	Central nervous system failure, vomiting, kidney and liver damage, skin irritation, nausea and dizziness
Chlordane Skin –A3	0.5	-	-	-	100 mg/m3	Filter/chrome 102, foluene, gas chromatograph with electrons trapper detector	At any remarkable concentration: use mask No.53/43 Escape: use mask No.51/23	Kidney and liver damage, vomiting, diarrhea, unclear vision, inability to coordinate voluntary muscular movement, shivering, convulsion
Chlorine A4	1.5	0.5	3.0	1.0	10 ppm	Filter, ions chromatograph	-5 ppm : use mask No.12/43/50 -12.5 ppm : use mask No.44/38 -25 ppm : use mask No.52/45/42/5 -30 ppm : use mask No.46 emergency : use mask No.53/47 escape: use mask No.24/51	Eye, nose and mouth burns, cough, headache, lung edema, constriction, dizziness, nausea, fainting, dermatitis
Chlorine dioxide	0.3	0.1	0.9	0.3	5 ppm	Bubbly, potassium iodide, ions chromatograph	1 ppm : use mask No.12 - 2.5 ppm : use mask No.44/38 - 5 ppm : use mask No.5/24/52/45 - 10 ppm : use mask No.46 - emergency : use mask No.53/47 - escape : use mask No.24/51	Eye, nose and throat irritation, cough, lung edema, difficult breathing with whistling sound
Chlorobenzene A3	350	75.0	-	-	1000 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with electrons trapper detector	- 1000 ppm : use mask No.34/2 - 1875 ppm : use mask No.44 - 2400 ppm : use mask No.19/52/45 - emergency: use mask NO.53/47 - escape: use mask No.19/51	Eye, nose and skin irritation, damage to liver, sleepiness
Chlorodifluoro Methane A4	3500	1000	4375	1250	Unknown	Mineral coal tube, methylene chloride, gas chromatograph with flame ionization detector	--	--
Chloroform A3	9.78	2.0	-	-	500 ppm	Mineral coal tube, methylene chloride, gas chromatograph with flame ionization detector	At any remarkable concentration: use mask No. 53/47 Escape: use mask No. 19/51	Headache, eye and skin irritation, nausea and dizziness, stupidity and mental laziness
Chlorodi methyl ether A2	-	-	-	-	Unknown	Iminger tube, hexane, gas chromatograph with electrons trapper detector	At any remarkable concentration: use mask No. 53/47 Escape : use mask No. 19/51	Lung cancer, irritation

Chloro picrine A4	0.7	0.1	-	-	2 ppm	Unavailable	2.5 ppm: use mask No. 44/34 4 ppm: use mask No. 52/45/2/19 Emergency: use mask No. 47/53 Escape: No. 19/51	Eye and skin irritation, cough, lung edema, vomiting and nausea, over tears
Chloroprene skin	35.0	10.0	3.6	1.0	300 ppm	Mineral coal tube, methelyene chloride, gas chromatograph with flame ionization detector	At any remarkable concentration: use mask No. 53/47 Escape: use mask No. 19/51	Skin and respiratory system irritation, mood agitation, hair falling and boldness
Chloro toluene	250	50.0	375	75.0	Unknown	Unavailable	-	Agitation
Chromic acid	.001	-	0.1	-	15 mg/ m^3	Filter, detector, visual spectrum analyzer	At any remarkable concentration: use mask No. 53/47 Escape: use mask No. 27/51	Respiratory system agitation, liver and kidney damage, blood changes, skin sores
Chromium (metal) and chrome compounds A4	0.5	-	-	-	250 mg/m^3 25 mg/m^3	Filter, acid, atomic absorption spectrum gauge	- 2.5 mg/m3 : use mask No.14 - 12.5 mg/m3 use mask No. 31/44 - 25 mg/m3: use mask No.45/52/39/27 - 250 mg/m3 : use mask No.46 - emergency: use mask No. 53/47 - escape : use mask No. 27/51	Agitation, sensitivity and dermatitis
Chromium (metal) A1	0.05	-	-	-	250 ppm	Filter, acid, atomic absorption spectrum gauge	- 2.5 mg/m^3 : use mask No.14 - 12.5 mg/m^3 : use mask No. 31/44 - 25 mg/m^3: use mask No. 27/39/52/45 - 500 mg/m^3: use mask No. 46 - emergency: use mask No. 53/47 - escape : use mask No. 27/51	Kidney and liver cancer , irritation
Coal Dust A4	2.0 mg/m^3 (for inhaled dust) 0.1 mg/m^3 (for quartz)				Unknown	Filter, weight	-	Drop in Lung function
Coal tar pitch A1	0.1	-	-	-	80 mg/m^3	Filter, benzene, weight	At any remarkable concentration: use mask No. 53/47 Escape: use mask No. 23/51	Effects on urinary system, bronchitis, dermatitis
Cobalt (dust, smokes) A3	0.05	-	-	-	20 mg/m^3	Filter, acid, elements atomic absorption spectrum gauge	0.25 : mg/m^3 use mask No. 14 1.25 mg/m^3 : use mask No. 31/44/32 2.5 mg/m^3 : use mask No. 27/52/45/39 20 mg/m^3: use mask No.46 emergency : use mask NO. 53/47 escape: use mask No. 27/51	Cough, over sensitivity, dermatitis

Copper (dust)	1.0	-	-	-	100 mg/m^3	Filter, acid, elements atomic absorption spectrum gauge	5 mg/m^3 use mask No. 14 25 mg/m^3: use mask No. 31/44 50 mg/m^3:: use mask No. 27/39/52/45/49 2000 mg/m^3 : use mask No. 46 escape: use mask No. 53/47 emergency: use mask No. 27/51	Eye and nose irritation, anemia, liver, lung and kidney damage
Copper (fumes)	0.1	-	-	-	100 mg/m^3	Filter, acid, elements atomic absorption spectrum gauge	1 mg/m^3: use mask No. 13 5 mg/m^3: use mask No. 30/44 10 mg/m^3: use mask No. 27/39/52/45/49 20 mg/m^3: use mask No.46 emergency: use mask No. 53/47 escape: use mask No. 51/27	Eye and upper respiratory system irritation, fever, change in skin color
Cotton dust	0.2	-	-	-	100 mg/m^3	Vertical filter, weight	1 mg/m^3: use mask No.13 2.5 mg/m^3: use mask No. 30/44 5 mg/m^3: use mask No. 27/39/52/45/49 200 mg/m^3: use mask No. 46 emergency: use mask No. 53/47 escape: use mask No. 51/27	Cough, breathing with difficulty with whistling sound, breathing obstruction
Cresol and similar materials Skin	10.0	2.3	-	-	250 ppm	Oxidization tube, methanol, gas chromatograph with flame ionization detector	23 ppm : use mask No. 9/43/50 57.5 ppm : use mask No. 44/36 115 ppm : use mask No. 4/52/45/23/39/44 250 ppm : use mask No.46 escape: use mask No. 23/51	Eye and skin irritation, kidney, lung and liver damage, failure, confusion and disorder, dermatitis, breathing difficulty
Cyanides	5.0	-	10.0-	-	25 mg/m^3	Filter/bubbly, potassium hydroxide, specific ion pole	50 ppm : use mask No. 34/2 emergency : use mask No. 53/47 escape: use mask No. 25/51	Headache, vomiting, eye and skin irritation,, suffocation, disorder and confusion, nausea
Cyanogen	20.0	10.0			Unknown	Unavailable	-	Eye and skin and mucous membrane irritation
Cyanogen chloride	-	-	0.6	03	Unknown	Unavailable	-	Eye and ear irritation, effects on lung function (reduction of lung efficiency)
Cyclohexane	1050	300	-	-	1300 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	1000 ppm : use mask No. 34/2 7500 ppm use mask NO. 44 10.000 ppm : use mask No. 19/52/45 emergency: use mask No. 53/47 escape : use mask No. 19/51	Eye and respiratory system irritation, unconsciousness, dizziness, dermatitis

Cyclohexanol Skin	200	50.0	-	-	400 ppm	Mineral coal tube, 2-propotol/ carbon sulfate, gas chromatograph with flame ionization detector	500 ppm : use mask No. 7/43/50 10.000 ppm : use mask No. 34/2 2500 ppm : use mask No. 19/52/45 3500 ppm : use mask No. 46 emergency: use mask No. 43/47 escape: use mask No. 19/51	Eye, nose and throat irritation, numbness, dermatitis
Cyclohexanone Skin A4	100	25.0	-	-	700 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	- 625 ppm : use mask No. 44/34 - 1000 ppm: use mask No. 2 - 1250 ppm: use mask No. 19/52/45 - 5000 ppm : use mask No. 46 - emergency: use mask No. 53/47 - escape: use mask No. 19/51	Eye and mucus membranes irritation, headache, kidney damage, numbness, dermatitis
Cyclohexene	1015	300	-	-	2000 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	-1000 ppm : use mask No. 34/2 -7500 ppm : use mask No. 44 10.000 ppm : use mask No. 19/52/45 emergency: use mask No. 53/47 escape: use mask No. 19/51	Eye and respiratory system irritation, sleepiness
Cyclopentadiene	200	75.0	-	-	750 ppm	Chromium tube, ethyle acetate , gas chromatograph with flame ionization detector	-750 ppm : use mask No. 7/43/50 -1000 ppm: use mask No. 34/2/40 - 1875 ppm : use mask No. 44 - 2000 ppm: use mask No. 19/52/45 - emergency: use mask No. 53/47 - escape: use mask No. 19/51	Eye and nose irritation
Diazinon Skin – A4	0.1	-	-	-	Unknown	Sampler, Toluene / acetone, gas chromatograph with sulfate light detector, nitrogen or phosphor	-	-
Diborane	0.1	0.1	-	-	15 ppm	Filter/ mineral coal tube, hydrogen peroxide, plasma emission spectrum	1 ppm : use mask No. 43/50 -2.5 ppm : use mask No. 44 -5 ppm : use mask No. 52/45/49 -40 ppm : use mask No. 55/47 -emergency: use mask No. 53/47 - escape: use mask No. 25/51	Breathing difficulty, cough, headache, nausea, dizziness, shivering
Di- bromoethane	0.3	.0.45	-	0.13	100 ppm	Mineral coal tube, benzene/methanol, gas chromatograph with electron trapper detector	At any remarkable concentration : use mask No. 53/47 Escape: use mask No. 19/51	Eye and respiratory system irritation, dermatitis
P-Dichlorobenzene A3	450	75.0	-	-	150 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with ionized flame	At any remarkable concentration : use mask No. 53/47 Escape: use mask No. 19/51	Headache, eye irritation, vomiting, nausea, jaundice, liver fibrosis, nose inflammation

DDT A3	0.5	-	-	-	500 mg/m^3	Filter, iso octane, carbon bisulfate, gas chromatograph with flame ionization detector	At any remarkable concentration : use mask No. 53/47 Escape: use mask No. 23/51	Eye and skin irritation, shivering, dizziness, nausea, disorder, confusion, convulsion
Dichloroethane A4	400	100	-	-	3000 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	1000 ppm : use mask No. 43/50 - 2500 ppm: use mask No. 44 - 4000 ppm : use mask No. 52/45 - emergency: use mask No. 53/47 - escape: use mask No. 19/51	Central nervous system failure, skin irritation, kidney and liver damage
1,1- Dichloroethylene A3	20.0	5.0	79.0	20.0	Unknown	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	At any remarkable concentration: use mask No. 53/47 Escape: use mask No. 51/19	Central nervous system failure, eye and respiratory system irritation
1,2 Dichloro ethylene	790	200	-	-	1000 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	-1000 ppm : use of mask NO.2/34 -4000 ppm: use mask No. 44/19/52/45 emergency: use mask No. 53/47 escape: use mask No. 19/51	Central nervous system failure, eye and respiratory system irritation
Dichloro ethylether – A4	30.0	5.0	60.0	10.0	100 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	At any remarkable concentration: use mask No. 53/47 Escape: use mask No. 51/19	Throat and nose irritation, vomiting, nausea, excessive tears
Dichloromonofluoro Methane	40.0	10	-	-	5000 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	-100 ppm : use mask No. 50/43 -250 ppm : use mask No. 44 -500 ppm : use mask No. 45/52 -10.000 ppm: use mask No. 47/19 emergency: use mask No. 53/47 escape: use mask No. 19/51	Suffocation, heart stop, irregularity of pulse
Dichloromethane A3	-	25.0	-	125	2300 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	At any remarkable concentration: use mask No. 53/47 Escape: use mask No. 51/19	Exhausion, weakness, eye and skin irritation, sleepiness, numbness in the limbs
Dichloro-nitro ethane	10.0	2.0	-	-	25 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	-20 ppm : use mask No. 43/50 -50 ppm : use mask No. 44 -100 ppm : use mask No. 52/45 -150 ppm : use mask No. 46 -emergency: use mask No. 53/47 escape: use mask No. 19/51	Eye and skin irritation, kidney and liver and heart damage, lung edema, bleeding
Dieldrin Skin – A4	0.25	-	-	-	50 mg/m^3	Filter, iso octane, gas chromatograph with electrons trapper detector	At any remarkable concentration: use mask No. 53/47 Escape: use mask No. 51/23	Headache, kidney and liver damage, comma, nausea, dizziness, convulsion and shivering, tension

Di ethyl ether	1200	400	-	500	900 ppm	Mineral coal tube, ethyl acetate, gas chromatograph with flame ionization detector	At any remarkable concentration: use mask No. 53/47 Escape: use mask No. 19/51	Irritation, numbness
Di Gylcidyl ether A4	0.5	0.1	-	-	10 ppm	Unavailable	At any remarkable concentration: use mask No. 47/53 Escape: use mask No. 19/51	Irritation, blood changes, damage in reproductive organs
Di-iso tuolene cyanate and similar substances	.036	.005	0.07	0.02	2.5 ppm	Iminger tube, fluid chromatograph supplied with fluorescent detector / electron trapper detector	At any remarkable concentration: use mask No. 47/53 Escape: use mask No. 51/19	Nose and throat irritation, cough, vomiting, nausea, lung edema, asthma, breathing difficulty
Dimethylamine A4	18.0	10.0	-	15.0	500 ppm	Silica gel, sulfate acid/ methanol, gas chromatograph with flame ionization detector	250 ppm: use mask No. 44 -500 ppm use mask No. 45/52 -2000 ppm use mask No. 46 - emergency: use mask No. 47/53 - escape: use mask No. 51/24	Nose and throat irritation, cough, lung edema, sneezing, conjunctivitis, dermatitis, breathing difficulty
Dimethylformalide Skin-A4	30.0	10.0	-	-	500 ppm	Silica gel, methanol, gas chromatograph with flame ionization detector	-100 ppm: fuse mask No. 43/50 -250 ppm : use mask No. 44 -500 ppm : use mask No. 52/45/49 -3500 ppm : use mask No. 46 emergency: use mask No. 53/47 escape: use mask No. 51/19	Vomiting, nausea, high blood pressure, face reddening, dermatitis
Dimethylsulfate Skin – A3	0.5	0.1	-	-	7 ppm	Urabag tube, ether dithyl, gas chromatograph with electrolyte connection detector	At any remarkable concentration: use mask No.24/51 Escape : use mask No.51/24	Eye and nose irritation, cough, vomiting, diarrhea, breathing difficult, urination difficulty
Dinitrobenzene	1.0	0.15	-	-	50 mg/m^3	Filter/bubbly, methanol, gas chromatograph with ultra violet rays detector	5 mg/m3: use mask No.14 -25 mg/m3: use mask No.44/31 -50 mg/m3 : use mask No.49/45/52/39/27 -200 mg/m3: use mask No.48 escape: use mask No.47/53 emergency: use mask No.51/27	Through dryness, liver damage, blue skin, drop of oxygen in the tissues
Dinitrotoluene Skin – A3	1.5	-	-	-	50 mg/m^3	Filter/ telax, acetone, gas chromatograph with thermal energy analyzer detector	At any remarkable concentration: use mask No.47/53 Escape : use mask No.51/23	Anemia, jaundice, drop of oxygen in the tissues
Dioxane Skin – A3	90.0	25.0	3.6	-	500 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	At any remarkable concentration: use mask No.47/53 Escape : use mask No.51/19	Headache, vomiting, nausea, eye, nose, throat and skin irritation, liver damage, renal failure

Diphenyl	1.0	0.2	-	-	100 mg/m^3	Gas chromatograph, telax , carbon tetrachloride, gas chromatograph with flame ionization detector	At any remarkable concentration: use mask No.47/53 Escape : use mask No.51/23	Throat and eye dryness, headache, liver damage, exhaustion, nausea, dizziness,
Diphemyl Amine A4	10.0	-	-	-	Unknown	Filter, methanol, gas chromatograph	-	Kidney and liver damage, eye and urethra irritation
Diuron	10.0	-	-	-	Unknown	Sampler, liquid, liquid chromatograph with ultra violet rays detector	-	Eye, nose, skin and throat irritation in animals, effects on respiratory and circulatory systems
Divinyl Benzene	50.0	10.0	-	-	Unknown	Mineral coal tube, toluene, gas chromatograph with flame ionization detector	-	Eye, nose and throat irritation, central nervous system effects
Endrin Skin – A4	0.1	-	-	-	2 mg/m3	Filter/chrom 2, 1, toluene, gas chromatograph with electrons trapper detector	1mg/m3: use mask No.50/43/10 -2.5 mg/m3 : use mask No.37/44 -5 mg/m3: use mask No.45/52/4 -100 mg/m3 : use mask No.48 -200 mg/m3 : use mask No.46 escape: use mask No.:51/23	Headache, vomiting, nausea, convulsions, disorder, insomnia
Ethanolamine	8.0	3.0	15.0	6.0	30 ppm	Silica gel, methanol/water, gas chromatograph with flame ionization detector	30 ppm: use mask No.12/50/43 -75 ppm : use mask No.38/44 -150 ppm: use mask NO.45/52/24/5 -1000 ppm : use mask No.46 emergency: use mask No.47/53 escape : use mask No.51/24	Eye, skin and respiratory system irritation, sleepiness
Ethyl Alcohol A4	1900	1000	-	-	3300 ppm	Mineral coal tube, gas chromatograph with flame ionization detector	Above 3300 ppm: use mask No. 43 /52 Emergency: use mask No. 47 Escape : use mask No. 51	Agitation, central nervous system failure, kidney and liver damage
Ethylamine Skin	18.0	10.0	-	15.0	600 ppm	Silica gel, sulfide acid, gas chromatograph with flame ionization detector	-250 ppm : use mask No. 38/44 -500 ppm : use mask No. 45/52/24/5 -4000 ppm : use mask No. 46 emergency: use mask No. 47/53 escape : use mask No. 51/24	Eye and respiratory system irritation, dermatitis
Benzenethyl	435	100	545	125	800 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	-1000 ppm : use mask No. 34/43/50/7 -2000 ppm : use mask No. 19/52/45 -emergency: use mask No. 53/47 -escape: use mask No. 19/51	Eye and mucous membrane irritation headache loss of consciousness anesthesia and skin irritation.
Ethylene A4	11500	10000	-	-	Unknown	Unavailable	Oxygen existence should not be less than 19.5%	Suffocation

Ethyl butyl ketone	230	50.0	-	75.0	2000 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	-500 ppm : use mask No. 7/43/50 -1000 ppm : use mask No. 2/34 -1250 ppm : use mask No. 44 -2500 ppm : use mask No. 45/52/19 -emergency: use mask No. 47/53 escape: : use mask No. 19/51	Eye and mucous membrane irritation headache faint anesthesia and skin irritation
Ethylene chlorohydrene Skin- A4	-	-	3.0	1.0	2 ppm	Mineral coal tube, 2-propanol/ carbon bisulfate, gas chromatograph with flame ionization detector	-10 ppm : use mask No. 50/43 emergency: use mask No. 53/47 escape : use mask No. 19/51	Mucous membrane irritation vomiting dizziness headache faints vision disorder.
Ethylene glycol aerosol A4	125	50.0	100	-	Unknown	Sampler, methanol, gas chromatograph with flame ionization detector	-	Eye and mucous membrane irritation kidney, renal and brain failure.
Ethylene glycol dinitrate Skin	-	0.05	0.1	-	75 mg/m3	Gas chromatograph, telax, thanol, gas chromatograph with electron trapper detector	1mg/m3: use mask No. 43/50 2.5 mg/m3: use mask No. 44 5mg/m3: use mask No. 52/45/49 200 mg/m3: use mask No. 46 emergency: use mask No. 53/47 escape: use mask No. 51/23	Headache, vomiting failure in central nervous system. Skin irritation kidney and renal failure dizziness and angina.
Ethylene amine Skin – A3	-	0.5	-	-	100 ppm	Bubbly, chloroform, fluid chromatograph with ultra violet rays detector	In any observed concentration: use mask No. 53/47 Escape use mask No. 19/51	Headache, vomiting, kidney and renal failure, lung dropsy, dizziness
Ethylene oxide A2	-	3.0	9.0	5.0	800 ppm	Mineral coal tube, fimethyl formamide, gas chromatograph with electron trapper detector	5 ppm: use mask No. 24/52/45 Emergency: use mask No. 53/47 Escape: Use mask No. 24/51	Nose, throat and eye irritation, vomiting dizziness, headache, lung dropsy, eye and skin burns
Ethyl ether	1200	400	1500	500	1900 ppm	Mineral coal tube, ethyl acetate, gas chromatograph with flame ionization detector	1000 ppm use mask No. 7/34 4000 ppm use mask No. 43/50 10000 ppm use mask No. 44 19000 ppm use mask No. 19/52/45 Emergency use mask No. 53/47 Escape use mask No. 19/51	Headache, vomiting, eye, skin and respiratory system irritation, dizziness and sleepiness
Ethyl compounds	1.0	0.5	1.3	0.5	500 ppm	Filter, hydrochloric acid/ 1,2 dichlorothane , gas chromatograph/ sulfide elements atomic absorption spectrum gauge, nitrogen or phosphor	5 ppm use mask No. 43/50/7 12.5 ppm use mask No. 44/34 25 ppm use mask No. 52/45/19/40/2/49 500 ppm use mask No. 48 Emergency use mask No. 53/47 Escape use mask No. 19/51	Headache, kidney and renal failure, mucous membrane irritation, sickness and dizziness

N-Ethyl morpholine Skin	23.0	5.0	-	-	100 ppm	Silica gel, sulfuric acid, gas chromatograph with flame ionization detector	50ppm : mask 43/50/7 125ppm : mask 44/34 250ppm: mask 52/45/2/19/40/49 2000ppm: mask 53/37 emergency: mask 53/47 escape: mask 19/51	Eye, nose and throat irritation, vision disorder
Finamiphos Skin-A4	0.1	-	-	-	Unknown	Sampler, toluene / acetone, gas chromatograph with flame ionization detector	_	_
Fenitheon Skin-A4	0.2	-	-	-	Unknown	Unavailable	_	_
Ferrie salts solvable	1.0	-	-	1.0	Unknown	Filtes, acids, dual propulsion plasma	_	Respiratory system agitation
Hydrogen fluorides	-	-	-	3.0	30 ppm	Silica gel, sodium bicarbonate/sodium carbonate, ions chromatograph	Emergency: mask 53/47 EscapeZ: mask 24/51	Eye, nose and throat irritation, lung edema, eye and skin burns, bronchitis
Fluorides A4	2.5	-	-	-	250 ppm mg/m^3	Sodium hydroxide, specific ion pole	12.5mg/m3: mask 14 62.5 mg/m3: mask 31/44 125mg/m3: mask 52/45/27 500mg/m3: mask 46 emergency: mask 53/47 escape: mask 27/51	Eye and respiratory system irritation, diarrhea, nausea, dizziness, dermatitis
Fluorine	0.2	0.1	-	2.0	25 ppm	Unavailable	1ppm : mask 34/50 2.5ppm : mask 44 5ppm : mask 52/45 25ppm: mask 46 emergency: mask 53/47 escape: mask 24/51	Eye, nose and respiratory system irritation, lung edema, bronchitis
Formaldehyde	-	.016	-	0.1	20ppm	Silica gel, fluid chromatograph with ultraviolet rays detector, acetonitril	At any remarkable concentration: mask 53/47 Escape: mask 24/51	Eye, nose and throat irritation
Formic acid	9.0	5.0	-	10.0	30ppm	Silica gel, water, ion chromatograph	30 ppm: mask 43/50 emergency: mask 53/47 escape: mask 23/51	Eye and throat irritation, cough, dermatitis, breathing difficulty, excess tears

Furfural Skin A3	8.0	2.0	-	-	100ppm	Oxidization tube, toluene, gas chromatograph with flame ionization detector	20ppm : mask 7/43/50 50 ppm: mask 44/34 100ppm: mask 2/19/52/45/40/49 250ppm: mask 46 emergency: mask 53/47 escape: mask 19/51	Eye and upper respiratory system irritation, headache, dermatitis
Gasoline A3	900	300	1500	500	Unknown	Unavailable	Emergency: mask 47 Escape: mask 19/50	Central nervous system failure, irritation in respiratory syste,
Germanium tetrahydride	0.6	0.2	-	-	Unknown	Unavailable	—	Lung edema, kidney and liver damage
Glycidol A3	75.0	25.0	-	-	150 ppm	Mineral coal tube, tetrahdyrofuran, gas chromatograph with flame ionization detector	Emergency: mask 53/47 Escape: mask 19/51	Irritation, formation of malignant diseases
Hafnium	0.5	-	-	-	50mg/m^3	Filter, acid, plasma emission spectrum	2.5mg/m^3: mask 14 12.5mg/m^3: mask 31/44 25mg/m^3: mask 27/39/52/45/49 250mg/m^3: mask 46 emergency: mask 53/47 escape: mask 27/51	Eye, skin and mucous membrane irritation, liver damage
Hallothane A4	-	50.0	16.2	2.0	Unknown	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	_	Central nervous system irritation
Heptachlor Skin-A3	0.5	-	-	-	35mg/m^3	Chrome 102, toluene, gas chromatograph with electron trapper	At any remarkable concentration: mask 53/47 Escape: mask 23/51	Liver damage, shivering , convulsion
Heptane and similar substances	1600	400	2000	5000	750 PMM	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	850ppm: mask 7/43/50 1000ppm: mask 34/2 2125ppm: mask 44 4250ppm: mask 19/52/45/49 emergency: mask 53/37 escape: mask 19/51	Mild headache, nausea, dizziness, dermatitis, loss of appetite, lung disease
Hexachlorocyclohexane Skin	0.5	-	-	-	50mg/m^3	Filter/bubbly, isooctane, gas chromatograph with electrolyte conductivity detector	5mg/m^3: mask 10/43/50 12.5mg/m^3: mask 37/44 25mg/m^3: mask 4/52/45 1000 mg/m^3: mask 53/47 emergency: mask 46 escape: mask 51	Eye, nose, throat and skin irritation, kidney and liver damage, anemia, convulsion

Hexachlorocyclo Pentadiene A4	0.1	0.01	-	-	Unknown	Bur pack tube, hexane, gas chromatograph with electron trapper detector	_	Respiratory system irritation, lung edema
Hexachloronaphthalene	0.2	0.01	-	-	2 mg/m^3	Filter, hexane, gas chromatograph with electron trapper	2mg/m^3: mask 43/50 emergency: mask 53/47 escape: mask 19/51	Comma, disorder, jaundice, dermatitis
Hexa Fluro Acetone Skin	0.7	0.1	-	-	Unknown	Unavailable	_	Kidney damage, reproductive organs damage
Hexa Methylene Disocyanate	.034	.005	0.14	0.02	Unknown	Fluid chromatograph/Iminiger, fluorescent detector/electron trapper detector	0.05ppm: mask 43 0.125ppm : mask 44 0.25ppm: mask 52/45 1ppm: mask 46 emergency: mask 53 escape: mask 19/51	Agitation, allergy
Hexane Skin	180	50.0	-	-	1100 ppm	Mneral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	500ppm: mask 43/50 1250ppm: mask 44 2500 ppm: mask 49/52/45 5000ppm: mask 46 emergency: mask 53/47 escape: mask 19/51	Eye and nose irritation, headache, limb numbness, pneumonia
Hexanone Skin	20.0	5.0	-	-	1600 ppm	Mneral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	10ppm: mask 43/50 25ppm: mask 44 50ppm: mask52/45/49 2000ppm: mask 46 emergency: mask 53/46/47 escape: mask 19/51	Eye and nose irritation, headache, external nerves inflammation, dermatitis
Hydrazine A3	0.10	0.1	0.04	0.03	50 ppm	Bubbly, detector, visual spectrum analyzer	At any remarkable concentration: mask 53/47 Escape: mask 51	Eye, nose and throat irritation, lung edema, dizziness, nausea, bronchitis, dermatitis
Hydrogen bromide	-	-	10	3.0	30 ppm	Silica gel, sodium bicarbonate/sodium carbonate, ion chromatograph	50ppm: mask 44/28/17/52/45 emergency: mask 53/47 escape: mask 17/51	Eye, nose and throat irritatio, eye and skin burns
Hydrogen chloride	-	-	7.5	5.0	50 ppm	Silica gel, sodium bicarbonate/sodium carbonate, ion chromatograph	50ppm: mask 43/50/12 100ppm: mask 44/52/45/24/5/38 emergency: mask 53/46/47 escape: mask 17/51	Bronchitis, nose, throat and trachea irritation, dermatitis

Hydrogen cyanide	11.0	10.0	5.0	4.7	50 ppm	Soda lime, water, vision spectrum analyzer	47ppm: mask 34/50 50ppm: mask 44/52/45 at any remarkable concentration: 53/47' escape: mask 24/51	Headache, change in breathing rate, vomiting, nausea, suffocation, confusion
Hydrogen fluoride	2.6	3.0	-	6.0	30 ppm	Silica gel, sodium bicarbonate/sodium carbonate, ion chromatograph	30ppm: mask 43/50/38/12/24 emergency: mask 53/47 escape: mask 24/51	Eye, nose and throat irritation, lung edema, bronchitis
Hydrogen peroxide	1.4	1.0	4.2	3.0	75 ppm	Bubbly, visual spectrum analyzer	10ppm: mask 43/50 25ppm: mask 44 50ppm: mask 52/45 75ppm: mask 46 emergency: mask 53/46/47 escape: mask 24/51	Eye, nose and throat irritation, hair whitening , ulcer, dermatitis,
Hydrogen phosphide	0.4	0.3	1.0	1.0	50 ppm	Carbon, water, ion chromatograph	3ppm: mask 43 7.5ppm: mask 44 15ppm: mask 24/52/45 50ppm: mask 48 emergency: mask 53/47 escape: mask 24/51	Vomiting, nausea, stomach and muscle pain, shivering, comma, numbness, breathing difficulty
Hydrogen sulfide	14.0	10.0	21.0	15.0	100 ppm	Dry tube/ ammonium hydroxide/hydrogen peroxide, ion chromatograph	100ppm: mask 43/50 250ppm: mask 44 300ppm: mask 52/45 emergency: mask 53/47 escape: mask 24/51	Comma, eye and respiratory system irritation, convulsions, headache, dizziness, nausea, cornea calcification
hydroquinone A3	-	-	-	-	50 mg/m^3	Filter, acetic acid, fluid chromatograph with ultraviolet rays detector	50mg/m3: mask 30 100mg/m3: mask 27/52/45/39/49 200mg/m3: mask 46 emergency: mask 53/47 escape: mask 27/51	Eye irritation, increased breathing, central nervous system irritation, nausea, dizziness, agitation or excitement
Lodine	1.0	0.1	1.0	0.1	2 ppm	Mineral coal tube, sodium carbonate, ion chromatograph	1ppm: mask 43/50 2.5ppm: mask 44 5ppm: mask 52/45 10ppm: mask 46 emergency: mask 53/47 escape: mask 18/51	Eye, nose irritation, skin burns, headache, breathing difficulty, skin allergy, skin rash

Iron oxide dust and fume A4	5.0	-	-	-	2500 mg/m^3	Filter, acid, dual propulsion plasma	50mg/m3: mask 16/43 125mg/m3: mask 44/32 250mg/m3: mask 27/49/39/52/45 emergency: mask 53/47 escape: mask 27/51	Lung unclearness
Isophorone A3	23.0	4.0	-	-	200 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	40ppm: mask 43/50/7 100ppm: mask 44/34 200ppm: mask 19/52/45/40/49 800ppm: mask 46 emergency: mask 53/47 escape: mask 19/51	Eye, nose and throat irritation, numbness, dermatitis
Isopropyl alcohol (isoprobalo)	980	400	1225	500	2000 ppm	Mineral coal tube, 2 buytanol/carbon bisulfate, gas chromatograph with flame ionization detector	1000 ppm: mask 34/2 10,000 ppm: mask 44 12,000 ppm: mask 19/52/45 emergency: mask 53/47 escape: mask 19/51	Eye, nose and throat irritation, headache, dryness and fissures in the skin, sleepiness, nausea, dizziness
Isopropylamine	12.0	5.0	24.0	10.0	750 ppm	Bubbly, sodium hydroxide, gas chromatograph with flame ionization detector	125ppm: mask 44/38 250ppm: mask 5/24/52/45/42 4000ppm: mask 46 emergency: mask 53/47 escape: mask 24/51	Eye, nose and throat irritation, lung edema, vision disorder, dermatitis
Lead (metal) A3	0.1	-	-	-	100mg/m^3	Filter, nitric acid/hydrogen peroxide, elements atomic absorption spectrum gauge	0.5mg/m^3: mask 43/26/50 1.25mg/m^3: mask 33/44 2.5mg/m^3 : mask 27/39/52 50mg/m^3: mask 48 100mg/m^3: mask 46 emergency: mask 53/46	Anemia, stomach convulsion
Lead Arsenate A2	0.15	-	-	-	100mg/m^3	Filter, nitric acid/hydrogen peroxide, elements atomic absorption spectrum gauge	0.5mg/m^3: mask 43/26/30 1.25mg/m^3 : mask 33/44 2.5mg/m^3 : mask 27/39/52 50mg/m^3: mask 48 100mg/m^3: 46 emeregency: mask 53/46 escape: mask 27/51	Effects on central nervous system, anemia, effects on kidney, damage in reproductive system

Lead chromate A2	0.5	-	-	-	100mg/m^3	Filter, nitric acid/hydrogen peroxide, elements atomic absorption spectrum gauge	0.5 mg/m^3: mask 43/26/30 1.25 mg/m^3 : mask 33/44 2.5 mg/m^3 : mask 27/39/52 50 mg/m^3: mask 48 100 mg/m^3: 46 emeregency: mask 53/46 escape: mask 27/51	Lung cancer, damage in reproductive system
Lithium hydride	.025	-	-	-	0.5mg/m^3	Unavailable	0.25 mg/m^3: mask 43/50/26 0.625 mg/m^3: mask 44/32 1.25 mg/m^3: 27/52/45/39 50 mg/m^3: 46 emergency: mask 53/47 escape: mask 27/51	Eye, skin and mouth burns, muscle strain, mental disturbance, unclear vision
Liquid Petroleum Gas (LPG)	1800	1000	-	-	2000 ppm	Inflammable gases gauge	2000ppm: mask 43/52 emergency: mask 53/47 escape: mask 51	Suffocation
Malathion A4	10.0	-	-	-	250mg/m^3	Sampler, toluene/acetone, gas chromatograph with light flame detector for sulfur, nitrogen or phosphor	1000mg/m^3: mask 43/50/10 250mg/m^3: mask 44/37 500mg/m^3: mask 52/45/4/23/41/49 5000mg/m^3: mask 46 emergency: mask 53/47 escape: mask 23/51	Eye and skin irritation, loss of appetite, unclear vision, nausea and dizziness, disorder, breathing difficulty with wheezing sound, inability to coordinate voluntary muscle movement
Manganese	1.0	-	3.0	-	500mg/m^3	Filter, acid, dual propulsion plasma	25mg/m^3: mask 31/44 50mg/m^3: mask 27/39/52/45/49 1000mg/m^3: mask 48 2000mg/m^3: mask 46 emergency: mask 53/47 escape: 27/51	Cough, breathing difficulty, vomiting, exhaustion, mental disorder
Marble (calcium carbonate)	10.0 total 5.0 inhale	-	-	-	Unknown	Filter, weight	—	Irritation
Mercury compounds Skin	0.05	-	0.1	-	10mg/m^3	Acid, cold elements atomic absorption spectrum gauge	0.5mg/m^3: mask 12/43/50 1.25mg/m^3: mask 44/38 2.5mg/m^3: mask 52/45/49/5/24/42 28mg/m^3: mask 48 emergency: mask 53/47 escape: mask 24/51	Vomiting, nausea, dizziness, hearing, vision and feeling disorder, diarrhea, inability to coordinate muscle movement, excess saliva excretion

Mercury (organic) alkaylic compounds	0.01	-	0.03	-	2mg/m^3	Unavailable	0.1mg/m^3: mask 43/50 0.25mg/m^3: mask 44 0.5mg/m^3: mask 52/45/49 10mg/m^3: mask 48 emergency: mask 53/47 escape: mask 51	Vomiting, nausea, dizziness, hearing, vision and feeling disorder, diarrhea, inability to coordinate muscle movement, excess saliva excretion
Methoxy acetate	0.5	0.1	-	-	200 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	1 ppm : mask 43 2.5 ppm: mask 44 5 ppm: mask 52/45 100 ppm: mask 48 200 ppm: mask 46 emergency: mask 53/47 escape: mask 19/51	Irritation
Methoxychlor	10.0	-	-	-	5000 mg/m^3	Filter, iso-octane, gas chromatograph with electron trapper detector	At any remarkable concentration: mask 53/47 Escape: mask 23/51	Kidney and liver damage, muscle strain, convulsions
Methyl acetate	610	200	760	250	3100 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	2000ppm: mask 7/43 3100 ppm: mask 44/2/17/28/52/45 emergency: mask 53/47 escape: mask 17/51	Irritation
Methyl Acrylate A4	35.0	10.0	-	-	250 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	100ppm: mask 43/50 250ppm: mask 44 500ppm: MASK 52/45 1000ppm: mask 46 emergency: mask 53/47 escape: mask 19/51	Eye and upper respiratory system irritation, dermatitis
Methanol Skin	260	200	325	250	6000 ppm	Silica gel, water, gas chromatograph with flame ionization detector	2000 ppm : mask 43/50 5000 ppm : 44 10,00 ppm : 52/45/49 25,000 ppm: mask 46 emergency: mask 53/47 escape: 51	Eye irritation, vomiting and nausea, headache, vision disorder, blindness
Methylamine	-	5.0	-	15.0	100 ppm	Oxidization tube, detector, fluid chromatograph with fluorescent detector	100ppm: 52/45/24/38 emergency: mask 53/47 escape: mask 24/51	Eye and respiratory system irritation, cough, skin and mucous membrane burns, dermatitis
Methylchloroform A4	1900	350	2450	450	700 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	700ppm: mask 43/50 emergency: mask 53/50 escape: mask 19/51	Headache, central nervous system failure, instability, heart beat disorder, dermatitis

Methyl ethyl keton peroxide	-	-	5.0	0.7	Unknown	Imbinger tube, visual spectrum analyzer	__	Agitation, liver and kidney damage
Methyl hydrazine Skin A3	-	0.01	-	-	20 ppm	Bubbly, visual spectrum analyzer	At any remarkable concentration: mask 53/47 Escape: mask 51	Eye and respiratory system irritation, shivering, inability to coordinate muscle voluntary movement, convulsions, drop of oxygen in tissues
Methyl iso butyl keton	205	50.0	300	75.0	50 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	Up to 500 ppm concentration: mask 7/20/40/43 Emergency: mask 53/47 Escape: mask 20/51	Eye, nose and throat irritation, kidney and liver damage, numbness
Methyl isopropyl keton	705	200	-	-	Unknown	Unavailable	__	Eye, nose and throat irritation, numbness
Methyl compounds	1.0	0.5	-	-	150 ppm	Filter, hydrochloric acid/methylene chloride, gas chromatograph with light flame detector for sulfur, nitrogen or phosphor	5 ppm: mask 43/50/7 12.5 ppm: mask 44/34 25 ppm: mask 52/45/2/19/40/49 400 ppm: mask 48 emergency: mask 53/47 escape: mask 19/51	Lung irritation, numbness, convulsions
Methacriyl methyl	-	100	-	-	1000 ppm	Oxidization tube, carbon bisulfate, gas chromatograph with flame ionization detector	1000 ppm : mask 34/2 2500 ppm : mask 44 4000 ppm : mask 19/52/45 emergency: mask 53/47 escape: mask 19/51	Eye, nose and throat irritation, dermatitis
Methyl styrene and similar substance	480	100	-	100	400 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	400 ppm: mask 7/34/19/43/52 emergency: mask 53/47 escape: mask 19/51	Eye, nose and throat irritation, dermatitis
Marpholine Skin A4	70.0	20.0	105	30.0	1400 ppm	Silica gel, sulfuric acid/sodium hydroxide, gas chromatograph with flame ionization detector	550 ppm : mask 44/34 1000 ppm: mask 52/45/2 8000 ppm: mask 46 emergency: mask 53/47 escape: mask 19/51	Vision disorder, eye, nose, skin and respiratory system irritation, cough, kidney and liver damage
Naphtha (coal tar)	400	100	-	-	1000 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	1000 ppm : mask No.34/2 2500 ppm: mask No.44 5000 ppm : mask NO.19/52/45 10.000 ppm : mask NO.46 emergency: mask No.53/47 escape : mask NO.19/51	Eye and nose irritation, mild headache, sleepiness, dermatitis

Naphthalene A4	50.0	10.0	75.0	15.0	250 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	100 ppm : mask NO.9/43/50 250 ppm: mask No.44/36 500 ppm : mask NO.4/52/45 emergency: mask No.53/47 escape: mask No.23/51	Headache, vomiting, nausea, eye irritation, confusion and disorder, agitation, jaundice, kidney damage
Nickel carbonyl	-	0.05	-	-	7 ppm	Mineral coal tube, nitric acid, atomic absorption machine for elements without flame, supplied with graphite analyzer	At any remarkable concentration: mask no.53/47 Escape: mask No.27/51	Allergy, pneumonia, dermatitis
Soluble nickel compounds A4	0.1	-	-	-	10 mg/m^3	Filter, acid, dual plasma	At any remarkable concentration: mask no.53/47 Escape: mask No.24/51	Headache, eye, nose and throat irritation, nausea, dizziness and dermatitis
Nickel metal and its non insoluble compounds	1.0	-	-	-	10 mg/m^3	Filter, acid, dual plasma	At any remarkable concentration: mask no.53/47 Escape: mask No.24/51	Headache, vomiting, nausea, dizziness, hallucination, or irritation
Nicotine Skin	0.5	-	-	-	3 mg/m^3	Oxidization tube, ethyl acetate, gas chromatograph with alkaline ionic ionization detector	5 mg/m3: mask No.43/50 12.5 mg/m3: mask No.44 25 mg/m3: mask No.46 35 mg/m3: mask No.46 emergency: mask No.: 53/47 escape: mask NO.19/51	Headache, convulsions, disorder in hearing and vision, nausea, dizziness, excess salivary secretion, stomachache, disorder or confusion, irregular heart beats
Nitroaniline Skin- A4	3.0	-	-	-	300 mg/m^3	Filter, 2-probatol, fluid chromatograph with ultraviolet rays detector	30 mg/m3: mask No.43/50 75 mg/m3: mask No.44 150 mg/m3: mask No.52/45 300 mg/m3: mask No.46 emergency: mask No.53/47 escape: mask No.19/51	Vomiting, diarrhea, anemia, agitation, inability to coordinate voluntary muscular movement, convulsions, blue skin, breathing difficulty
Nitrobenzene Skin – A3	-	1.0	-	-	200 mg/m^3	Silica gel, methanol gas chromatograph with flame ionization detector	10 ppm : mask No. 7/43/50 25 ppm : mask No. 44/34 50 ppm : mask No. 2/19/52/45 200 ppm : mask No. 46 emergency: mask No. 52/47 escape: mask No. 22/51	Eye irritation, kidney and liver damage, anemia, drop of oxygen in tissues, dermatitis
Nitrogen dioxide A4	1.8	1.0	-	-	20 ppm	Detector, visual spectrum analyzer	25 ppm : mask No.44 50 ppm : mask No. 52/45 emergency: mask No.53/47 escape: mask No.24/51	Irritation, lung edema

1- Nitropropane A4	-	25.0	-	-	1000 ppm	Oxidization tube, carbon bisulfate, gas chromatograph with nitrogen/phosphor detector	250 ppm : mask No. 43/50 625 ppm : mask No. 44 1250 ppm : mask No. 52/45 2300 ppm : mask No. 46 emergency: mask No. 53/47 escape: mask No. 51	Eye irritation, headache, vomiting, nausea, diarrhea
Oil mist	5.0	-	10.0	-	2500 ppm	Filter, 1,1,2- tricholoride, 1,2,2 ethyl trifluride, infrared rays measuring system	50 mg/m^3: mask No. 43/50/26 125 mg/m^3: mask No. 44/33 emergency: mask No. 53/47 escape: mask No. 27/51	Respiratory system effects
Ozone	-	0.1	-	0.3	5 ppm	Filter, water, ions chromatograph	1 ppm: mask No. 43/50/12 2.5ppm: mask No. 44/38 5 ppm: mask No. 5/24/52/45/49 10 ppm: mask No. 46 emergency: mask No. 53/47' escape: mask No. 24/51	Eye and mucous membrane irritation, lung edema, respiratory system diseases
Parathion Skin – A4	0.1	-	-	-	10 mg/m^3	Filter, isooctane, gas chromatograph with light, sulfur, nitrogen or phosphor flame detector	0.5 mg/m^3: mask No.10/43/50 1.25 mg/m^3: mask No.44/37 2.5 mg/m^3: mask No. 4/52/45/41/49 20 mg/m^3: mask No.48 emergency: mask No.53/47 escape: mask No.23/51	Headache, convulsions, respiration difficulty, comma, difficult breathing with wheezing sound, excess salivary excretion, loss of appetite, blue skin, disorder and confusion, heart deformities
Particulates	15.0 total 5.0 inhaled	-	-	-	Unknown	Filter, weight	—	Irritation
Penetachloro-napthalene Skin	0.5	-	-	-	Unknown	Filter/bubbly, isooctane, fluid chromatograph with ultraviolet rays detector	5 mg/m^3: mask No. 43/50 emergency: mask No. 53/47 escape: mask No. 23/51	Headache, exhaustion, nausea, dizziness, jaundice, live local death, loss of appetite
Penta-chlorophenol Skin – A3	0.5	-	-	-	2.5 mg/m^3	Filter/bubbly, methanol, fluid chromatograph with ultraviolet rays detector	5 mg/m^3: mask No. 10/43/50 12.5 mg/m^3: mask No. 44/37 25 mg/m^3: mask No. 4/52/45 125 mg/m^3 : mask No. 46 emergency: mask No. 53/47 escape: mask No. 23/51	Eye, nose and throate irritation, cough, headache, vomiting, nausea and dizziness, chest pain, dermatitis, breathing difficulty

Perlite A4	10.0 total 5.0 inhaled	-	-	-	Unknown	Filter, weight	__	Eye, nose and throat irritation, cough, headache, vomiting, nausea and dizziness, chest pain, dermatitis, breathing difficulty
Phenol Skin	-	5.0	-	-	250 ppm	Oxidization tube, methanol, fluid chromatograph with ultraviolet rays detector,	50 ppm : mask No. 9/43/50 125 ppm : mask No. 44/36 250 ppm: mask No. 52/45/4/23/41 emergency: mask No. 53/47 escape: mask No. 23/51	Irrigation
Phenylene diamine	0.1	-	-	-	25 mg/m^3	Unavailable	2.5 mg/m^3: mask No. 44 5 mg/m^3: mask No. 52/45 25 mg/m^3: mask No. 46 emergency: mask No. 53/47 escape: mask No. 25/51	Eye, nose, trough irritation, weakness, loss of appetite, muscle pain, kidney and liver damage, yellow urine, blue skin, shivering, convulsions
Phenyle ehter (steam)	-	1.0	-	2.0	100 ppm	Mineral coal tube, carbon sulfate, gas chromatograph with flame ionization detector	25 ppm : mask No. 44/36 50 ppm : mask No. 4/23/52/45 100 ppm: mask No. 53/46 emergency: 53/47 escape: Mask No. 23/51	Eye, nose and skin irritation, nausea, dizziness
Phenyl Glycidyl Ether Skin	6.0	1.0	-	-	100 ppm	Mineral coal tube, carbon sulfate, gas chromatograph with flame ionization detector	At any remarkable concentration: mask No. 53/47 Escape : mask No. 19/51	Irritation, allergy, dermatitis
Phenyl hydrazine skin- A3	20.0	0.1	-	-	15 ppm	Bubbly, phosphomolbidic acid, visual spectrum analyzer	At any remarkable concentration: mask No. 53/47 Escape: 51	Kidney damage, skin allergy, blueskin, anemia, jaundice, blood clot in blood vessels
Phosgene	0.4	0.1	0.8	0.2	2 ppm	Oxidization tube, toluene, gas chromatograph with phosphor or nitrogen detector	1 ppm: mask No. 43/50 2 ppm: mask No. 52/45 emergency: mask No. 53/47 escape: mask No. 24/51	Eye and nose irritation, throat dryness, vomiting , cough, skin burns, blue skin, breathing difficulty
Phosphine	0.4	0.3	1.0	1.0	50 ppm	Carbon, hydrogen peroxide, ion chromatograph	3 ppm: mask No.43/50 7.5 ppm: mask No. 44 15 ppm: mask No. 52/45/24 200 PM 40 emergency: mask No. 53/47 escape: mask No. 24/51	Irritation, effects on central neverous system

Phosphoric acid	1.0	-	3.0	-	1000 mg/m^3	Silica gel, sodium bicarbonate, ion chromatograph	25 mg/m^3: mask NO.44 50 mg/m^3: mask No.52/45/27 2000 mg/m^3: mask NO.46 emergency: mask NO.53/47 escape: mask No.27/51	Eye, skin and upper respiratory tract irritation, skin and eye burns, dermatitis
Phosphorus (yellow)	-	0.02	-	-	5 mg/m^3	Gas chromatograph (tenax) , axylene, gas chromatograph supplied with light, sulfur, nitrogen or phosphor flame detector	1 mg/m^3: mask No. 43 2.5 mg/m^3: mask No. 44 5 mg/m^3: mask No. 52/45 200 mg/m^3: 46 emergency: mask No. 53/47 escape: mask No. 51	Eye and respiratory system irritation, skin and eye burns, nausea and dizziness, stomachache, jaw pain, jaundice, anemia
Phosphorus oxychloride	0.6	0.1	3.0	0.5	Unknown	Unavailable	__	Eye, nose and throat irritation, kidney damage
Phosphorus pentachloride	-	0.1	-	-	70 mg/m^3	Bubbly, detector, visual spectrum detector	10 mg/m3: mask No.43/50 25 mg/m3: mask No.44 50 mg/m3: mask No.:52/45 200 mg/m3: mask No.46 emergency: mask No.53/47 escape: mask NO.23/51	Eye and respiratory system irritation, bronchitis, dermatitis
Phosphorus trichloride	1.5	0.2	3.0	0.5	25 ppm	Bubbly, detector, visual spectrum detector	10 ppm: mask No.52/45 50 ppm: mask No.46 emergency: mask NO.53/47 escape: mask No.24/51	Eye, nose and throat irritation, lung edema, skin and eye burns
Picric acid	0.1	-	0.3	-	75 mg/m^3	Filter, methanol/water, fluid chromatograph with ultraviolet rays detector	0.5 mg/m3: mask No.14 2.5 mg/m3: mask No.31/44 5mg/m3: mask No. 27/52/45/39/49 100 mg/m3: mask No.46 emergency: mask No.53/47 escape: mask No.27/51	Eye irritation, kidney damage, allergy, colon disorder, liver inflammation
Platinum metal	1.0	-	-	-	Unknown	Filter, acids, dual impulsion plasma	__	Skin irritation
Platinum soluble salts)	.002	-	-	-	4 mg/m^3	Filter, acid, detector, atomic absorption of elements without flame and supplied with graphite analyzer	0.05 mg/m3: mask No.33 0.1 mg/m3: mask No.27/52/45 4 mg/m3: mask No.46 emergency: mask NO.53/47 escape: mask No.27/51	Eye and nose irritation, breathing with difficulty with wheezing sound, blue skin, skin allergy

Portland cement	10.0 total 5.0 inhaled	-	-	-	5000 mg/m^3	Filter, weight	50 mg/m3: mask No.13 250 mg/m3 : mask No.30/44 emergency: mask No.53/47 escape: mask No.27/51	Irritation, dermatitis
Potassium hydroxide	2.0	-	2.0	-	Unknown	Filter, hydrochloric acid, calibration	_	Eye irritation, skin burns, respiratory system effects
Propane	-	2500	-	-	2100 ppm	Inflammable gases measuring gauge	10,000 ppm : mask No.43/50 20.000 ppm: use mask No.44/52/45 emergency: mask No. 53/47 escape: mask No. 51	Nausea and dizziness, agitation
Propargyl alcohol Skin	2.0	1.0	-	-	Unknown	Mineral coal tube, toluene, gas chromatograph with electrolyte conductivity detector	__	irritation, kidney and liver damage
Propoxur A3	0.5	-	-	-	Unknown	Detector, fluid chromatograph with ultraviolet rays detector	__	__
Prophylene Glycol Skin	0.3	0.05	-	-	Unknown	Unavailable	__	Headache, effects on central nervous system, drop of oxygen in the tissues
Pyridine	15.0	5.0	30.0	10.0	1000 ppm	Mineral coal tube, methylene chloride, gas chromatograph with flame ionization detector	125 ppm: mask No.44/34 250 ppm: mask No. 2/19/52/45 3600 ppm: mask No. 46 emergency: mask No. 53/47 escape: mask No. 19/15	Headache, eye irritation, kidney and liver damage, nausea, dizziness, dermatitis, loss of appetite
Quinone	0.4	0.1	-	-	100 mg/m^3	Oxidization tube, ethanol/hexane, fluid chromatograph with ultraviolet rays detector	10 mg/m^3: mask No. 44 20 mg/m^3: mask No. 52/45 300 mg/m^3 : mask No. 46 emergency: mask No. 53/47 escape: mask No. 19/15	Eye and skin irritation
Selenium compounds	0.2	-	-	-	1 mg/m^3	Filter, acid, elements atomic absorption spectrum	2 mg/m^3: mask No.15/43/50 5 mg/^{m3} : mask No.31/44 10 mg/m^3: mask No.27/52/45 100 mg/m^3: mask No.46 emergency: mask No.53/47 escape: mask NO.27/51	Eye, nose and throat irritation, kidney and liver damage, pneumonia, colon disorders, dermatitis, breathing difficulty

Selecium hexafluoride	0.4	0.05	-	-	2 ppm	Unavailable	0.5 ppm : mask No.43/50 1.25 ppm : mask No.44 2.5 ppm : mask No.52/45/49 5 ppm : mask No.48 escape : mask No.53/47 emergency: mask No.24/51	Lung agitation, lung edema
Silanes	7.0	5.0	-	-	Unknown	Unavailable	__	Irritation
Silica amorphons	6.0	-	-	-	3000 mg/m^3	Filter, low heat ash, x-ray spectrum measuring machine	30 mg/m^3: mask No. 14 150 mg/m^3: mask No. 31/44 300 mg/m^3: mask No. 27/39/52/45/49 3000 mg/m^3 : mask No. 48 emergency: mask No. 53/47 escape: mask No. 27/51	Unclear lung
Silica crystal line	Within 8 hours mg/m^3 0.5 crystobalet (1) 0.5 liverdist (2) 0.1 quartz (3) 0.1 triboli (4)				25 mg/m^3 (1,2) 25 mg/m^3 (3,4)	Filter, low heat ash, x-ray spectrum measuring machine	At any remarkable concentration, use mask No.53/47 Escape: mask No.2727/51	Unclear lung
Silicon carbide A4	10.0 total 5.0 inhale	-	-	-	Unknown	Filter, weight	__	Unclear lung
Silver	0.1	-	-	-	10 mg/m^3	Filter, acids, dual impulsion plasma	0.25 mg/m^3: mask NO.44/33 0.5 mg/m^3: mask No.27/52/45 20 mg/m^3: mask No.46 emergency: mask No.53/47 escape: mask No.27/51	Skin irritation, ulcer
Sodium Azide A4	-	-	0.3	0.1	Unknown	Filter/silica gel, sodium bicarbonate, ion chromatograph/ ultraviolet rays machine	__	Irritation
Sodium Flouracetate Skin	0.05	-	0.15	-	2.5 mg/m^3	Filter, water, ion chromatograph	0.25 mg/m^3: mask No. 14/33 1.25 mg/m^3: mask No. 31/44 2.5 mg/m^3: mask No. 39/52/45/27/49 emergency: mask No. 53/47 escape: mask No. 27/51	Face muscle strain, lung edema, convulsions, increase in heart contractions

Sodium hydroxide	-	-	2.0	-	10 mg/m^3	Filter, hydrochloric acid, calibration,	50 mg/m^3: mask No. 31/47 100 mg/m^3: mask No. 52/45/27 250 mg/m^3: mask No.46 emergency: mask No. 53/47 escape: mask No. 27/51	Nose irritation, eye and skin burns, automatic hair falling
Stodaard solvent	350	100	1800	-	20,000 mg/m^3	Mineral coal tube, carbon bisulfate, gas chromatograph with ionized flame	500 mg/m^3: mask No. 7/43 8750mg/m^3: mask No. 44/34 17500 mg/m^3: mask No. 7/19/40/52/45 20000 mg/m^3: mask No. 46 emergency: mask No. 53/47 escape: mask No. 19/51	Agitation, kidney effect, numbness
Styrene A4	215	50.0	425	100	700 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	500 ppm : mask No. 7/43/50 1000 ppm : mask No. 2/34 1250 ppm : mask No. 44 2500 ppm : mask No. 19/52/45 emergency: mask No. 53/47 escape: mask No. 19/51	Eye and nose irritation, weakness, dizziness, numbness, unstable walking, dermatitis
Sulfur dioxide A4	5.0	2.0	13.0	5.0	100 ppm	Filter, sodium bicarbonate, sodium carbonate, ion chromatograph	20 ppm: mask No. 12/43/50 50 ppm: mask No. 37/44 100 ppm: mask No. 5/24/42/52/45/49 emergency: mask No.53/47 escape: mask No.24/51	Eye, nose and throat irritation, cough, skin and eye burns
Sulfuric acid A2	1.0	-	3.0	-	15 mg/m^3	Silica gel, sodium bicarbonate, sodium carbonate, ion chromatograph	15 mg/m^3: mask No. 44/29/21/52/45 emergency: mask No.53/47 escape: mask No.18/51	Irritation, lung cancer
Fiberglass A4 Wool glass A3 Stone wool A3	3.0 fiber/cubic centimeter for fibers of 3.0 micrometer diameter and 10.0 micrometer length 5.0 mg/m^3 (total)				Unknown	Filter, weight		Irritation

Talc (not containing asbestos fiber)	2.0 inhale	-	-	-	1000 mg/m^3	Filter, low temperature ash, x-ray spectrum measuring gauge	10 mg/m^3: mask No. 14 50 mg/m^3: mask No. 31/44 100 mg/m^3: mask No. 27/39/49/52/45 1000 mg/m^3: mask No. 48 emergency: mask No. 53/47 escape: mask No. 27/51	Lung fibrosis
Talc containing asbestos fiber A4	-	-	2.0	-	Unknown	Filter, acetone/ triacetate, microscope	At any remarkable concentration Mask No. 53/47 Escape: mask No. 27/51	Asbestos lung fibrosis
Tellurium hexa-fluoride	0.1	0.02	-	-	1 ppm	Mineral coal tube, sodium hydroxide, elements atomic absorption gauge	01 ppm : mask No.43/50 0.5 ppm : mask No. 44 1 ppm : mask No. 52/45/49 Emergency: mask No. 53/47 Escape: mask No. 24/51	Headache, lung edema, breathing difficulty
Tetrachloro Ethan Skin A3	7.0	1.0	-	-	100 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	At any remarkable concentration: mask No. 53/47 Escape: mask No. 19/51	Vomiting and nausea, kidney damage, stomachache, finger shivering, jaundice, dermatitis
Tetrachloro ethylene	170	25.0	1368	200	150 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	At any remarkable concentration: mask No. 53/47 Escape: mask No. 19/51	Eye, nose and throat irritation, face and neck reddening, headache, liver damage, nausea, dizziness
Tetrachloro Naphthalene	2.0	-	-	-	Unknown	Filter/bubbly, gas chromatograph supplied with ionized light detector	20 mg/m^3: mask No. 52/45 emergency: mask No. 53/47 escape: mask No. 23/51	Dizziness and nausea, jaundice, dermatitis, loss of appetite
Tetraethyl Lead Skin – A4	.075	-	-	-	40 mg/m^3	Oxidization tube, pentane, gas chromatograph with ionized light detector	0.75 mg/m^3: mask No. 43 1.875mg/m^3: mask No. 44 3.75 mg/m^3 : mask No. 49/52/45 40 mg/m^3: mask No. 47 emergency: mask No. 53/47 escape: mask No. 24/51	Effects on central nervous system
Tetramethyl Lead A3	.075	-	-	-	40 mg/m^3	Oxidization tube, pentane, gas chromatograph with ionized light detector	0.75 mg/m^3: mask No. 52/45 1.875mg/m^3: mask No. 44 3.75 mg/m^3 : mask No. 49/52/45 40 mg/m^3: mask No. 47 emergency: mask No. 53/47 escape: mask No. 24/51	Effects on central nervous system

Tetra nitro methane A3	8.0	.005	-	-	4 ppm	Iminger tube, gas chromatograph with alkaline ionized light detector	5 ppm : mask No. 44/38/5/24/52/45 emergency: mask No. 53/47 escape: mask No. 24/51	Eye, nose, throat irritation, headache, chest pain, skin burns, nausea and dizziness, breathing difficulty
Tetryl	1.5	1.5	-	-	750 mg/m^3	Filter, detector, visual spectrum analyzer	7.5 mg/m^3: mask No. 14 37.5 mg/m^3: mask No. 31/44 75 mg/m^3: mask No. 27/52/45 3000 mg/m^3: mask No. 46 emergency: mask No. 53/47 escape: mask No. 27/51	Cough, anemia, vomiting, headache, allergy, flu, tiredness and laziness, insomnia, dermatitis
Thalium Skin	0.1	-	-	-	15mg/m^3	Filter, acid, elements atomic absorption spectrum gauge	.5 mg/m3: mask No.14 2.5 mg/m3: mask No.31/44 5 mg/m3: MASK no.27/52/45/39/49 20mg/m3: mask No.46 emergency: mask No.53/47 escape: maskNO.27/51	Vomiting, nausea, dizziness, diarrhea, chest and stomach pain, lung edema, kidney and liver damage, shivering
Tin (in organic compounds)	2.0	-	-	-	100 mg/m^3	Filger, acid, dual propulsion plasma	10mg/m3: mask No.14 50 mg/m3: mask NO.31/44 100 mg/m3: mask No.27/52/45 400 mg/m3: mask NO.53/47 emergency: mask No.53/47 escape: mask No.27/51	Eye and skin irritation
Tin (organic compounds) A4	0.1	-	-	-	25mg/m^3	Filter/oxidization tube, fluid chromatograph, elements atomic absorption spectrum gauge	4mg/m3; mask No.9/43/50 2.5mg/m3: mask NO.44/36 5mg/m3::maslk No.4/52/45/23/41/49 emergency: mask No.53/47 escape: mask No.23/51	Headache, cough, vomiting, kidney damage, dizziness and nausea, stomachache, urinary occlusion, throat sores
Tin hydride	2.0	-	-	-	100mg/m^3	Filter/oxidization tube, fluid chromatograph, elements atomic absorption spectrum gauge	1mg/m3: mask No.9/43/50 2.5mg/m3: mask No.44/36 5mg/m3: mask No.4/52/45/23/41.41.49 200mg/m3: mask No.46 emergency: mask No.53/47 escape: mask No.23/51	Headache, cough, vomiting, liver damage, nausea, dizziness, urinary occlusion, throat sores
Titanium dioxide A4	10.0	-	-	-	5000mg/m^3	Filter, acid, elements atomic absorption spectrum gauge	At any remarkable concentration: use mask No.53/47 Escape: mask No.27/51	Lung fibrosis

Toluene A4	375	100	560	150	500 ppm	Mineral coal tube, carbon bisulfate	1000 ppm : mask No.7/43/34/50 2000 ppm : mask No.44/52/45/19 emergency: mask No.53/47 escape: mask No.19/51	Exhaustion, weakness, disorder, confusion, insomnia, partial paralysis , dermatitis
Toluene disocyanate A4	0.04	.005	0.15	0.02	2.5 ppm	Iminger tube, detector, fluid chromatograph with electron trapper detector	At any remarkable concentration: mask No.53/47 Escape: mask No.19/51	Eye, nose and throat irritation, cough, chest and stomach pain, nausea and dizziness, lung edema, bronchitis, pneumonia, dermatitis
Tributyl phosphate	2.5	0.2	-	-	30 ppm	Filter, ether diethyl , gas chromatograph with light flame detector for sulfur, nitrogen or phosphor	2 ppm : mask No. 43/50 5 ppm: mask No. 44 10 ppm : mask No. 52/45 125 ppm : mask No. 46 emergency: mask No. 53/47 escape: mask No. 23/51	Eye, skin and respiratory system irritation, headache, nausea and dizziness
Tricholoro acetic acid A4	7.0	1.0	-	-	Unknown	Unavailable	-	Irritation
Tetrachloro benzene	-	-	40.0	5.0	Unknown	Filter/oxidization tube, hexane, gas chromatograph with electron detector	-	Irritation
Trichloroethane A4	1900	350	-	-	Unknown	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	1000 ppm : mask No. 43/50 emergency: mask No. 53/47 escape: mask No. 19/51	Eye irritation, headache, central nervous system failure, laziness, instability, irregular heart beats, dermatitis
Tetrachloro ethane Skin – A4	45.0	10.0	-	-	100 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	At any remarkable concentration: mask No. 53/47 Escape: mask No. 19/51	Eye and nose irritation, central nervous system failure, kidney and liver damage
Trichlorethylene	270	50.0	1080	200	1000 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	At any remarkable concentration: mask No. 53/47 Escape: mask No. 19/51	Headache, vomiting, eye irritation,
Trichloronapthalene Skin	5.0	-	-	-	Unknown	Filter/bubbly, ethyl ether, gas chromatograph with ionized light detector for sulfur, nitrogen or phosphor	50 mg/m^3: mask No. 52/45 emergency: mask No. 53/47 escape: mask No. 23/51	Dizziness and nausea, shivering, jaundice, dermatitis, loss of appetite
Triorthocresyl phosphate	0.1	-	-	-	40 mg/m^3	Filter, ether diethyl, gas chromatograph with light flame detector for nitrogen, sulfur, or phosphor	0.5 mg/m^3: mask No. 14 2.5 mg/m^3: mask No. 31/44 5 mg/m^3: mask No. 27/39/52/45/49 emergency: mask No. 53/47 escape: mask No. 27/51	Convulsions, intestinal disorders

Trimethylamine	24.0	10.0	36.0	15.0	Unknown	Unavailable	–	Eye, skin and respiratory system irritation
Tetranitro tuelene Skin	0.5	-	-	-	500 mg/m^3	Gas chromatograph, tenax, acetone, gas chromatograph with thermal energy analyzer detector	5 mg/m3: mask No. 43/50 12.5 mg/m3; mask No. 44 25 mg/m^3: mask No. 52/45 1000 mg/m^3: mask No. 46 emergency: mask No. 53/47 escape: mask No. 23/51	Kidney and liver damage, cough, muscle pain, glaucoma, jaundice, throat sores, allergy, dermatitis, irregular heart beats
Triphenyl phosophate	3.0	-	-	-	1000 mg/m^3	Filter, ether diethyl, gas chromatograph with light flame detector for sulfur, nitrogen or phosphor	15 mg/m^3: mask No. 13 75 mg/m^3: mask No. 31/44 150 mg/m^3: mask No. 27/39/49/52/45 1500mg/m^3: mask No. 48 emergency: mask No. 53/47 escape: mask No. 27/51	Effects on blood enzymes, muscular weakness
Tungsten	1.0 dissolved	5.0 undissolved	3.0 dissolved	10.0 undissolved	Unknown	Filter, water, elements atomic absorption spectrum by use of flame	10mg/m^3: mask No. 26/43 25mg/m^3: mask No. 44 50mg/m^3: mask No. 27/52/45 emergency: mask No. 53/47 escape: mask No. 27/52	Eye, nose and throat irritation (insoluble compounds) effects on central nervous system (soluble compounds)
Turpentine	-	100	-	-	Unknown	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	1000 ppm : mask No. 2/34 1500 ppm: mask No. 44/19/52/45 emergency: mask No. 53/47 escape: mask No. 19/51	Eye, skin, nose and throat irritation, headache, nausea, dizziness, allergy, urine blood
Uranium (insoluble compounds) A1	0.2	-	0.6	-	10 mg/m^3	Unavailable	At any remarkable concentration: mask No. 53/47 Escape: mask No. 27/51	Kidney damage, lymphatic tumors, dermatitis
Uranium (soluble compounds) A1	0.2	-	0.6	-	10 mg/m^3	Unavailable	At any remarkable concentration: mask No. 53/47 Escape (aldhydes) mask No.18/51 Escape: mask (non aldhydes) mask No. 27/51	Cough, vomiting, nausea, tiredness, excess tearing
Vandium pentaoxide A4	0.05	-	-	-	mg/m^3	Filter, tetrahyrdofuran, X-ray spectrum gauge	.5 mg/m^3: mask No. 26/43/50 1.25 mg/m^3: MASK No. 44/33 2.5mg/m^3: mask No. 27/52/45/39 70mg/m^3: mask No. 46 emergency: mask No. 53/47 escape: mask No. 27/51	Eye and throat irritation, tongue color changed to green, cough, eczema, difficult breathing with wheezing

Vegetable oils	10.0 total 5.0 inhale	-	-	-	Unknown	Filter, weight	–	Lung effects
V Phenyl acetate A3	30.0	10.0	60.0	20.0	Unknown	methylene chloride / methanol, gas chromatograph with flame ionization detector	40 ppm : mask No. 7/43 100 ppm : mask No. 44/34 400 ppm : mask No. 48 at any concentration: mask No. 53/47 escape: mask No. 19/51	Eye, nose and throat irritation
Vinyl chloride A1	-	5.0	-	-	Unknown	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	At any remarkable concentration: mask No. 53/47 Escape: mask No. 24/51	Stomachache, blue skin in the limbs
Vinyl toluene A4	480	100	-	100	400 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	500 ppm : mask No. 7/43/50 1000 ppm : mask No. 34/2 1250 ppm : mask No. 44 2500 ppm : mask No. 19/52/45 emergency: mask No. 53/47 escape: mask No. 19/51	Eye, skin and upper respiratory tract irritation, sleepiness
Warafarin	0.1	-	-	-	100 mg/m^3	Filter, methanol, ions chromatograph with ultraviolet X-ray detector	0.5 mg/m^3: mask No. 14 2.5 mg/m^3: mask No. 31/44 5 mg/m^3: mask No. 27/39/52/45/49 100 mg/m^3: mask No. 48 200 mg/m^3: mask No. 46 emergency: mask No. 53/47 escape: mask No. 27/51	Vomiting, lip and mucous membrane bleeding
Welding fumes	5.0	-	-	-	Unknown	Filter, acid, dual propulsion plasma	At any remarkable concentration: mask No. 53/47 Escape: mask No. 27/51	Eye, nose and throat irritation, fever
Wood dust A1	2.5	-	10.0	-	Unknown	Filter, weight	At any remarkable concentration: mask No. 53/47 Escape: mask No. 27/51	Cancer, agitation, effects on lung, dermatitis
Xyelenes	435	100	655	150	900 ppm	Mineral coal tube, carbon bisulfate, gas chromatograph with flame ionization detector	1000ppm: mask No. 7/24/43/50 emergency: mask No. 53/47 escape: mask No. 19/51	Eye, nose and throat irritation, dizziness, nausea, sleepiness, unstable walking, loss of appetite

Xylidine Skin A3	10.0	2.0	-	0.5	50 ppm	Silica gel, ethanol, gas chromatograph with flame ionization detector	20ppm : mask No. 7/43/50 50ppm: mask No. 44/34 100ppm: mask No. 2/40/19/52/45 150ppm: mask No. 48 emergency: mask No.53/47 escape: mask No. 19/51	Kidney and liver damage, blue skin, loss of appetite
Zinc chloride fumes	1.0	-	2..0	-	50 mg/m^3	Filter, water, elements atomic absorption gauge by use of flame	10mg/m^3: mask No. 16/43/50 25mg/m^3: mask No. 32/44 50mg/m^3: mask No. 27/39/52/45 2000mg/m^3: mask No. 46 emergency: mask No. 53/47 escape: mask No. 27/51	Eye, nose and throat irritation, cough, chest pain, chest pain, lung edema, skin burns, lung fibrosis, difficulty in breathing
Zinc chromates A1	0.01	-	-	-	Unknown	Filter, water, elements atomic absorption spectrum gauge	10mg/m^3: mask No. 16/43/50 25mg/m^3:mask No. 32/44 50mg/m^3: mask No. 27/39/52/45 2000mg//m^3: mask No. 46 emergency: mask No. 53/47 escape : mask No. 27/51	Lung cancer
Zinc oxide fume	5.0 fumes 10.0 dust	-	10.0 fumes dust	-	500 mg/m3	Filter, X-ray spectrum gauge	50mg/m^3: mask No.16/43/50 125mg/m^3: mask No.32/44 250mg/m^3: mask No.27/39/49/52/45 2500 mg/m^3: mask No. 48 emergency: mask No.53/47 escape : mask No.27/51	Metallic taste, throat dryness, cough, fever, breathing difficulty, headache, vomiting, nausea, drop of lung efficacy, unclear vision
Zirconium compounds A4	5.0	-	10.0	-	50mg/m3	Filter, acid, dual propulsion plasma	25mg/m^3: mask No.14 125mg/m^3: mask No. 31/44 250 mg/m^3: mask No. 27/39/49/52/45 500 mg/m^3: mask No.48 emergency: mask No.53/47 escape: mask No.27/51	Eye and mucous membrane irritation
Zirconium compounds A4	5.0	-	10.0	-	50mg/m3	Filter, acid, dual propulsion plasma	25mg/m^3: mask No.14 125mg/m^3: mask No. 31/44 250 mg/m^3: mask No. 27/39/49/52/45 500 mg/m^3: mask No.48 emergency: mask No.53/47 escape: mask No.27/51	Eye and mucous membrane irritation

Zirconium compounds **A4**	**5.0**	**-**	**10.0**	**-**	**50mg/m3**	**Filter, acid, dual propulsion plasma**	**25mg/m^3: mask No.14** **125mg/m^3: mask No. 31/44** **250 mg/m^3: mask** **No. 27/39/49/52/45** **500 mg/m^3: mask No.48** **emergency: mask No.53/47** **escape: mask No.27/51**	**Eye and mucous membrane irritation**

Protective Masks Appendix (masks)

Item	Definition
Mask No. 1	Any protective mask against chemicals covering face fully provided with filter (s) against Gases and particulates
Mask No. 2	Any protective mask against chemicals covering face fully provided with filter (s) against Organic fumes
Mask No. 3	Any protective mask against chemicals covering face fully provided with filter (s) against Organic fumes, smokes and dues
Mask No. 4	Any protective mask against chemicals covering face fully provided with filter (s) against Organic fumes and particulates
Mask No. 5	Any protective mask against chemicals covering face fully provided with filter (s) against Concerned compound
Mask No. 6	Any protective mask against chemicals covering face fully provided with filter (s) against Concerned compound , highly effective to prevent particulates
Mask No. 7	Any protective mask against chemicals and organic fumes
Mask No. 8	Any protective mask against chemicals, organic fumes and acid gases
Mask No. 9	Any protective mask against chemicals, organic fumes, dust and spray
Mask No. 10	Any protective mask against chemicals, organic fumes, dust, spray and smokes
Mask No. 11	Any protective mask against chemicals, organic fumes, supplied with highly effective filter to prevent particulates
Mask No. 12	Any protective mask against chemicals with filter (s) to protect against concerned compound
Mask No. 13	Any protective mask against dust
Mask No. 14	Any protective mask against dust and spray
Mask No. 15	Any protective mask against dust and spray provided it covers full face
Mask No. 16	Any protective mask against dust, spray and smokes
Mask No. 17	Any mask for filtering air provided it covers full face (gas mask) supplied with filter (s) to prevent acid gases
Mask No. 18	Any mask for filtering air provided it covers full face (gas mask) supplied with filter (s) highly effective to prevent acid gases
Mask No. 19	Any mask for filtering air provided it covers full face (gas mask) supplied with filter (s) to prevent organic fumes
Mask No. 20	Any mask for filtering air provided it covers full face (gas mask) supplied with filter (s) to prevent organic fumes and acid gases
Mask No. 21	Any mask for filtering air provided it covers full face (gas mask) supplied with filter (s) to prevent particulates, organic steams and acid gases
Mask No. 22	Any mask for filtering air provided it covers full face (gas mask) supplied with filter (s) highly effective to prevent particulates, organic steam, spray and smokes
Mask No. 23	Any mask for filtering air provided it covers full face (gas mask) supplied with filter (s) to prevent particulates and organic steams
Mask No. 24	Any mask for filtering air provided it covers full face (gas mask) for protection against concerned compound
Mask No. 25	Any mask for filtering air provided it covers full face (gas mask) supplied with filter (s) to prevent particulates and for protection against concerned compound
Mask No. 26	Any mask for refining air supplied with filter highly effective to prevent particulates
Mask No. 27	Any mask for refining air supplied with filter covering full face and highly effective to prevent particulates
Mask No. 28	Any mask for refining air supplied with filter to prevent acid gases, provided it is power operates
Mask No. 29	Any mask for refining air supplied with filter to prevent acid gases and supplied with filter (s) highly effective to prevent particulates, provided it is power operated
Mask No. 30	Any mask for refining air supplied with filter to prevent dusts provided it is power operated
Mask No. 31	Any mask for refining air supplied with filter (s) to prevent dusts and spray provided it is power operated
Mask No. 32	Any mask for refining air supplied with filter (s) to prevent dusts, spray and fumes
Mask No. 33	Any mask for refining air supplied with filter, highly effective, to prevent particulates, provided it is power operated
Mask No. 34	Any mask for refining air supplied with filter to prevent organic fumes provided it is power operated
Mask No. 35	Any mask for refining air supplied with filter to prevent organic fumes and acid gases provided it is power operated
Mask No. 36	Any mask for refining air supplied with filter to prevent organic fumes and supplied with power operated filter to prevent dusts and spray
Mask No. 37	Any mask for refining air supplied with filter to prevent organic fumes and supplied with power operated filters to prevent dusts, spray and fumes
Mask No. 38	Any mask for refining air supplied with filter for prevention from concerned compound provided it is power operated
Mask No. 39	Any mask for refining air supplied with filter covering full face and supplied with highly effective power operated filter (s) to prevent particulates
Mask No. 40	Any mask for refining air supplied with filter provided it covers full face and supplied with power operated filter (s) to prevent organic fumes
Mask No. 41	Any mask for refining air supplied with filter provided it covers full face to prevent organic fumes and highly effective, power operated filter (s) to prevent particulates

Mask No. 42	**Any mask for refining air provided it covers full face and**
Mask No. 43	**Any mask for supplying air**
Mask No. 44	**Any constantly operating mask for supplying air**
Mask No. 45	**Any mask for supplying air provided it covers full face**
Mask No. 46	**Any mask for supplying air provided it covers full face and works under any pressure**
Mask No. 47	**Any mask for supplying air provided it covers full face and works under any pressure and supplied automatic breathing apparatus**
Mask No. 48	**Any mask for supplying air working under any pressure**
Mask No. 49	**Any mask for supplying air provided it covers full face and works constantly**
Mask No. 50	**Any automatic breathing apparatus**
Mask No. 51	**Any automatic breathing apparatus during escape cases**
Mask No. 52	**Any automatic breathing apparatus provided it covers full face**
Mask No. 53	**Any automatic breathing apparatus provided it covers full face and works under any pressure**

APPENDIX NO. (3-2)

Maximum Limits Allowance Table for Biological Effect As a Result of Occupational Exposure to Chemical Substances

The following terms shall have the meanings set against to each of them:

Biological Exposure Indices (BEI): Are the levels, which may not be exceeded in order to avoid some health damages.

Sample taking time: Is the time specified during the working shift to take samples of the various chemical substances and is as follows:

First: For materials, which do not accumulate in the body and are eliminated over a short period (half life less than 5 hours) samples are taken either:

1- Before the working shift (i.e. after approx. 16 hours without exposure
2- During the working shift
3- At the end of the working shift (i.e. during the last two hours of the shift)

Second: For materials, which remain for a longer period and are eliminated over a longer period (half life more than 5 hours) samples are taken either:

1- At the beginning of the week (after two days without exposure)
2- At the end of the week (after five days of exposure)

Third: For materials, which accumulate in the body, the timing for sample taking is not significant.

Biological Samples: Include exhaled air, blood and urine. In some cases, nails or hairs may be used, although they are not recommended to be used, taking the following into consideration:

(1) Urine samples need modification of results to a standard level in order to facilitate their reading and avoid changes in the excretion rate with the environmental circumstances, intake of fluids and so forth. This is done either through adjustment of results to a unified concentration (sp.gr.1.024) or the unified excreted quantity of the creatinine substance (1 g creatinine/L.)

(2) For exhaled air, the rapid change in the concentration with exhalation stages is considered among the determining factors. Therefore, the exhaled air should be defined as to whether it is at the end (alveoli air) or at its middle (mixture of alveoli air with bronchioles air).

(3) It is conditional that the lung functions of the person should be normal in order to give a correct expression of the exposure.

(4) As for blood samples, the blood components being analyzed should be determined and whether they are the full blood, plasma, blood serum or red blood cells.

Reference by some symbols: Some symbols are used referred to indicate basic information, as follows:
(Sc) means there is a group of similar materials, which are likely to be liable to be affected by chemical substances, and therefore are left unprotected at the biological exposure level.

(B) means this substance is present in tangible quantities in the biological fluid required to be tested without any occupational exposure. This is taken into consideration upon computing the biological exposure level.

(Nq) means there are no sufficient data to estimate the level of biological exposure and is estimated by referring to scientific reports and studies.

(NS) means the substance required to be tested is unspecific due to its existence of some exposure to various pollutants. In such cases, a confirmation examination of the specific duration is required.

(Sq) means the test is specific for the substance required to be tested, nevertheless its qualitative estimation is imprecise.

APPENDIX NO. (3-2)

Maximum Limits Allowance for Biological Effect as a Result of Occupational Exposure to Chemical Substances

Chemical Substance Name, Test Indication and Sample Type	Sampling Time	Exposure Level
Acetone Acetone in urine	At end of working shift	100 mg/L
Aniline Total P- Aminophenol in urine Methemoglobine in blood	At end of working shift During or at end of the shift	50 mg/g createnine 1.5% of hemoglobin
Arsenic and soluble compounds	At end of working week	50 microgram/g createnine
Benzene S- Phenylmercapturic acid urine	At end of working shift	25 microgram/g createnine
Cadmium and inorganic compounds Cadmium in urine Cadmium in blood	Non hazardous Non hazardous	5 microgram/ g createnine 5 microgram/ L
Carbon disulfide 2 theothiazolidine 4 carboxysilic acid in the urine	At end of working shift	5 mg/g createnine
Carbon Monoxide 4 Carboxy- Hamoglobin in blood CO in exhaled air	At end of working shift At end of working shift	3.5% of hemoglobin 20 ppm
Clorobenzine of total 4 chlorocalicole in urine total p-chlorophead in urine	At the end of working shift At the end of working shift	150 mg/g createnine 25 mg/g createnine
Chromium (vi), Water-Soluble Fame Total Chromium in urine	Increases during working shift At end of working shift, at end of working week	10 microgram/g createnine 30 microgram/g createnine
Cobalt Cobalt in urine Cobalt in blood	At end of working shift at end of working week At end of working shift by end of working week	15 microgram/L 1 microgram/L
N,N- Dimethylacetamide N- Methyl acetatamide amine in urine	At end of working shift by end of working week	30 mg / g createnine

N, N- Dimethyl lormamide N- Methyl formamide in urine	At end of working hours	40 mg / g createnine
2- Ethoxyethanol 2- Ethoxyethyl Acetate 2- Ethoxyacetic acid in urine	At end of working shift by end of working week	100 mg/g createnine
Ethyl benzene Mandelic acid in urine Ethyl benzene in end of exhaled air	At end of working shift by end of working week	1.5 g/g createnine
Fluorides Fluorides in urine	Prior working shift At end of working shift	3 mg/ g createnine 10 mg/ g createnine
Furfural Total furoic acid in urine	At end of working shift	200 mg/ g createnine
N-hexane 2,5- Hexanedion in urine n- hexane in end of exhaled air	At end of working shift	5 mg/g createnine
Lead Lead in blood	Non hazardous	30 microgram/100 ml
Mercury Inorganic mercury in urine Inorganic mercury in blood	Prior working shift At end of working shift by end of the working week	35 microgram/ g createnine 15 microgram/L
Methanol Methanol in urine	At end of working shift	15 mg/ L
Metohemoglobin Metohemoglobin in blood	During or at end of working shift	1.5 hemoglobin
2- Meoxy ethanol and 2-minoaxy ethyl acetate 2- Meto axy acetic in urine	At end of working shift by end of working week	--
Methyl chloroform Methyl chloroform in exhaled air Trichlorroacetic acetate acid in urine Total trichloroethanol ethanol in urine Total trichloro ethanol in blood	Prior last working shift in the working week, At end of working week, At end of working shift by end of working week, at end of working shift at end of working week	40 ppm 10 mg / L 30 mg/L 1 mg/L
4,4- Methylne Bis (2-chloroaniline) Total MBOCA in urine	At end of working week	__
Methyl Ethyl ketone MEK in urine	At end of working shift	2 mg/L
Methyl Isobutyl ketone Methyl Isobutyl ketone in urine	At end of working shift	2 mg/L
Nitrobenzene Total P- nitrophenol in urine Metohemoglobin in the blood	At end of working shift by end of working week At end of working shift	5 mg/g createnine 105% of hemoglobin

Organophosphorus Cholinesterase Inhibitors Cholinesterase activity in red blood cells	By estimation	70% of basic level per person
Parathion Total P- Nitrophenol in urine Cholinesterase activity in red blood cells	By end of working shift By estimation	0.5 mg/g createnine 70% of basic level per person
Pentachlorophenol Total pentachlorophenol in urine Free penta-chlorophenol in blood plasma	Prior end of last working shift in the working shift By end of working shift	2 mg/g createnine 5 mg/L
Perchloroethylene Perchlor ethylene at end of exhaled air Perchlor ethylene in blood Tri chloroacetatic acid in urine	Prior last working shift in the working week Prior last working shift in the working week At end of working shift at end of working week	5 ppm 0.5 mg /L 3.5 mg/ ml
Phenol Total phenol in urine	At end of working shift	250 mg/g createnine
Styrene Mandelic acid in urine Phenylgyoxylie acid in urine Styrene in venous blood	At end of working shift Prior next working shift At end of working shift Prior next working shift At end of working shift Prior next working shift	800 mg/g createnine 300 mg/g createnine 240 mg/ g createnine 100 mg/g createnine 0.55 mg/L 0.02 mg/L

Appendix No. (3-3)
Table of Standard Guidelines

For Chemical Substances in Indoor Environment

Substance name and chemical composition	Exposure level	Exposure duration
Acrolein CH_2CHCHO	0.025 mg/m^3	Maximum limit
Ammonia NH_3	0.5 mg/m^3 6 mg/m^3	One year Maximum limit
Asbestos and Other Fibrous Aerosols	0.05 fibers /ml	Maximum limit
Black Smoke	0.04 – 0.06 mg/m^3 0.1 – 0.15 mg/m^3	One year 24 hours
Cadmium Cd	5 ng / m^3	Annually
Carbon Dioxide CO_2	0.1%	Maximum limit
Carbon Disulphide CS_2	0.1 mg/m^3	24 hours
Carbon Monoxide CO	100 mg/m^3 60 mg/m^3 30 mg/m^3 (35 ppm) 10 mg/m^3 (9 ppm)	15 minutes 30 minutes One hour 8 hours
1,2 Dichloroethane $CH_2\,ClCH_2CL$	0.7 mg/m^3	24 hours
Dichloromethane (Methylene Chloride) $CH_2\,CL_2$	(3 mg/m^3)	24 hours
ETHYL ACETATE $CH_3CCOC_2H_5$	14 mg/m^3 42 mg/m^3	24 hours 30 minutes
Formaldyhde HCHO	0.12 mg/m^3 0.1 mg/m^3	Maximum limit 30 minutes
Glutaraldehyde $OCH(CH_2)_3\,CHO$	0.8 mg/m^3 (0.2 ppm)	- -
Aliphatic Hydrocarbons	1 mg/ m^3	3 hours
Hydrogen Sulfide H_2S	0.008 mg/m^3 (0.00 ppm)	30 minutes
Inhealable Particulate I P	0.34 mg/m^3 0.08 mg/m^3	24 hours One year
Lead Pb	(0.001 – 0.0005 mg/m^3)	One year
Lindane $C_6H_6CL_6$	0.001 mg/m^3	-
Manganese Mn	1.5 mg/m^3	One year
Mercury Hg	0.002 mg/m^3 0.001 mg/m^3	24 hours One year
Nitrogene Dioxide NO_2	0.66 mg/m^3 0.2 mg/m^3 0.1 mg/m^3 ---	30 minutes One hour 24 hours One year

Ozone O_3	0.235 mg/m^3 (0.12 ppm) 0.2 mg/m^3 0.120 mg/m^3 0.06 mg/m^3	One hour 8 hours 24 hours One year
Penta Chlorophenol C_6CL_5OH	0.001 mg/m^3	--
Pesticides	0.005 mg/m^3	--
Phenol C_6H_5OH	0.1 mg/m^3	24 hours
Radon Rn	4 bicocures / L	Annual
Styrene $C_5H_5CHCH_2$	0.8 mg/m^3 0.26 mg/m^3	24 hours One week
Sulfates (S)	0.012 mg/m^3 0.004 mg/m^3	24 hours Annual
Carbon Dioxide CO_2	0.5 ppm 0.28 ppm 0.14 ppm 0.03 ppm	One hour 3 hours 24 hours Annual
Tetra Chloroethylene $CCL_2\,CCL_2$	0.25 mg/m^3	Annual
Toluene $C_6H_5CH_3$	7.50 mg/m^3 1.0 mg/m^3 0.26 mg/m^3	30 minutes 24 hours One week
Total Suspended Particulates (TSP)	0.230 mg/m^3 0.075 mg/m^3	24 hours Annual
Tri Chloroethylene $CHCLCCL_2$	5 mg/m^3 2mg/m^3	24 hours One year
Vanadium V	0.001 mg/m^3	24 hours
Volatile Organic Compounds (VOC)	3 ppm	--

mg	milligram
g	gram
µg	microgram
ng	nanogram
L	liter
ml	milliliter
m^3	cubic meter

APPENDIX NO. (4)
ALLOWABLE NOISE LIMITS

APPENDIX NO. (4-1)
Noise Tolerance Limits at Work Environment

The following terms set forth under this Appendix shall have the meanings as explained against respective terms:

Noise are the undesired sounds resulting from sound waves emitted from indoor or outdoor sources which have immediate rapid effect on the activity of workers, which may affect their hearing ability.

Decibel is the unit for measuring extent of noise to which human ear is exposed. It is calculated by the logarithmic difference between the pressure of the sound desired to measure its intensity (A) and the pressure of the lease sound (Po), which the human ear may hear, which is (20) micro Pascal, as specified by the measuring device compatible with the international standard specifications ISO-176.

Decibel A "dBA" is the unit for measuring intensity of noise as described above by using the A filter for measuring sounds in a specified frequency field.

Noise level is the pressure level of continues sound at the exposure location at the moment of measuring and equivalent to decibel A unit by measuring to the pressure of (20) micro Pascal.

Continuous or equivalent noise level: this is a measuring unit for intensity of continues noise calculated during a certain time period and is denoted by the limits equivalent to the decibel A unit by measuring to the pressure of (20) micro Pascal.

Occupational noise is the exposure to high levels of noise at the various working locations and other non-industrial occupational working locations.

Community noise are all the noise sources to which man is exposed to outside or inside his residence during his daily life throughout 24 hours, which represent all the above said sources in addition to projects and social activities in the area such as constructional works, establishing buildings, maintenance works or indoor sources resulting from the use of domestic appliances.

Appendix No. (4-1)
Allowable Noise Limits at Work Environment

Time (T)				Time (T)			
Exposure level L, (dBA)	Hours	Minutes	Seconds	Exposure level L, (dBA)	Hours	Minutes	Seconds
80	25	24	-	106	-	3	45
81	20	10	-	107	-	2	59
82	16	-	-	108	-	2	22
83	12	42	-	109	-	1	53
84	10	5	-	110	-	1	29
85	8	-	-	111	-	1	11
86	6	21	-	112	-	-	56
87	5	2	-	113	-	-	45
88	4	-	-	114	-	-	35
89	3	10	-	115	-	-	28
90	2	31	-	116	-	-	22
91	2	-	-	117	-	-	18
92	1	35	-	118	-	-	14
93	1	16	-	119	-	-	11
94	1	-	-	120	-	-	9
95	-	47	37	121	-	-	7
96	-	37	48	122	-	-	6
97	-	30	-	123	-	-	4
98	-	23	49	124	-	-	3
99	-	18	59	125	-	-	3
100	-	15	-	126	-	-	2
101	-	11	54	127	-	-	1
102	-	9	27	128	-	-	1
103	-	7	30	129	-	-	1
104	-	5	57	130-140	-	-	<1
105	-	4	43	-	-	-	-

Appendix No. (4-2)
Noise Limits Allowed at the Various Locations Inside the Industrial Facilities Buildings on the Basis of Noise Level Decibel A (dBA)

Allowed Noise level limits (dBA)	Type of location inside the industrial establishment
35-40	Conference room
40-45	Offices
45-50	Workshop offices
50-55	Laboratory, measurement or inspection room
60-65	Repair workshops
50-55	Canteen
85-90	Production area & fan rooms, compressor rooms – etc.

Appendix No.(4-3)
Maximum Limits Allowed for Indoor Noise in Non-Industrial Environment

Type of Indoor Location/ or Activity Inside this Location	Recommended noise level in dB(A)
First : Educational Buildings	
Seminar rooms	30-35
Teaching staff rooms	35-40
Lecture rooms	30-35
Lecture rooms (until 250 seats)	25-30
Conference rooms	30-35
Secondary schools classrooms	40-45
Elementary and junior schools classrooms	45-50
Teaching laboratories	35-40
Working labs	40-50
Engineering workshops	45-50
Administrative affairs offices	35-40
Second: Health Care Buildings	
Causality and outpatient clinics	40-45
Operation theaters and intensive care units	30-35
Dental clinics	40-45
Various specialized clinics and consultants rooms	40-45
Sterilization rooms	45-50
Corridors and waiting areas (inside this type of buildings)	40-50
Patients room (one bed)	30-35
Patients room (two beds or more)	35-40
Administrative offices rooms	40-45
Doctors and nursing staff residences	30-35
Third: Residential Buildings	
A- Residential houses (villas) and residential units (flats) located at rural areas and outer suburbs)	
* Sitting and living areas	30-40
Sleeping areas	25-30
Entertainment and working areas inside the house	40-45
B- Residential houses (villas) and residential units (flats) in inner suburbs	
Sitting and living areas	35-40
Sleeping areas	30-35
Entertainment and working areas inside the house	40-45

C- Hotels	
Conference rooms	30-35
Dinning rooms	40-45
Car parks appendixes to hotels	55-65
Entertainment areas inside the hotel	45-50
Kitchen, laundry room and maintenance areas	45-55
Bedrooms	30-35
Fourth: Office Buildings	
Conference and meeting rooms	30-35
Accountants room	45-55
Computer room	45-55
Corridor and lobbies	45-50
Design office	40-45
Drafting office	40-50
General office area	40-45
Private offices	35-40
Typing rooms	45-55
Fifth: Public Buildings	
1- Airport terminals	
Departure lounges	45-60
Luggage dispatch and collection areas	45-60
Passenger check in areas	50-55
Passengers waiting area inside the departure lobbies	45-55
2- Auditoriums	
Motion picture theaters & musical play	35-45
Restaurants	35-45
Theaters	40-45
3- Municipal buildings	
Administrative offices	40-45
General offices	45-50
Public areas inside the building (waiting, etc.)	50-55
Council chamber	35-40
4- Courts	
Court rooms	25-30
Judge chamber	30-35
Presentation and interrogation rooms, attorney generals rooms	40-45
Administrative rooms	40-45
Waiting areas	45-55

5- Libraries	
Reading areas	35-40
Administrative office spaces	40-45
Stack areas	45-45
6- Museums	35-45
7- Car parks areas (public buildings)	55-65
8- Post offices and general banking areas	45-50
Sixth: Shop Buildings	
Department stores	55-60
Showrooms	45-50
Supermarkets	50-55
Car parks	55-65
Seventh: Studio Buildings	
Radio and television recording studios	25-35

Appendix (5)
Limits Allowed for Ultra-Sound Waves

	Octave Band Level		
	Measured in the air by dB re: 20 Head in the air		Measures in the air by dB re :1 Head in the water
Mid Frequency of Third Octave Band (KHZ)	Ceiling value	8 hours (TWA)	Ceiling value
10	105*	88*	267
12.5	105*	89*	167
16	105*	92*	167
20	105*	94*	167
25	110	-	172
31.5	115	-	177
40	115	-	177
50	115	-	177
63	115	-	177
80	115	-	177
100	115	-	177

* Self-noise determined source, which may occur to some persons at levels ranges from 74 dB-105 dB for frequencies of 10 kilohertz, especially if the levels are of tonic nature. We may need hearing protection or engineering control to prevent self-effects. Tonic frequencies require less than 10 kilohertz to drop to less than 80 decibel.

Man can accompany these values with water or a substrate with intensity, which may increase to 30 decibel when ultra sound waves may not affect the body by way of contacting water or another medium. When ultra sound waves contact the body directly, then the values set forth in the table are applied (the frequency level should be used at the mastoid. The accelerated values (15 dB) higher than (1g RMS) should be avoided by reducing exposure or isolating the body from the contact source.

(g) Refers to the earth gravity and (RMS) refers to average square root.

Appendix (6-1)
Maximum Limits Allowed for Heat-Stress in Industrial Environment (Effective Temperature) (W.B.G.T)

Applicable system (work/rest)	Work plan					
	Light		Medium		Heavy	
	Celsius	Fahrenheit	Celsius	Fahrenheit	Celsius	Fahrenheit
1- Continues work	30	86	26.7	80	25	77
2- (75% work, 25% rest) every hour	30.6	87	28	82	25.9	78
3- (50% work, 50% rest) every hour	31.4	89	29.4	85	27.9	82
4- (25% work, 75% rest) every hour	32.2	90	31.1	88	30	86

Note: The values available in centigrade (C) and Fahrenheit (F) and WBGT (thermal intensity) are derived through the following formulas:

Thermal intensity in outdoor environment and under the sunrays
= 0.7 x humid temperature + 0.2 x radiant temperature + 0.1 x dry temperature.

Thermal intensity in indoor environment and absence of sunrays
= 0.7 x humid temperature + 0.3 x radiant temperature.

Appendix No. (6-2)
Upper Limits of Exposure for Unimpaired Mental Performance (W.B.G.T) Effective Temperature

Influential temperature (^oC)	31	31.5	32	33	34	35	36	37	38	39	40	42	43
Daily exposure period by	240	180	130	90	65	60	55	50	40	35	20	15	12

Appendix No. (6-3)
Upper Limits Considered and Allowed for
Exposure to Low Temperatures in Industrial Environment

Temperature (^oC)		Maximum allowed exposure per day
From	To	
- 18	- 1	There is no maximum period as long as the worker is health and wears sufficient and adequate protective clothing
- 35	- 19	Total time for exposure inside the location does not exceed four hours alternatively, one hour of work followed by one hour of rest and so forth
- 57	- 36	Total exposure period per day shall not exceed one hour on two periods each of which is 30 minutes separated by 4 hours. They may be divided into four periods each of 15 minutes with two hours interval between each exposure
- 74	- 58	Total allowed exposure period per day is five minutes provided the worker is provided with tightly sealed head cover provided with a tube attached to the body from the bottom of the leg to provide a sufficient opportunity to heat the inhalation air

^oC= Degree Celsius

Appendix No. (6-4)
Limits Required for Temperatures in Indoor Environment

1- Air temperature between 23 to 26 degree Celsius

2- The difference in perpendicular temperature* (between 0.1 m and 1.1 m above room floor) less than (3) degrees Celsius.

3- Mediator air speed is less than (0.25 m/s) meter per second.

4- Room floor surface temperature between 19 to 26 degrees Celsius.

5- The radiant air temperature from windows or other cold perpendicular surfaces is not symmetrical: “less than 10 degrees Celsius for a small perpendicular surface (0.6) meter above room floor”

6- Non-symmetrical radiant temperature from hot or warm ceiling “less than 5 degrees Celsius for a small perpendicular leveled surface (0.6) meter above room floor.”

* Measuring the variation in height between the head and foot.

Appendix No. (6-5)

The following terms in this Appendix shall have the meanings set next to each of them:

Depleted (Consumed) Air: Is the air removed from a certain air and not used again.

Air Renewal: Is the process where the external air entering the indoor environment is supplied with recycled air treated for the purpose of providing us with a good quality of air. (Supplied air layer consists of external air + any recycled air treated for the purpose of providing us with a good quality of air.)

Exploited zone: Is the area comprising the probable area between the levels of (75 and 1800 millimeter) above ground surface and more than (600 millimeter) of the walls or fixed ventilation system.

Appendix No. (6-5) Continued
Values of Air Flow Rates in Indoor Environments
(Cubic feet per minute per person)

Building type	Average values
Office areas	20
Leased warehouses	0.02 – 0.3 cubic feet per minute per square foot
Teaching rooms	15
Lunch and dinner rooms	20
Hotel meetings rooms	20
Office meetings rooms	20
Viewing and watching areas	15
Theater listening areas	15
Transport lobby	15
Patients and hospitals rooms	25
Accommodation residences	10
Beverages lobbies	30
Cosmetics shops	25
Smoking lobbies	60

Appendix No. (7)
Working Environment Light
Minimum Light Levels Allowed for Occupational Activities

Activity	Minimum Limit Lux		Recommended Lux
A- Low precision works: 1- Assembly of big parts, construction and building works 2- Ordinary inspection works, working in front of machines or tables, etc.	100	300	400
B- Medium precision works: 1- Initial stages for polishing and varnishing – difficult examination works 2- Testing quality of colors – categorization and classification of products 3- More difficult inspection works – accounting works ... etc.	500	700	1000
C- High precision works: * High precision works in front of machines – middle stages for polishing and varnishing – computer – typing machines	700	1200	1500
D- Very precise works: * Welding very minute parts – assembly and testing of watches – engineering design and drafting	1500	2000	3000

<u>The following should be taken into consideration:</u>

1- Light should not fall directly on the eye whether from the source or reflected from a shinning surface

2- The eye should not be exposed to any flashing light without using appropriate protective measures.

3- Light at working locations is preferred to be indirect and should achieve the health allowed limits as per the visual activity of the worker.

4- Light should be measures on the height of working surface level.

Appendix No. (8)
Limits Allowed for Exposure of Hands to Vibrations (x, y, z)

Daily exposure period by hours	Overwhelming values which may not be exceeded	
	m/s^2	(g) Gravity
4 hours and less than 8 hours	4	0.4
2 hours and less than 4 hours	6	0.61
One hour and less than 2 hours	8	0.81
Less than one hour	12	1.22

Note:

1- Limiting the effect of exposure of the two main parts of human body, which is the whole body and segmental parts from high vibrations at the work environment.
2- Defining safe limits for exposure of hands to axes vibrations (S, S, A). The following figure illustrates how the environment is exposed to vibrations on the three axes.
3- Daily exposure period is the total time period in which vibrations enter the arms, whether continuous or on interrupted periods.
4- The gravity (f) value is 9.81 m/s^2
5- It is prohibited for hands to be exposed to vibrations at low temperatures and in case of necessity of exposure; it should be to the least possible time with providing medical care.

Vital and Central Axial Motor Coordination for the Hand
Showing the Directions of Acceleration Components

Appendix No. (9-1)
Limits Allowed for Skin or Eye Exposure to Ultra Violet Rays

Daily exposure time	Radiation energy micro watt/ cm^2
8 hours	0.1
3 hours	0.2
2 hours	0.4
1 hour	0.8
30 minutes	1.7
15 minutes	3.3
10 minutes	5
5 minutes	10
1 minute	50
30 seconds	100
10 second	300
1 second	3000
0.4	6000
0.1	30000

Notes:

1- It is allowed to use protective paints against ultra violet rays, which exceed the exposure limits set forth under this table, to protect the skin from the direct effects but they do not provide confirmed protection against the probable appearance of skin cancers.

2- Exposure to ultra violet rays of waves less than 250 nanometer may be accompanied with the appearance of the ozone gas, which requires implementing its own exposure criteria and limits.

3- Such limits do not apply on person who suffers from photosensitivity or those dealing with photosensitivity agents.

4- These criteria do not apply on laser rays falling in the ultra violet rays zone.

Appendix No. (9-2)
Limits Allowed for Exposure to Electro Magnetic Fields at 50/60-Hertz Frequencies

Exposure features	**Produced intensity of electric field** Lv/m (rms)	Intensity of magnetic flow mt (rme)
For a full working day	10	0.5
For a short duration	*30	**5
For limbs	-	25

(*) Calculating the period of exposure to fields ranging between 10 and 30 kilo volt/ m can be derived from the following: T<180/E , t is the time by hours for every working day, and E is the intensity of the electrical field calculated by Kv/m.

(**) Maximum exposure period is two hours for each working day.

Appendix No. (9-3)
Selected Occupational Exposure Limits for some common lasers

Laser	Wave Length	Exposure Limit
Argon-fluoride laser	193 nm*	3.0 mJ/cm^2 over 8 hrs
Xenon-chloride laser	308 nm	40 mJ/cm^2 over 8 hrs
Argon Ion laser	488.514.5 nm	3.2 mW/cm^2 over 0.1 s
		2.5 mW/cm^2 for 0.25 s
Helium-neon laser	632,8 nm	1.8 mW/cm^2 for 1.0 s
Krypton ion laser	568,647 nm	1.0 mW/cm^2 for 10 s
Helium- neon laser	632,8 nm	17 μW/cm^2 for 8 hrs
Neodymlum YAG laser	632,8	5.0μJ/cm^2 for 1 ns to 100 μs
Carbon dioxide laser	1,064 nm	No EL for 1< 1 ns
		5mW/cm^2 for 10 s
Erbuim glass laser	1,540 nm	1.0 J/cm2 for 1-1, 000 ns
Erbium YAG	2,940 nm	1.0 mJ/cm^2 doe 1-100 ns
Hydrogen fluoride laser	2.7-3,1 μm	10 mj/cm2 for 1-100 ns
Carbon dioxide laser	10,6 ų m	10mW/cm^2 for >10 s for areas > 1,000 cm^2

All the criteria do not comprise exposure limits for wavelength less than .200 nm.

Note: For converting the exposure limits estimated by mw/cm^2 to mJ/cm^2, they should be multiplied by the exposure time and seconds.

Appendix (9-4)
Direct Nominal Exposure Limits to Laser Rays
(Vision within the Rays)

Wave length (mm)	Exposure time (t) (s) (Second)	Exposure Limit EL (J/cm^2) or (W/cm^2)	
Ultra violet			
180 to 302	1 ns to 30 Ks	3.0×10^1 J/m^2	All exposure limits
303	1 ns to 30 Ks	4.0×10^1 J/m^2	Permitted for a wave
304	1 ns to 30 Ks	6.0×10^1 J/m^2	Length less than 315 mm
305	1 ns to 30 Ks	1.0×0^2 J/m^2	Must be
306	1 ns to 30 Ks	2.5×10^2 J/m^2	$5.6x10^3\ t^{3/4}$ J/m2
307	1 ns to 30 Ks	4.0×10^2 J/m^2	
308	1 ns to 30 Ks	6.3×10^2 J/m^2	
309	1 ns to 30 Ks	1.0×10^3 J/m^2	
310	1 ns to 30 Ks	1.8×10^3 J/m^2	
311	1 ns to 30 Ks	2.5×10^3 J/m^2	
312	1 ns to 30 Ks	4.0×10^3 J/m^2	
313	1 ns to 30 Ks	6.3×10^3 J/m^2	
314	1 ns to 30 Ks	5.6×10^3 J/m^2	
315 to 400	10 ns to 30 Ks	1.0×10^3 J/m^2	
315 to 400			
Visual and IR-A			
400 to 700	1 ns to 18 μs	0.005 J/m^2	Identification pervious 7 mm
400 to 700	18 μs to 10 s	$18\ t^{3/4}$ J/m^2	
400 to 550	10 s to 10 Ks	100 J/m^2	
550 to 700	10 s to *T* s	$18\ t^{3/4}$ J/m^2	
550 to 700	*T* s to 10 ks	$100\ C_8$ J/m^2	
400 to 700	10 ks to 30 ks	$0.01\ C_8$ W/m^2	
700 to 1.050	1 ns to 18 μs	$0.005\ C_8$ J/m^2	
700 to 1.050	18 μs to 1 ks	$18\ C_4\ t^{3/4}$ J/m^2	
1.051 to 1.400	1 ns to 50 μs	0.05 Cc J/m^2	
1.051 to 1.400	50 μs to 1 ks	$90\ Cc\ t^{3/4}$ J/m^2	
700 to 1.400	1 ks to 30 ks	$3.2\ C_8\ Cc$ W/m^2	

Wave length (mm)	Exposure time (t) (S)	Exposure Limit EL (J/cm^3) or (W/cm^2)	
Infra red			
1.400 to 1.500	1 ns to 1.0 ms	1.000 J/m^2	Identification pervious 3.5 mm
1.400 to 1.500	1.0ms to 10 s	5.600 $t^{3/4}$ J/m^2	
1.500 to 1.800	1 ns to 10 s	10^4 J/m^2	
1.801 to 1.800	1 ns to 1.0 ms	1.000 J/m^2	
1.801 to 2.600	1.0 ms to 10 s	5.600 $t^{3/4}$ J/m^2	
2.601 to 10^2	1 ns to 100 ns	100 J/m2	
2.601 to 10^2	100 ns to 10 s	5.600 $t^{3/4}$ J/m^2	
1.400 nm to 1 mn	10 s to 30 ks	1.000 W/m^2	

Note: The identification pervious is for all the allowed exposure limits for ultra violet rays, for positive lengths ranging from 1400 nm to 0.1 mm is 1 mm for the time less than 0.25 second and 3.5 mm for longer periods, which is 11 mm for positive lengths longer than 0.1 mm, which is 7 mm for all nominal exposure limits permitted for positive lengths ranging from 400 mm to 1400 mm.

For a 1 ks=1000 s. and 30 ks – 8 hours
C_A=1 for 400 To 700 nm; C_A – $10^{[0.02(-700)]}$ if = 700 – 1.050 nm
C_B=1 for <550 nm; C_B=$10^{[0.015(-500)]}$ for 550 nm to 700 nm
T_1= 10 X $10^{[0.02(-550)]}$ for = 550 nm to 700 nm.
C_c= 1 for < 1.150
C_c=$10^{[0.0181\ (-1150\ nm)]}$ for 1.150 <<1.200
C_c=8 for 1.200 << 1.400.

Appendix No. (9-5)
Limits for Eye Exposure to Laser of Extended (non matrix) Source

The allowed exposure limits to an extended source is defined by multiplying the nominal exposure limits within the rays band by the correction coefficient C_E. This following correction coefficient C_E applies on the exposure limits within the recorded ray band for source sizes exceeding αmim where αmim is:

α_{mm} = 1.5 mrad for t<0.7 S.

$\alpha_{mm} = 10 \times t^{3/4}$ mrad for 0.7 S<t < 10 S and

α_{mm} = 11 mrad for t < 10 S.

$C_E = \alpha/\alpha_{mim}$ for $\alpha_{min} < \alpha < 100$ mrad.

$C_E = 10 \times \alpha^2 / \alpha_{mim}$ for $\alpha > \alpha$ 100 mrad

Appendix No. (9-6)
Limits for Skin Exposure to Laser Rays

Wave length (mm)	Exposure time (t) (s)	Exposure Limit LT (J/cm^2) or (W/cm^2)	Restrictions
Ultra violet			
200 to 400	1 ns to 30 ks		
Visual and IR-A		Similar to eye exposure limit	
400 to 10^4	1 ns to 100 ns	0.2 C kJ/m2	
400 to 10^4	100 ns to 10 s	11 Ct^{vt} kJ/m2	Identification pervious
400 to 10^4	10 s to 30 ks	2.0 CkW/m2	
Remote Infrared			3.5 mm or 1
400 to 10^4	1 ns to 30 ks	Same as eye EL	
		For 2,601 nm to 1 mm	

Note: The identification pervious for all pulse exposures (time 1 < 0.25 seconds) is 1 mm and is 3.5 mm for longer exposure times

A- Coefficient Error

Wave length (nano-meter)

Figure No.(1)
Coefficient Factor (CA) used for Identification
Of Exposure Limit value in the Proximal Infra Red Rays Spectrum Area

APPENDIX NO. (10)
CHEMICAL MATERIALS MANAGEMENT

Appendix (10-1)
Classification of Hazardous Chemical Materials

The terms set forth under this Appendix shall have the meanings as explained against respective terms:

Hazardous chemical materials: are chemical materials in their gaseous- solid and fluid states set forth under the following categories:

Category (1) explosives:

1- Category (1) comprises the following:

I- Explosive materials: Other than those, which are severely hazardous to be transferred or those, which their imminent danger is appropriate for another category.

Note: Material, which is not in itself explosive but is able to form an explosive surrounding of gas, steam or dust, is not classified under category No.1

II- Explosive materials other than machines which contain explosive materials in such a quantity or quality which does not cause its intended or unintentional blazing while being transported in external effects on the machine such as denture, fire, smoke, heat or high noise.

III-Materials and brands which are not mentioned under (A) or (B) above, manufactured for the purpose of producing an explosive effect or similar to fireworks.

2- Category (1) is divided as follows:

- Category (1-1): The materials and types which contain total explosive hazard, i.e. hazard which practically affects on all the load instantaneously
- Category (1-2): Materials and types, which contain the danger of denture of package surface and not total explosive danger.

- Category (1-3): Materials and types, which contain fire hazard and small fire hazard also or denture hazard or both but not total explosion hazard. This category comprises the following materials and types:

  I- Those, which emit huge radiation heat.

  II- Those, which burn one after the other, causing a minor explosion or denture effects, or both.

* Category (1-4): Materials and types, which do not cause huge dangers. This category comprises the materials and types, which cause minor damages only in case of burning or emission while being transported. The resulting effects are basically limited to the package and it is not expected that any splinters of serious size or extent will appear. Practically, the external fire should not cause any instant effect on all the package contents.

- Category (1-5): Fully insensitive materials, which may cause a major explosion. Such category comprises materials, which have major explosive hazard but are insensitive to an extent, which makes the probability of their release or transfer from the burning state to explosion under normal transport conditions weak.

- Category (1-6): Fully insensitive materials, which do not have total explosion hazard. This category is limited to materials, which are completely insensitive to explosion which may explode or which may show an remarkable unintentional discharge or expansion.

2- Category (1): Is rare as package type usually has a decisive effect on the danger and therefore on listing the material under a specific group under category (1).

Category (2) Compressed, liquidated gases or gases dissolved under pressure:

1- This category comprises compressed gases, liquidated gases, dissolved gases, refrigerated cooled gases, mixtures of one type or more of gases with one type or more of steams of materials under other categories, materials charged with tellurium hexafluoride) and sprayers with capacity more than one liter.

2- This category comprises gaseous materials which:

I- Have steam pressure at 50 degrees Celsius more than 300 kilo Pascal.

II- Becomes fully gaseous at 20 degrees Celsius and at a standard pressure of (101.3) kilo Pascal

3- Gas described during transport according to its physical state as follows:

I- Compressed gas: Non-dissolved gas, which when packed under transport pressure is fully gaseous at 20 degrees Celsius.

II- Liquidated gas: Gas when packed for transport is partially liquidated at a temperature of 20 degrees Celsius.

III- Refrigerated liquidated gas: gas which when packed for transport is partially liquidated to its low temperature.

IV- Dissolved gas: compressed gas which when packed for transport is dissolved in a solution

4- Category (2) is divided up into the following:

- Category (2-1) flammable gases
- Category (2-2) non igneous and non poisonous gases
- Category (2-3) poisonous gases.

Category (2-1) flammable gases: Gases which at 20 degrees Celsius and standard pressure of 101.3 kilo Pascal are flammable when they are at a mixture of 13% or less volume with air and their flammability with air is at 12% point regardless of the minimum explosion limits. Flammability should be defined by test or calculation according to the method approved by the International Specifications Organization (ISO) (see ISO specification 10156-1990). When the available data are insufficient for application of such methods, tests by use of comparable methods approved by the concerned authorities may be applied.

Note: Sprayers with capacity more than 1 liter (United Nations 1950) and small vessels containing gases (United Nations 2073) are considered under category (2-1).

Category (2-2) non-flammable and non-poisonous gases: Gases, which are transported at pressure not less than 280 kilo Pascal at temperature of 20 degrees Celsius or as refrigerated liquids. As for suffocating gases which are diluted or dissolved with the presence of oxygen they may cause or attribute in the burning of other materials more than done by air, they are not included under category (2-1) or (2-3).

Category (2-3) poisonous gases: Are gases, which are known for being seriously poisonous or erosive and constitute a health danger. They are presumed to be poisonous or erosive and constitute a health danger because the LD amount = 50 (the level at which or less than which it is capable of killing 50% of living beings in its surrounding) is equivalent or less than (5000) parts per million.

Category (3) flammable liquids: includes combustible or flammable liquids, which comply with the following:

- Liquids are listed under category (3) if its flashing point does not exceed (61) degrees Celsius, except the following exceptions:

  I- Fluids with flashing point not less than (23 degrees Celsius) and not exceeding (61 degrees Celsius) but its self-flammation point exceeds 104 degrees Celsius or which boils before reaching the combustion point. This criterion excludes many flammable fluids, water mixtures and mixtures of petroleum products because their flashing points do not constitute a real burning hazard.

  II- Water solutions, which do not contain more than 24% ethanol by volume.

  III- Alcoholic drinks and other human consumable products when packed in internal containers of capacity, which do not contain 5 liters.

  IV- Materials, which are classified under other categories due to other more dangerous characteristics.

Category (4): Solid flammable materials and materials exposed to automatic ignition and materials which when contact the water emit flammable materials:

Category (4) is divided up into the following:

I- Solid flammable materials

II- Materials, which are self-reacting and react with associated materials.

III-Desensitized explosives.

Solid flammable materials: Solid flammable materials are materials, which are easily ignitable and those, which may cause fire through friction. Solid materials, which are easily combustible, are powdered, granular or pastymaterials, which are hazardous if easily burned by contacting causing danger not only from fire but from the poisonous combustion products also. Metal powders are particularly hazardous due to difficulty of extinguishing their fires because ordinary extinguishing materials such as carbon dioxide or water may increase the hazard.

Materials, which are self-reacting and related materials: self-reacting materials, which may be exposed to strong heat emission dissolution (at regular temperature or higher). The materials should be listed as being self reacting under category (4-1) if:

- They are explosives according to the criteria of category (1).
- They are oxidized materials according to the identification measures under category (5-1)
- If their decomposition temperature is less than 300 joule/ volume.
- Self-acceleration of their decomposition temperature is higher than 57 degree Celsius.

Note: **Decomposition temperature may be defined by using internationally accredited thermal methods for measuring heat quantity.**

Desensitized explosives properties: Desensitized explosives are materials, which are wetted by water or alcohol or diluted with other materials to extinguish their explosive properties. They include, for example:

1310	Ammonium picrate, wetted, etc.
1320	Dinitrophenol , wetted, etc.
1321	Dinitrophenolates, wetted, etc.
1322	Dintroesorcinol, wetted, etc
1337	Nitrostarch, wetted, etc
1344	Silver picarate, wetted, etc.
1347	Silver picrate, wetted, etc
1348	Sodium dinitro-o-credolate, wetted, etc.
1349	Sodium picramate, wetted, etc.
1354	Trinitrobenzene, wetted, etc.
1355	Tribitrobenzoic acid, wetted, etc.
1356	Urea nitrate, wetted, etc.
1357	Zirconium acid, wetted, etc.
1571	Nitrocellulose with water, etc.
2555	Nitrocellulose with alcohol, etc.
2556	Nitrocellulose with water, etc.
2557	Nitrocellulose with platicizing substance, etc.
2852	Dipicryl sulfid, wetted, etc
2907	Isosorbided initrate mixture, etc.

2- Category (4-2) materials, which may be exposed to automatic combustion: this category includes:

- Automatic combustion materials:

- Self heating materials:

Automatic combustion and self heating materials: self heating of materials which leads to automatic combustion is produced from the material's reaction with oxygen in the air) and non diffusion of resulting heat at a sufficient speed to the surrounding which causes self combustion when the heat production rate exceeds its diffusion rate and reaching the automatic self combustion temperature. Two types of materials with self-combustion properties are distinguished:

A. Materials, including mixtures and solutions (liquid or solid), which even at small quantities, burn within 5 minutes of contacting the air. These materials are more vulnerable to self-combustion and are called automatically combusting materials.

B. Other materials, which are vulnerable to self-heating upon contacting the air without being supplied with energy. These materials burn when they are at huge quantities only (kilograms) after long periods of times (hours or days) and are called self-heating materials.

3- Category (4-3) materials, which emit inflammable gases when contacting the water: Some materials may emit inflammable gases upon contacting the water, which may make an explosive mixture with air. Such mixtures may be ignited easily with all ordinary sources of ignition such as exposed light or manual tools emitting sparkles or unprotected light bulbs. The explosive wave and flame resulting from the explosion may expose the life of people and the environment to danger.

One such example is Calcium Carbide.

Category (5) oxidizing factors and organic peroxides:

1- Category (5) is divided up as follows:

- Category (5-1) oxidizing materials: With being necessarily combustible, these materials emit oxygen easily or can be a cause for oxidization processes which may start a fire in other materials or instigate the burning of other materials, hence increasing the fire.

☐ Category (5-2) organic peroxides: The majority of materials listed under this category are combustible and all of them contain bivalent-O-O. These materials operate as oxidizing materials, which are vulnerable to explosive decomposition. They may react in a hazardous way, whether in their liquid or solid form, with other materials and the majorities of them burn rapidly and are sensitive to collision or friction.

2- Due to the various properties of the materials listed under categories (5-1), (5-2), it is impractical to put one criterion for classifying materials under either categories. The tests and criteria applied be obtained from the concerned authorities in order to classify the materials under categories 5-1, 5-2.

4- Category (5-1) and category (5-2) are treated as separate categories for the purpose of marking containers and packages and transport vehicles and for the purpose of separating the packages and transport.

Category (6) poisonous and contagious materials:

Category 6 is divided into the following:

Category (6-1) poisonous materials:

The material that can endanger the lives of the people to this or severe injury, should it is swallowed, inhalated, or contacted the skin.

Criteria of poison included within category 6-1

Physical condition	LD50, oral (mg/ Kg)	LD50, skin (mg/ Kg)	LD50, inhalation, (mg/ Kg)
Solid	200	1000	10
Liquid	500	1000	10

Remark: LD50 is the dose capable of killing 50% of the biological materials within the atmosphere where it exists.

Category (6-2): Contagious materials

That contain fine biological materials, including bacteria, virus, rectos (biological materials which its size ranges between that of bacteria and virus), parasites, fungi, genetically modified biological materials or the biological materials which are known or reasonably believed that it causes diseases to humans or animals.

Category (7): Radius materials

Category (7) includes the materials or the set of materials, which are automatically radioactive.

Category (8): Corroding materials

Category (8) includes the materials that cause severe damage if it contacts tissues or in case of leakage it damages or even destroys other goods or means of transport.

Category (9): Other dangerous materials

Category (9) includes materials that constitute danger during transport. It is not included within other categories. Category (9) includes number of materials and items that constitute simple danger and materials environmentally dangerous that do not comply with other technical criteria.

Transport of consignments of unpacked dangerous materials:

(i) Chemical substances from category (2): In 500 liters containers, provided that total containers transported by this way should not exceed 1000 liters.

(ii) Chemical substances within categories other than category (2) which may be liquid or in the form of paste: in 250 liters containers or in smaller containers which its capacity does not exceed 1000 liters.

(iii) Solid chemicals: In indivisible containers exceeding 400 Kg. or in divisible containers exceeding 800 Kg.

IATA Regulations: It is the regulations relating to dangerous materials issued by International Air Transport Association (IATA).

ICTO Regulations: It is the technical regulations of International Civil Aviation Organization.

IMDG Regulations: It is the document issued under the title (Manual of International Sea Freight of Dangerous Goods) issued by International Sea Freight Organization.

United Nations Code: It is the code allocated by United Nations Experts Commission for any dangerous material regarding transportation of this material as published in the recommendations of the UN, manual of International Sea Freight of dangerous materials, the rules of the International Civil Transport Organization and in the regulations of the International Air Transport Union.

Consignment Correct Name: It means

(i) The appropriate shipping name used for the ship materials as per the recommendations of the United Nations, Sea Freight manual of dangerous materials, the rules of the International Civil Transport Organization or that of the International Air Transport Organization.

(ii) With regard to the radioactive materials, it is the name specified by the Authority concerned with radiation prevention.

(iii) With regard to chemicals, explosives category, the correctness will be that name determined by the concerned authorities.

C.A.S. No.: The serial chemical number of the chemical substance

Customs statistical number it represents the code of the chemical substance according to the international convention of the regulated system of goods classification concluded in Brussels in 1983.

PIC Convention: It provides that any country that is a member in the agreement should advice or agree with the concerned National Authority in the importing country upon the international consignment of any prohibited or strictly restricted chemical substance for the purpose of protecting the health of the human being or the environment.

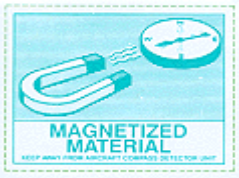
Appendix No. (10-2)
Handling Card

Handling cards: These are internationally recognized safety cards, which comprise illustrative signs concerned with the handling of chemical materials as shown in this list.

Handling card for airfreight only
Minimum dimensions 110x 120 mm
For small packages of contagious materials
(category 6 type 2) dimensions may be classified

Packages handling card
Red or black color on
contrast background
Minimum dimensions 90 x
105 mm

Handling card for category (9)
magnetized materials
Minimum dimensions 90 x 110 mm



Appendix No. (10-3)
Danger Cards

Danger cards: These are the information required for the majority of goods of hazardous materials of all categories, which is in the shape of square and placed on 45 angle as illustrated in this list.

Characteristic Properties of the Substance	**Classification**	**Hazard warning sign**
Organic peroxides acetates, which are not necessarily inflammable, but may generate oxygen causing or contributing in the burning of another substance.	Oxidizing substance	
This substance consists of: a. One of the organic peroxides b. Unstable substance which may decompose automatically, accompanied with emission of heat	Organic Peroxide	
A substance known to have poisonous effects on man to the extent which constitutes a health danger while being transferred	Poisonous substance	
A substance known to have poisonous effect on man but unlikely to cause dangerous effects on health during transport operations	Harmful substance	

A substance with chemical reaction which has effects: a. Causing severe damages when in contact with living tissues b. Substance leakage may cause damages to other substances transferred therewith	Corrosive substance	
A substance containing diseases emitting microscopic living organisms	Contagious substance	
Substance with automatic radioactive emission with specific activity exceeding (0.002) micro Cory per gram	Radioactive substance	
A substance, although does not have any of the above mentioned properties, but may constitute a danger on the health and safety of lives under unexpected cases during transport operations due: A-to their chemical properties B- being transferred at temperature exceeding (100 degree Celsius) Hazardous substances transferred in the form of one load comprising miscellaneous dangerous goods	Other hazardous substances Hazardous substances	
Substance other than poisonous or flammable gas which: I. Has critical temperature less than (50 degrees Celsius) or emit steam pressure exceeding (3) atmosphere in temperature less than (50 degrees Celsius) II. Requires upon transferring them to be under pressure exceeding 500 millibar above atmospheric pressure or being in a liquid form	Compressed non flammable gas	

A substance which has critical temperature less than (50 degrees Celsius) or which has steam pressure above (3) atmospheric at temperature of (50 degrees Celsius) and has a poisonous effect	Poisonous gas	
A substance which has critical temperature less than (50 degrees Celsius) or which have steam pressure exceeding (3) atmospheric at temperature of (50 degrees Celsius) and is flammable	Flammable gas	
Fluid with flashing point at (55 degrees Celsius) or less	Flammable liquid	
Solid substance prepared for burning under unexpected conditions while being transported by land or which may cause or contribute in the occurrence of fire due to friction	Solid flammable substance	
A substance exposed to self heating under unexpected conditions while being transported by land, or which is exposed to heating upon contacting the air and may burn	Self combustible substance	

A substance which if contacting the water will be exposed to self combustion or emitting flammable gas	A substance which when contacting water will emit flammable gas	

APPENDIX NO. (11)

MANAGEMENT OF DOMESTIC WASTES, HAZARDOUS WASTES, HEALTH CARE WASTES AND SLUDGE WASTES

Appendix No. (11-1)
List of Hazardous Characteristics as Per Basel Agreement

UN Class*	Code	Characteristics
1	H1	**Explosive substances** An explosive substance is a substance or waste (or mixture of substances or wastes) which are solid or liquids and capable by itself to produce through chemical reaction a gas at a such temperature and pressure and at a such speed which causes damage to the surrounding environment
3	H3	**Flammable liquids** The word "flammable and "inflammable" have synonymous meaning which is "combustible." Inflammable substances are liquids or mixture of fluids or liquids containing solid substances in solution or suspension (such as types of paints, varnishes, lacquers and so forth, provided they do not contain the substances or wastes classified under different category on account of the dangerousness of their characteristics) which give off a flammable vapor at temperatures not exceeding 60.5 degree Celsius in the closed beaker test, or not more than 65.6oC, open beaker test (Since the results of the open beaker test and of closed beaker test are not completely similar and even individual results by the same test are often variable regulations varying from the above figures to make allowance for such differences would be within the spirit of this definition.)
4.1	H4.1	**Flammable solids substances** * These are solid substances or solid wastes other than those described as explosives, which are inflammable under circumstances faced during the transport operations or which may cause or contribute, to fire through friction.
4.2	H4.2	**Substances or wastes liable to spontaneous combustion** Substances or wastes, which are liable to spontaneous heating under normal conditions encountered during transport, or exposed to heating up on contact with the air, and being then liable to catch fire.
4.3	H4.3	Substances or wastes emitting inflammable gases when contacting water. Substances or wastes, which by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities.
5.1	H5.1	**Oxidizing** These are substances or wastes, which may not be necessarily combustible themselves, but in general may cause or contribute in burning other substances through the production of oxygen.
5.2	H5.2	**Organic peroxides** Organic substances or wastes containing bivalent –0-0- structure are thermally unstable substances which may undergo exothermic self-accelerating + decomposition.
6.1	H6.1	**Poisonous substances (acute):** Substances or wastes, which may cause death or serious harm or injury to human health if swallowed, or inhaled or by skin contact.
6.2	H6.2	**Infections substances** Substances or wastes containing viable micro or their toxins, which are known or suspected to cause disease in animals or humans.

UN Class*	Code	Characteristics
8	H8	**Corrosives substances** Substances or wastes which by chemical action, will cause severe serious damage when in contact living tissue, or which may lead, if leaked, to causing essential damage to other goods or means of transport or even their destruction; they may also cause other hazards.
9	H10	**Liberation of toxic gases in contact with air or water** Substances or wastes, which may emit toxic gases in dangerous quantity by interaction with the air or water.
9	H11	**Toxic (Delayed or chronic)** Substances or wastes which, if they are inhaled or ingested or if they penetrate the skim, may involve delayed or chronic effects, including carcinogenieity.
9	H12	Ecotoxic Substances or wastes the emission of which cause or may cause immediate or delayed adverse environmental impacts due to their accumulation in living organisms and/or toxic effects upon biotic systems.
9	H13	Substances, which are capable, by any means, after disposal, of yielding another material, e.g. leachate, which possesses any of the characteristics listed above.

* Corresponds to the hazard classification system included in the United Nations Recommendation on the Transport of Dangerous Goods (ST/SG/AC.10/1/Rev.5, United Nations, New York, 1988).

Appendix No. (11-2)
Categories of Wastes to be Controlled According to Basel Agreement

(i) Waste Streams:

Y1 Clinical wastes from medical care in the hospitals, medical centers and clinics
Y2 Wastes from the production and preparation of pharmaceutical products.
Y3 Wastes pharmaceuticals, drugs and medicines
Y4 Wastes resulting from the manufacture, formulation and use of biocides and phytopharmaceuticals.
Y5 Wastes from manufacturing, processing and use of wood preserving chemical substances
Y6 Wastes from the production, formulation and use of organic solvents
Y7 Wastes from heat treatment and tempering operations containing cyanides.
Y8 Waste of mineral oils unfit for their originally intended use.
Y9 Waste oil/water, hydrocarbons/water mixtures, emulsions
Y10 Waste substances and articles containing or contaminated with polychlorinated biphenyls (PCBs) or polychlorinates terphenyls (PCTs) and/or polybrominated biphenyls (PBBs)
Y11 Waste tarry residues arising from refining, distillation and any pyrolytic treatment.
Y12 Wastes resulting from the production, formulation and use of inks, polish, coloring substances, paints, lacquers and varnish.
Y13 Wastes resulting from production, formulation and use of resins, plasticizers, glues and adhesive substances.
Y14 Waste chemical substances arising from research and development activities or academic activities which are not identified and/or are new classification., the effects of which are unknown on man and/or the environment.
Y15 Wastes of an explosive nature, which are not subject to another legislation
Y16 Wastes resulting from the production, formulation and use of photographic chemical substances and photographic treatment and their processing and use.
Y17 Wastes resulting from surface treatment of metals and plastics.
Y18 Residues arising from industrial wastes disposal operations.

(ii) Wastes having as Constituents:

Y19 Metal Carbonyls.
Y20 Beryllium, beryllium compounds.
Y21 Hexavalent chromium compounds.

Y22 Copper compounds.
Y23 Zinc compounds.
Y24 Arsenic; arsenic compounds.
Y25 Selenium; selenium compounds.
Y26 Cadmium; cadmium compounds.
Y27 Antimony; antimony compounds.
Y28 Tellurium; tellurium compounds.
Y29 Mercury; mercury compounds.
Y30 Thallium; thulium compounds.
Y31 Lead; lead compounds.
Y32 In organic fluorine compounds, excluding calcium fluoride.
Y33 In organic cyanides.
Y34 Acidic solutions or acids in solid form.
Y35 Basic solutions or bases in solid form.
Y36 Asbestos (dust and fibers).
Y37 Phosphorous organic compounds.
Y38 Cyanide organic compounds.
Y39 Phenols; phenol compounds including chlorophenol.
Y40 Ether compounds.
Y41 Halogenated organic solvents.
Y42 Organic solvents except halogenized solvents.
Y43 Any substance similar to furan dibenzene of polychloride bonds.
Y44- Any congenor of Polychlorinated dibenzo-p-dioxin.
Y45 Organohalogen compounds other than the substances referred in this Appendix (e.g.Y39, Y41, Y42, Y43, Y44)

(iii) <u>Categories of Wastes Requiring Special Care:</u>

Y46 Wastes collected from households.
Y47 Residues arising from incineration household wastes.

Appendix No. (11-3)
Limits Allowed for Hazardous Pollutants Concentration at Leachate Produce (TCLP)*

No.	Hazardous Chemical Substances	Leachate Concentration mg/L
1	Arsenic	5.00
2	Barium	10
3	Benzene	0.5
4	Calcium	1.0
5	Carbon tetrachloride	0.5
6	Chlorobenzene	100
7	Chloroform	6.0
8	Chromium	5.0
9	Cresol	200
10	Paracresol	200
11	4, 1- benzene dichloride	7.5
12	2,1- ethane dichloride	0.5
13	1,1 ethylene dichloride	0.7
14	Oxalate phthalate diethyl	10
15	4, 3- toluene dinitrate	0.13
16	Benzene ethyl	70
17	Benzene hexachloride	.013
18	Butadiene hexachloride	0.5
19	Ethan hexachloride	3.0
20	Iron	5.0
21	Mercury	0.2
22	Methyl ethyl ketone	200
23	Nickel	10.0
24	Nitrobenzene	2.0
25	Phenol pentachloride	100
26	Pyridine	5.0
27	Selenium	1.0
28	Silver	5.0
29	Styrene	10.0
30	Ethylene tetrachloride	0.7
31	Toluene	10.0
32	Ethylene trichloride	0.5
33	Phenol trichloride	400
34	Phenol triachloride	2.0
35	Phenol chloride	0.2
36	Xylene	70

TCLP: Toxicity Characteristics Leachate Produce

Appendix No. (11-4)
Manifest for Transportation, Disposal of Non-Hazardous Waste and Construction Waste

CC	Environment Public Authority	Environment Public Authority
CC	Waste (source)	Industrial Affairs Dept. Industrial Waste Control Division
CC	Kuwait Municipality / Cleaning Dept. Kuwait Municipality/ Dept. of Environmental Affairs	Telephone: 4821285-9 Ext. 203 Fax: 4821724 P. O. Box: 24395 Kuwait Safat 13104
CC	Transporter	

(A) Waste (source) Information	The wastes set forth under B, were collected from: And transferred to : _____, at the recommendations of the Environment Public Authority Name: _____ Occupation: _____: Signature_____ Hour: _____ Date : _____ Address: _____Telephone No.: ___ Fax No.:_____
(B) Waste Description	1- Waste general description: 2- Waste status: Solid – semi solid – slime – fluid – other (specify) 3- Waste classification: Oil waste – chemical materials – medicines – other (specify) 4- Waste details: waste weight (kg): _____ No.of cars : _____ Load capacity: _____ 5- Operations resulting in the waste:
(C) Transporter	I hereby declare that I have collected the wastes said under clause (B) and that the above details are correct. The above wastes were taken from : _____ Hour : _____ Name : _____ Job : _____: Signature: _____ Hour : _____ Date : _____ Address : _____ Phone No.: _____ Fax No.: _____
(D) Authority Carrying the Destruction	The waste mentioned under clause (B) were destroyed at the Location: _____ Waste disposal method: ___ sanitary burial ___ spraying on ground – treatment then burial-evaporation _____ other (specify) : _____ site manager name : _____ signature : _____ in the presence of the Environment Public Authority Representative and representative of the waste source authority. The Environment Public Authority hereby certify that the wastes set forth under clause (B) pertaining to _____ has been treated / destroyed. Name of Environment Public Authority's representative: _____ Signature : _____

A copy of the waste list should be attached

Appendix No. (11-5)
Disposal Operations According to Basel Agreement

(a) Operations, which do not lead to the possibility of resource recovery of recycling them, reclamation, direct re-use or operation which do not lead to the possibility of resource recovery, recycling, reclamation, direct re-use or alternative uses.

Section "A" includes all such disposal operations, which occur in practice.

D1 Deposit into or on to land (e.g. landfill, etc.).
D2 Land treatment such as biodegradation of liquid or sludgy discards in the soil etc.
D3 Deep injection such as: Injecting wastes which may be pumped inside wells, salty dunes or naturally formed reservoirs etc.
D4 Surface impoundment such as placement of liquid or sludge discards into pits, lakes and coastal lagoons etc.
D5 Landfill specially designed such as placement into lined discrete cells,which are capped and isolated from one another and the environment etc.
D6 Release into water body, except seas/oceans.
D7 Release into seas/oceans including insertion in sea bottom.
D8 Unspecified biological treatment at any other place in this Appendix which result in final compounds or mixtures which re discarded by means of any other operations mentioned under section "A".
D9 Physieo-chemical treatment unspecified at another location in this Appendix resulting in final compounds or mixtures disposed of by any of the operations set forth under section "A" such as; evaporation, drying, calcination, neutralization and precipitation, etc.
D10 Incineration on the land.
D11 Incineration at sea.
D12 Permanent storage such as emplacement of containers in a mine.
D13 Mixing or blending prior submission to any of the operations set forth under "A"
D14 Repackaging prior submission to any of the operations in section "A"

(B) Operations which may lead to resources of recovery, recycling, reclamation, direct re-use or alternative uses.
Section "B" includes all such operations with respect to materials legally defined as being hazardous or considered to be hazardous wastes and which otherwise would have been destined for operations included section "A".

R1– Use as a fuel (other than indirect incineration) or means to generate energy.
R2– Solvents used for extraction /re-generation
R3- Recycling/extraction of organic substances which are not used as solvents.
R4- Recycling/extraction of metals and metal compounds.
R5- Recycling/extraction of other organic substances.
R6- Re-generation of acids or bases.
R7- Recovery of components used for pollution abatement.
R8- Recovery of components from catalysts.
R9- Used oil re-refining or other reuse of oils which have been used previously.
R10- Land treatment leading to benefit for agriculture or ecological improvement.
R11- Uses of residual materials obtained from any of the operations numbered R1 to R10.
R12- Exchange of wastes for submission to any of the operations numbered R1 to R11.
R13- Accumulation of material intended for any operation in section “B”.

Appendix No. (11-6)
Manifest for Transportation
and Disposal of Hazardous Waste

CC	Environment Public Authority	Environment Public Authority
CC	Waste (source)	Industrial Affairs Dept. Industrial Waste Control Division
CC	Kuwait Municipality / Cleaning Dept. Kuwait Municipality/ Environmental Affairs	Telephone: 4821285-9 Ext.203 Fax: 4821724 P. O. Box: 24395 Kuwait Safat 13104
CC	Transporter	

(1) Waste (source) Authority Information	The wastes set forth under B, were collected from: And transferred to : _____, at the recommendations of the Environment Public Authority. Name: _____ Occupation: _____: Signature_____ Hour: _____ Date : _____ Address: _____Telephone No.: ___ Fax No.:_____
(B) Waste Description	1- Waste general description: 2- Waste status: Solid – semi solid – slime –liquid – other (specify) 3- Hazard degree: Poisonous _ inflammable _ corrosive __ explosive __ other (specify) 4- Waste classification: Oil waste – chemical materials – medicines – other (specify) 5- Waste details: Waste weight (kg): _____ No.of cars : _____ Load capacity: _____ 6- Operations resulting in the waste:
(C) Transporter	I hereby declare that have collected the wastes said under clause (B) and that the above details are correct. The above wastes were taken from : _____ Hour : _____ Name : _____ Job : _____: Signature: _____ Hour : _____ Date : _____ Address: _____ Phone No.: _____ Fax No.: _____
(D) Authority Carrying The Destruction	The waste mentioned under clause (B) were destroyed at the location : _____ Waste disposal method: ___ sanitary burial ___ burning _ chemical treatment – treatment then burial- evaporation _____ other (specify) : _____ site manager name : _____ signature :

	_____ in the presence of the Environment Public Authority's representative and representative of the waste source authority. The Environment Public Authority hereby certify that the wastes set forth under clause (B) pertaining to _____ has been treated / destroyed. Name of the Environment Public Authority's representative: _____ Signature : _____

A copy of the waste list should be attached

Appendix No. (11-7)
Transport Document Requirements

1) Waste source ____
2) Waste producer ____
3) Waste disposer _____
4) Waste transporter (s) or agent (s) _____
5) General or individual advise subject to the wastes exported outside Kuwait
6) Date of starting internal transport/across the borders and receiving date (s) and signing the delivery receipt by each person responsible for the waste.
7) Means of transport (land or railway, internal waterways or by sea or air_ including exporting country, transit, import and also the entry and exit points where defined.
8) General description of the waste (material composition, consignment name and category as per the UN terms, UN number, Y number and hazardous characteristics H, number wherever possible)
9) Information on the conditions for handling including emergency provisions in case of accidents.
10) Package type and number of packages type of packaging envisaged (e.g. bulk, drummed and tanker).
11) Weight/ kg
12) Statement from the generator or source on the validity of the information.
13) Statement from the generator or no objection certificate from Environment Public Authority for exporting the waste.
14) Statement from the producer or no objection statement from the concerned authorities in the country importing the waste.
15) Statement of acceptance from the disposer at the specific disposal facility and illustrating the disposal method and approximate disposal date.

The required information should be inserted in the transport document, wherever possible, with the required information in the transport document as per the transport rules and not a repetition thereof.

Full name, address, telephone, fax, telex and telefax number and the name, address, phone, telex or personal telefax number of the person to be contacted in case of emergency.

Appendix No. 11-8
Hazardous Waste Transport Advice Across the Borders

<table>
<tr><td colspan="2">1- Informer/source (Name/Address) and Registration Document No.)
Telephone :
Fax:
Contact person:</td><td colspan="2">3- Advise Subject : No.:
A-
i Transport for one time : L
ii General advise (transport several times)
B-
i Disposal and not recovery
ii Recovery operation L
C- Authorized authority for recovery Yes L No L
(Answer this item if Item B is approved)</td></tr>
<tr><td colspan="2">2- Receiver (Name, Address) and Registration Document No.:
Telephone:
Fax:
Contact No.:</td><td>4- No. of consignments to be forwarded</td><td>5- quantity of consignments to be forwarded
KG/ L</td></tr>
<tr><td colspan="2">7- Transporter (Name, Address) and Registration Document No.:
Telephone:
Fax:
Contact Person:</td><td>6- date of transporting first consignment</td><td>Date of transporting last consignment:</td></tr>
<tr><td colspan="2">9- Disposal Operation Code No. / Recover:
Technology used:
Details (if needed)</td><td colspan="2">8- Disposal / Recovery Authority (Name, Location, Address)
Telephone:
Fax:
Registration Document No.:
Validity Period:
Contact Person:</td></tr>
<tr><td>11- transport means:</td><td>12- transport type:</td><td colspan="2">10- Waste Generator / Producer (Name, Address):
Name:
Fax:
Contact Person:
Waste Generation Process and Location:
Details (if needed)</td></tr>
<tr><td colspan="2">14- waste physical characteristics:</td><td colspan="2">13- Waste Name and Chemical Compound</td></tr>
<tr><td colspan="2">16- OECD classification : L
amber, red L, other (specify) L</td><td colspan="2">15-Code number for waste identification:
• In the exporting / sender country
• In the importing country
• International waste identification code (IWIC)
• European waste chart (EWC)</td></tr>
<tr><td colspan="2"></td><td colspan="2">17- Code Number Y:</td></tr>
<tr><td colspan="2">19- UN classification with mentioning the required shipping method. :</td><td colspan="2">18- Code Number H:</td></tr>
<tr><td colspan="4">20 – Concerned countries, code number for concerned authorities, points specified for entry and exist:
Exporting Country : Transit Country : Importing Country:</td></tr>
</table>

<table>
<tr><td>21- Entry and / or exit customs office:
Entry:
Exist :

22- Number of Appendixes</td><td>23- Statement of the source / informer :
I hereby declare that the above said information are complete and true as per our knowledge. Further, we hereby declare that we shall comply with all the legal procedures and financial obligations covered by the advise document .
Name :
Signature:
Date:</td></tr>
<tr><td colspan="2">This part for use by the official authorities</td></tr>
<tr><td>24- This part shall be completed by the concerned authority in the importing country:
date of receiving the advise:
Date of sending acknowledgement of receipt:
name of concerned authority, stamp or Signature:</td><td>25- approval on the transport offered by the Concerned authority:
Name of country:
Date:
Date of approval expiry:
Special cases: Yes L No. L</td></tr>
</table>

Appendix No. (11-9)
Characterizing Colors Recommended for Health Care Waste Bags and Containers

Waste type	Bag or container type	Bag or container color and marks or symbols
Very contagious waste	Strong anti leakage plastic bags	Yellow with “very contagious” mark
Other contagious wastes, human parts and organs wastes	Anti leakage plastic bags or containers	Red
Sharp wastes	Anti piercing containers with plastic handles	Yellow “sharp wastes”
Chemical and pharmaceutical substances wastes	Plastic bags or containers	Yellow “chemical wastes”
Radioactive wastes	Lead containers with international radioactive symbol	___
Other health care wastes	Plastic bags	Black or blue
Poisonous wastes	Strong anti leakage containers with poisonous wastes symbols	__

Appendix No.11- 10
Microbes Inactivation Levels

The standards used for measuring the effectiveness of each technique are reaching the microbes inactivation levels. The inactivation levels used for protecting the American Environment (EPA) in their evaluation of the alternative techniques are defined as follows:

1- Level (I): Inactivation of inactive bacteria, fungi, viruses (lipophilic) at 6 log 10 reduction or more.
2- Level (II): Inactivation of inactive bacteria, fungi, all types of viruses (lipophilic – hydrophilic), parasites, fungal bacterial at 6 log 10 reduction or more.
3- Inactivation level (III): Inactivation of inactive bacteria, fungi, all types of viruses (lipophilic – hydrophilic), parasites, fungal bacteria at 6 log 10 reduction or more, as well as inactivation of B.stearothemophilus B.subtilis germs at 4 log 10 reduction or more.
4- Inactivation level (IV): Inactivation of inactive bacteria, fungi, all types of viruses (lipophilic- hydrophilic), parasites, fungal bacteria, B. stearothemophilis, B subtilis at 6 log 10 reduction or more.

- B.stearothemophilis, B.subtilis are mostly used as indicator for organic organisms at level III. Both types are resistant to thermal and chemical treatment. B.subtilis is used as indicator for the inactivation level (II) for thermal and humid operations, while inactivation level (IV) is preferred to represent the B.starothemophilus germs, which are considered as indicator for levels (III) and (IV) for chemical operations.

- Level (III) is the suitable inactivation level for treatment of medical wastes, and used in all the techniques for treatment of medical wastes.
- The following microrganisms are used for Efficacy Tests:

Vegetative Bacteria
Staphylococcus aureus
Pseudommonas aeruginosa

Parasites
Cryptosporidium spp.oocysts
Giradia spp. Cysts

Fungi
Candida albiccans
Penicillium chrysogenum
Aspergillus niger

Mycobacteria
Mycobacteriam trre
Mycobacteriam phlei
Mycobacteriam bovis

Viruses
Polio 2, Polio 3
Ms-2 bacteriophage

Bacterial spores
Bacillus stearothermophilus
Bacillus substilis

- For chemical treatment systems, inactivation of microbes depends on: The suitable concentration of chemical disinfectants used for treatment – contact time between polluted surface and treatment substance.

Appendix No. (11-11)

Maximum permissible concentration of solid materials
at dry sludge resulting from sanitary drainage treatment
plants that is used for agricultural lands

Pollutants		**Maximum limits mg/Kg dry**
Arsenic	As	75
Cadmium	Cd	85
Chromium	Cr	3000
Copper	Cu	4300
Lead	Pb	840
Mercury	Hg	57
Molybdenum	Mo	75
Nickel	Ni	420
Selenium	Se	100
Zinc	Zn	7500
Cobalt	Co	150

Appendix No. (11-12)

Maximum permissible limits of annual charging of solid materials and organic pollutants in the sludge of sanitary drainage used in arable land (Kg/Hectare/365 days)

Pollutants		**Addition rate of the element level Kg/Hectare/365 days**
Arsenic	As	2
Cadmium	Cd	1.9
Chromium	Cr	150
Copper	Cu	75
Lead	Pb	15
Mercury	Hg	0.85
Molybdenum	Mo	0.9
Nickel	Ni	21
Selenium	Se	5
Zinc	Zn	140
Cobalt	Co	1.8
Aldrin / dieldrin		0.016
Benzo (a) pyrene		0.13
Chlordane		1.2
DDT/DDD		0.0055
Dimethyl nitrosamine		0.039
Heptachlor		0.073
Hexachlorobenzene		0.039
Hexachlorobutadiene		0.34
Lindane		4.6
Polychlorinated biphenyl		0.0056
Toxaphene		0.048
Trichloroethylene		0.013

Appendix No. (11-13)
Maximum permissible limits of accumulative charging rates for materials concentration in sludge used in agricultural lands

Pollutants		**In sludge Hectare / Kg**
Arsenic	As	14
Cadmium	Cd	18
Chromium	Cr	530
Copper	Cu	46
Lead	Pb	125
Mercury	Hg	15
Molybdenum	Mo	5
Nickel	Ni	78
Selenium	Se	32
Zinc	Zn	170

Appendix No. (11-14)

Maximum permissible limits of biotic pollutants of

the sanitary drainage sludge used for agricultural purposes

Biotic Pollutants	**Maximum Limits**
Total Coliform	1000 bacillus per gram
Fecal Coliform	100 bacillus per gram
Salmonella	<3 bacillus per 4 dry gram
Viable Helminth Eggs	<1 egg per 4 dry gram
Enteric Viruses	<1 (unit) per 4 dry gram

Bacillus: Bacterial cell in MPN (most probable number).

Appendix No. (11-15)

Maximum limits of metals and organic compounds concentration in dry sanitary drainage sludge used in non-agricultural lands

Pollutants		**mg / Kg**
Zinc	Zn	8600
Arsenic	As	36
Chromium	Cr	3100
Cadmium	Cd	380
Copper	Cu	3300
Lead	Pb	1600
Mercury	Hg	30
Molybdenum	Mo	230
Nickel	Ni	990
Selenium	Se	64
Chlordane		24
DDT/DDE/DDD		0.11
Toxaphene		0.97
Trichloroethylene		180
Aldrin/dieldrin		0.33
Lindane		92
Heptachlor		1.5
Dimethyl nitrosam		1.4
Hexachlorobenzene		2.8
Hexachlorobutadi		6.8
Polychlorinated bi		0.11
Benzo(a)pyrene		6.9

Appendix No. (11-16)

Maximum permissible limits of metal and organic compounds concentration in sanitary drainage sludge accumulated in surface filling up location

Pollutants		**Sanitary drainage sludge maximum concentration mg/Kg**
Arsenic	As	36
Cadmium	Cd	385
Copper	Cu	3300.3
Lead	Pb	1622
Mercury	Hg	17
Nickel	Ni	988
DDT/DDE/DDD		0.95
Lindane		2.3
Toxaphene		0.5
Trichloroethylene		181
Chlordane		180
Dimenthyl nitrosam		1.4
Polychlorinated biphenyls		49
Benzene		15
Benzo(a)pyrene		99
Bis (2-ethylhylhexyl) phthalat		782

Appendix No. (12)

Ambient Seawater Quality Criteria

Pollutants	**Chemical Symbol**	**Unit**	**Maximum Limit**
pH		--	6.5-8.5
Salinity		%	33-42
Dissolved Oxygen		mg/l	>4
Total Suspended Solids		mg/l	32.8
Phosphate	PO_4	µg/l	33.70
Ammonia	NH_3-N	µg/l	60
Hydrocarbons		ppm	5
Cadmium	Cd	µg/l	0.7
Nickel	Ni	µg/l	20.0
Nitrate	NO_3-N	µg/l	94.7
Mercury	Hg	µg/l	0.37
Iron	Fe	µg/l	91.3
Copper	Cu	µg/l	15.5
Lead	Pb	µg/l	12.0
Vanadium	V	µg/l	9.4
Silicate	SiO_3	µg/l	893.2
Nitrate	NO_2	µg/l	33.7

Appendix No. (13)
Maximum limits of Pollutants in Industrial Water Waste permissible to be discharged into the sea

Pollutant	Symbol	Unit	Maximum Limit
Colour	-	-	clear
pH	pH	-	6-8
Temperature		^{o}C	*10
Biological Oxygen Demand	BOD (5 days, 20 ^{o}C)	mg/L	30
Chemical Oxygen Demand	COD	mg/L	200
Oil / grease		mg/L	10
Total Suspended Solids	TSS	mg/L	10
Total Soluble Solids		mg/L	1500
Phosphate	PO_4	mg/L	2
Ammonia	NH_3-N	mg/L	3
Nitrate	NO_3	mg/L	30
Total Kaldal Nitrogen		mg/L	5
Total Nitrogen		mg/L	30
Total Recoverable Phenol		mg/L	1
Fluorides	F	mg/L	25
Sulfides	S	mg/L	0.5
Chlorine	Cl_2	mg/L	0.5
Dissolved Oxygen	DO	mg/L	>2
Turbidity		NTU	50
Floatables		mg/L	Nil
Aluminum	Al	mg/L	5
Arsenic	As	mg/L	0.1
Barium	Ba	mg/L	2
Boron	B	mg/L	0.75
Beryllium	Br	mg/L	0.1
Cadmium	Cd	mg/L	0.01
Cyanides	Cn	mg/L	0.1
Chromium	Cr	mg/L	0.2
Nickel	Ni	mg/L	0.2
Mercury	Hg	mg/L	0.001
Cobalt	Co	mg/L	0.2
Iron	Fe	mg/L	5
Antimony	Sb	mg/L	1.0
Copper	Cu	mg/L	0.2
Manganese	Mn	mg/L	0.2
Zinc	Zn	mg/L	2.0
Lead	Pb	mg/L	0.5
Lithium	Li	mg/L	2.5
Molybdenum	Mo	mg/L	0.01
Vanadium	V	mg/L	0.1
Silver	Ag	mg/L	0.1
All herbicides		mg/L	0.2
Most probable number of total Coliform		MP/N/100 ml	1000

* The subtraction of the external and internal water temperature in water entry and exit point.

Appendix No. (14)
The criteria of the treated waste
drainage water discharged into sewerage

Pollutant	Symbol	Unit	Maximum Limit
Biological Oxygen Demand	BOD5 (5 day, 20 °C)	mg/L	500
Chemical Oxygen Demand	COD	mg/L	750
Total Suspended Solids	TSS	mg/L	300
Phenol	Total Recoverable Phenol	mg/L	1
Fluorides	F	mg/L	1000
Sulfides	S	mg/L	10
Arsenic	As	mg/L	0.1
Cadmium	Cd	mg/L	0.1
Cyanides	Cn	mg/L	0.1
Chromium	Cr	mg/L	1.0
Nickel	Ni	mg/L	0.2
Mercury	Hg	mg/L	0.002
Copper	Cu	mg/L	0.5
Zinc	Zn	mg/L	2.0
Lead	Pb	mg/L	0.5
Silver	Ag	mg/L	4.0
Tar & Tar Oil		mg/L	Nil
Floating Oil & Grease		mg/L	5
Emulsified Oil & Grease		mg/L	5
Most Probable number of total coliform		MPN/100 ml	1000
Most Probable number of faecal coliform		MPN/100 ml	100
Egg parasites			Nil
Worm parasites			Nil

Appendix No. (15)
Criteria of treated drainage wastes water used in irrigation

Pollutant	Symbol	Unit	Maximum Limit
pH		-	6.5-8.5
Biological Oxygen Demand	BOD(5 day, 20 ^{o}C)	mg/L	20
Chemical Oxygen Demand	COD	mg/L	100
Oil / grease		mg/L	5
Total Suspended Solids	TSS	mg/L	15
Total Soluble Solids		mg/L	1500
Phosphate	PO4	mg/L	30
Ammonia	NH3-N	mg/L	15
Nitrogen		mg/L	35
Total Recoverable Phenol		mg/L	1
Fluorides	F	mg/L	25
Sulfides	S	mg/L	0.1
Chlorine	Cl_2	mg/L	0.5-1.0
Dissolved (Oxygen Do)		mg/L	>2
Hydrocarbons		mg/L	5
Floatable		mg/L	Nil
Aluminum	Al	mg/L	5
Arsenic	As	mg/L	0.1
Barium	Ba	mg/L	2
Boron	B	mg/L	2
Cadmium	Cd	mg/L	0.01
Chromium	Cr	mg/L	0.15
Nickel	Ni	mg/L	0.2
Mercury	Hg	mg/L	0.002
Cobalt	Co	mg/L	0.2
Iron	Fe	mg/L	5
Antimony	Sb	mg/L	-
Copper	Cu	mg/L	0.2
Manganese	Mn	mg/L	0.2
Zinc	Zn	mg/L	2.0
Lead	Fb	mg/L	0.5
Most probable number of total coliform		MPN/100 ml	400
Most probable number of faecal coliform		MPN/100 ml	20
Egg parasites		--	<1
Worm parasites		--	Nil

Appendix No. (16)
Un-bottled Potable water

Un-bottled potable water, which is provided to the consumers through public network, limited distribution network, wales, springs or any other type of drinkable water, must have the following properties:

(1) Natural Properties

Un-bottled potable water must not have materials that may affect its color, smell, or appearance. It must be free of strange materials and blemishes, which can be seen with the naked eye whether it is dust, sand thirds little hair or any other blemishes. The permissible maximum limits of the properties must not exceed the rates provided in the following schedule:

Natural Properties Schedule
(Physical Quality of Un-bottled Potable Water)

Properties	Units	Maximum Value
Colour	TCU (True Colour Unit)	15 units
Turbidity	NTU (Nephelometric Turbidity Unit)	5 units
Taste	-	Acceptable
Odour	-	Acceptable

TCU: True Colour Unit
NTU: Nephelometric Turbidity Unit

(2) Chemical Properties

Chemical properties of un-bottled potable water quality must be as follows:

1- In organic constituents properties which has an effect on health:

Permissible maximum value of inorganic constituents which has an effect on health must not exceed limits provided in the following schedule:

Inorganic Constituents Levels of Health Significance in Potable Water Schedule

Constituents	Units	Max. Value
Antimony (Sb)	mg/l	0.005
Arsenic (As)	mg/l	0.010
Barium (Ba)	mg/l	0.700
Boron (B)	mg/l	0.300
Cadmium (Cd)	mg/l	0.003
Chromium (Cr)	mg/l	0.050
Copper (Cu)	mg/l	2
Cyanide (CN)	mg/l	0.070
Fluoride (F)	mg/l	1.500
Lead (Pb)	mg/l	0.010
Manganese (Mn)	mg/l	0.500
Mercury (Hg)	mg/l	0.001
Molybdenum (Mo)	mg/l	0.070
Nickel (Ni)	mg/l	0.020
Nitrate (NO_3)	mg/l	50
Nitrite (NO_2)	mg/l	3
Selenium (Se)	mg/l	0.010

2- Inorganic constituent properties, which causes consumer complaint:

Maximum permissible value of inorganic constituent, which causes consumer complaint, must not exceed the values provided in the following schedule.

Inorganic Constituent Level of Consumer Complaint

Constituents	Units	Max. Value
Chloride (CL)	mg/l	250
Copper (Cu)	mg/l	1
Iron (Fe)	mg/l	0.300
Manganese (Mn)	mg/l	0.100
pH	--	6.5-8.5
Sodium (Na)	mg/l	200
Sulphate (SO_4)	mg/l	250
Total Dissolved Solids (TDS)	mg/l	1000
Zinc (Zn)	mg/l	3
Aluminium (Al)	mg/l	0.200
Calcium (Ca)	mg/l	*200
Magnesium (Mg)	mg/l	**150
Potassium (K)	mg/l	10
Total Hardness	mg/l	500
Total Alkalinity	mg/l	100
Anionic Detergents	mg/l	0.200
Ammonia (NH_3)	mg/l	1.500
Hydrogen Sulphide (H_2S)	mg/l	0.050

* Calcium and Magnesium rates must be observed so as not to exceed the total specified percentage of hard water.

** Magnesium concentration must not exceed 30 ppm/L in case there is 250 ppm/L. It must not exceed 150 ppm/L if sulphate percentage was less than this.

3- **Properties of organic constituents, which have an effect on health**:

Maximum permissible value of organic constituents that have health significance in un-bottle water must not exceed the values provided in the following schedule:

Organic Constituents Levels (mg/L)
of Health Significance in Potable Water

Constituents	Units	Max. Value
1.2 – Dichloroethane	µg/l	30
1.2- Dichloroethane	µg/l	50
Vinyl Choride	µg/l	5
Pesticides:		
Aldrin / Dieldrin	µg/l	0.030
Lindane	µg/l	2
Methoxychlor	µg/l	20
2.4-D	µg/l	30
Chlorodane	µg/l	0.200
Heptachlor & Heptachlor Epoxide	µg/l	0.030
Hexachlorobenzene	µg/l	1
D.D.T	µg/l	2
Aromatic Hydrocarbons:		
Benzene	µg/l	10
Toluene	µg/l	700
Xylene	µg/l	500
Styrene	µg/l	20
Ethylbenzene	µg/l	300
Benzo (a) Pyrene	µg/l	0.700
Chlorinated Benzene		
Monochlorobenzene	µg/l	300
1.2 Dichlorobenzene	µg/l	1000
1.4 Dichlorobenzene	µg/l	300
Trichlorobenzenes (Total)	µg/l	20
Halogenated Hydrocarbon Compounds:		
Chloroform	µg/l	200
Bromoform	µg/l	100
Dibromochloromethane	µg/l	100
Bormodichlormethane	µg/l	60
Phenolic Compounds:		
Pentachlorophenol	µg/l	9
2.4.6 – Trichlorophenol	µg/l	200

(3) Free Residual Chlorine (Cl_2)

a- The concentration of Free Residual Chlorine in un-bottled potable water should be enough to kill all microbes, provided that the concentration of (Cl_2) in this water when it reaches the consumer should be between 0.2 parts in million and 0.5 parts in million.

b- The concentration of chlorine will increase in cases of epidemics or in special cases according to the implementations of the Ministry of Health or concerned parties.

(4) In the case of treating water by ozone of by Ultra Violate Rays, or by any other treating method, the treatment must be enough to kill microbes, and that the treated water must correspond to the microbiological attributes to the treated water stated in this report.

(5) Biological Qualities:

Unbottled drinking water must be completely free of algae and fungi and parasites and insects and from its eggs or larvae or vesicle or parts to basic animals, which include amoeba.

(6) Microbiological Qualities:

- Unbottled drinking water must be completely free of disease causing microbes and of Microbes that excrete faces, which may cause damage to public health.
- Unbottled drinking water must be of *E. Coli* or *Thermotolerant* bacteria in any 100 ml tested sample.
- Water Distribution via Networks:
  - *i) Treated water in the distribution network:*
    - Any 100 ml tested sample must be free of total coliform bacteria.
    - Any 100 ml tested sample must be free of E. Coli or Thermotolerant bacteria.
  - *ii) Treated water in the distribution network:*
    - Any 100 ml tested sample must be free of total coliform bacteria. In case of supplies where enough samples are tested, they must be free of 95% of total coliform bacteria from the samples that are tested throughout the year.
    - Any 100 ml tested sample must be free of E.Coli Thermotolerant Bacteria.

1. Water Distribution without Networks:
   - Total Coliform bacteria should not exceed 10 parts / 100 ml of tested sample as long as it does not happen repeatedly. If that to occur because of a lack of

improvement in water hygiene of the water source, an alternative source must be found if possible.

- Any 100 ml tested sample must be free of E. Coil or Thermotolerant Bacteria.

(7) <u>Radiation Qualities:</u>

Radiation qualities of drinking water must comply with Ministerial Decree No. 5/1989, relating to acceptable radiation levels in consumer products in the State of Kuwait, and also for drinking water and bottled liquids are as follows:

- Alpha particles 0.37 BKRL/Liter
- Beta particles 3.7 BKRL/Liter
  As maximum Radiation level.
- On condition that the concentration of Radium should not exceed (226) for 0.185 BKRL/Liter
- And that the concentration of Estranthium should not exceed (90) for 1.85 BKRL/Liter

Appendix No. (17)

Definitions mentioned in this appendix are followed by their meaning:

1- **Living Environment:** An environment that is closely linked to the individual's life. ...and plant and animal.

2- **Standards of Quality Environment:** Level of pollutants that are nor allowed to exceed in air, water and earth.

3- **Ambient Air:** Atmospheric air outside the buildings and the place of work.

4- **Air Pollution**: The existence of the pollutant, or a combination of pollutants in the outside air in quantities and in periods that would cause or cause harmful effects on the health of human being, or that would curtail his well being, or would affect plants and animals or property, or would hinder from enjoying a comfortable life, or from carrying out his everyday work.

5- **Air Pollutants:** Any solid, liquid, gas or odors or a combination of the above, which emits to the outside air from any source.

6- **Allowed Levels:** The levels of pollutants that are not allowed to exceed under particular circumstances. This value is not considered a minimum but is considered as maximum, but is considered an absolute level, where emergency procedures should be taken to remedy the situation when it is exceeded.

7- Ambient Air Quality Standards:
The allowed level of pollutants in the outside air in the troposphere and its measurement on breathing levels unless otherwise stated.

8- Ambient Air Quality Standards (AAQS):

$\mu g/m^3$ = micrograms per cubic meter of air.
mg/m^3 = milligrams per cubic meter of air
ppm = part per million
ppb = part per billion

Appendix No. (17-1)
Ambient Air Quality Standards for Residential Areas

Unit / Pollutant	Hour*		8 hours		Day**		Year	
	ppb	mg/m^3	ppb	mg/m^3	ppb	mg/m^3	ppb	mg/m^3
Sulfur Dioxide (SO_2)	170	444	-	-	60	157	30	80
Hydrogen Sulphide (H_2S)	140	200	-	-	30	40	6	8
Nitrogen Dioxide (NO_2)	100	225	-	-	50	112	30	67
Carbon Monoxide (CO)	30000	34000	10,000	11500	8000	9000	-	-
Ozone (O_3)	80	157	60	120	-	-	-	-
Ammonia (NH_3)	#800	850	-	-	-	-	140	148
Hydrocarbon Compounds without Methanes	1/10 from specified rate in works environment (TLV's) 0.24 ppm for three hours from 6:00 – 9:00 morning (a.m)							
Suspended particulate matter (PM-10)	-	-	-	-	-	350	-	90
Dust – Fall out Matter	-	-	-	-	-	-	7.5 ton $/km^2$	
Lead	-	-	-	-	-	-	1.5 mg/m^3	
Chlorine ##	30.0 (30 min.)	100	-	-	10	30	-	

Notes:

* Average hour should not occur more than twice during the period of 30 days on the same site.
** Daily average (24 hours) should not occur more than once during the year.
Should not occur more than once per year.
- Should apply in residential dominated areas that lie on the border of industrial areas.

Appendix No. (17-2)
Ambient Air Quality Standards for Industrial Areas

Pollutant \ Unit	Hour*		8 hours		Day**		Year	
	ppb	mg/m^3	ppb	mg/m^3	ppb	mg/m^3	ppb	mg/m^3
Sulfur Dioxide (SO_2)	300	782.5	-	-	200	523.3	65	157
Hydrogen Sulphide (H_2S)	-	--	-	-	130	173.3	-	-
Nitrogen Dioxide (NO_2)	100	225	-	-	50	112	30	67
Carbon Monoxide (CO)	30000	34000	10000	11500	8000	9000	-	-
Ozone (O_3)	80	157	60	120	-	-	-	-
Ammonia (NH_3)	#800	850	-	-	-	-	140	148
Non-methane Hydrocarbons	1/10 from specified rate in works environment (TLV's) 0.240 ppm for three hours from 6:00 – 9:00 morning (a.m.)							
Suspended Particulate Matter – PM-10	-	-	-	-	-	350	-	90
Lead	-	-	-	-	-	-	1.5 mg/m^3	
Chlorine ##	30.0 (30 min.)	100	-	-	10.0	30	-	

Notes:

* Average hour should not occur more than twice during the period of 30 days on the same site.

** Daily average (24 hours) should occur once during the year.

To occur more than once per year

- These standards should occur in industrial dominated areas to protect residents permanently.

Appendix No. (18-1)
Limits of Community Noise Resulting from Traffic Movement, based on L,eq., decibel A (dBA)

Type of Area exposed to external noise	Table of Leq decible (A) over different time periods		
	Day From 7:14	Evening From 14:22	Night From 22:4
Ideal residential areas (villa Areas – or suburbs)	55	55	50
Urban residential areas	62	60	55
Urban residential areas with some commercial activities and workshops	65	65	60
Industrial and commercial areas	70	65	60

Appendix No. (18-2)
Limits of Community Noise Resulting from Air-Traffic Movement, based on Leq, decibel A

Type of Area exposed to external noise	Table of Leq decible (A) over different time periods		
	Day From 7:14	Evening From 14:22	Night From 22:4
Ideal residential areas (villa Areas – or suburbs)	55	50	45
Urban residential areas	55	50	45
Urban residential areas with some commercial activities and workshops	60	55	50
Industrial and commercial areas	70	65	60

Appendix No. (18-3)
Limits of Community Noise Resulting from Industry based on Leq., decibel A (dBA)

Type of Area exposed to external noise	Table of Leq decibel (A) over different time periods		
	Day From 7:14	Evening From 14:22	Night From 22:4
Ideal residential areas (villa Areas – or suburbs)	50	45	45
Urban residential areas	55	50	45
Urban residential areas with some commercial activities and workshops	60	55	50
Industrial and commercial areas	70	70	65

Appendix No. (18-4)
Limits of Community Noise Resulting from Society Activities, based on Leq, decibel A (dBA)

Type of Area exposed to external noise	Table of Leq decibel (A) over different time periods		
	Day From 7:14	Evening From 14:22	Night From 22:4
Ideal residential areas (villa Areas – or suburbs)	50	45	45
Urban residential areas	55	50	45
Urban residential areas with some commercial activities and workshops	60	55	45
Industrial and commercial areas	70	70	70

Appendix No. (18-5)
Maximum Limits of the Noise Allowed in the Outdoor Environment

Type of Area exposed to external noise	Table of Leq decibel (A) (dBA) over different time periods		
	Day From 7:14	Evening From 14:22	Night From 22:4
Ideal residential areas (villa Areas – or suburbs)	50-55	50-45	50-40
Urban residential areas	55-62	50-60	55-50
Urban residential areas with some commercial activities and workshops	60-65	55-60	55-45
Industrial and commercial areas	70	65-70	60-65

Appendix No. (19-1)
Allowed Environmental Standards of Pollutant Emissions from Vehicle Exhausts, which used Gasoline or Diesel, Expressed as Gram / Kilometers of Date of Manufacturing Since Year 1990

Description / Pollutants	3 years or passed 80,000 km.					6 years or passed 160,000 km.				
	Hydrocarbon Non-Methane	Carbon monoxide	Nitrogen oxides		Diesel	Hydrocarbon substances without methane	Carbon monoxide	Nitrogen oxides		Diesel
			Gasoline	Diesel				Gasoline	Diesel	
Light vehicles Cars that are 1700 Kg. or less	0.15	2.215	0.25	0.625	0.05	0.193	2.63	0.38	0.78	0.0625
Medium vehicles Medium size vehicles that are more than 1700 kg. and less than 2500 Kg.	0.2	2.75	0.44	0.44	0.05	0.25	3.4	0.61	0.61	0.0625
Heavy vehicles Heavy vehicles that are more than 2500 Kg.	0.24	3.125	0.69	0.69	0.05	0.35	4.56	0.96	0.96	0.075

Average emissions of Hydrocarbon fumes must not exceed 0.26 gm./Km. for all vehicles, which passed 80,000 Km. and 0.5 gm./km for vehicles that passed 160,000 Km.

Appendix No. (19-2)

Allowable Environment Standards of Air Pollutants Emissions Rates from Vehicle Exhausts which need Gasoline or Diesel, Manufactured before Year 1990, (expressed as gram/km)

Pollutant Description	Hydrocarbon substances	Non-Methane Hydrocarbon	Carbon monoxide	Nitrogen Oxide
Vehicles	0.5	0.22	2.22	0.63
Medium and heavy vehicles	0.5	0.42	6.25	Medium vehicle 0.75 Heavy vehicles 1.1

Appendix No. (20)

Definitions included in this supplement are followed by their meaning:

(1) Sulfur Dioxide Gas: Causes the lungs to reduce its ability to exchange gases, it also increase amounts of infections to lungs as well as asthma between afflicted persons.

(2) Hydrogen Sulphide Gas: Causes irritation of eyes, affecting the sense of smell, and causes physical symptoms.

(3) Nitrogen Oxide gases (Nitrogen Dioxide): They are poisonous gases that develop nitric acid in mercury. Causes dangerous infections, affects the heart, chest and breathing causes chronic diseases.

(4) Carbon Monoxide Gas: Very poisonous, reacts with hemoglobin to create carboxy hemoglobin to sterilize it and reduces its ability to transfer oxygen from the lungs to the rest of the body. It also causes physical fatigue and mental retardation.

(5) Hydrocarbon substances: Weakens the lungs from carrying on with their functions, and increases the possibility of contracting lung cancer.

(6) Lead: Affects the nervous system especially in children. Causes reduction in comprehension, mental retardation and blood poisoning.

(7) Suspended particulate: Affects the function of lungs and weakens its ability. Causes tuberculosis.

(8) Photo chemical oxidants: The ozone is considered one of the strongest photochemical oxidants, which affects the breathing, the heart and eyes.

(9) Ammonia Gas: Exposure to this gas leads to the irritation of the respirator system. It also affects the central nervous system when exposed to high concentrations of this gas.

Appendix No. (20)
Allowable Environmental Standards of Air Pollutants Emission Rates from Fixed Sources

Source	Pollutant	Maximum allowed emissions
First: Fixed sources		
1- All industrial installations		
1-1 All sources of emission	Suspended particulates	Smut must not exceed a maximum of 20%
	Asbestos	No emission is allowed
1-2 Product piles	Suspended particulates	Smut must not exceed a maximum of 20%
1-3 Chimneys	Suspended particulates	115 mg./cubic meter
	Opacity	It must not exceed a maximum of 20%
2- Combustion facilities:		
Boilers and furnaces operated by mine fuel of thermal capacity exceeding 30 mega watt (100 MBTU / Hour)	Suspended particulates	43 Nano-gram / Jol
	SO_2	512 Nano-gram / Jol
	NH_2	86 Nano-gram / Jol for natural gas burning facilities
	Nitrogen oxides NOx	130 Nano-gram / Jol for oil burning facilities
	Opacity	It must not exceed a maximum of 20%
3- Oil refineries:		
3-1 Burning systems or boilers used with FCCU	Suspended particulates	1 Kg. per ton of charcoal to be burnt
	SO_2	9.8 Kg. per ton of charcoal to burnt
	CO	500 ppm.
	Opacity	30% except 6 minutes per hour
3-2 Gas fuel burning operations	SO_2	230 mg/cubic dry meter
3-3 Clouse sulfur retrieval units of more than 20 ton / day capacity	SO_2	250 ppm for oxidization, reduction and burning activities

4- Petroleum liquids and organic volatile liquids storage tanks:		
4-1 Petroleum liquids tanks of 1000 barrel capacity	Volatile organic compounds	Liquids of steam pressure ranging between 78/570 mm mercury can be kept in tanks having floating or fixed ceilings with an internal floating cover or steam recall system. It can be disposed to the emission rate remains at 95% or its equivalence.
4-2 Tanks of the volatile organic liquids, including petroleum liquids tanks of more than 1000 barrel capacity and which its actual steam pressure is more than 39 mm. mercury and less than 570 mm. mercury or of 500 barrels capacity which its steam pressure is more than 207 and less than 570 mm mercury.	Volatile organic compounds	The tanks must be provided with recall systems and the steam must be relieving so that emission rate should be 95% or its equivalence.
4-3 Fuel tanks of more than 500 barrel capacity and its steam pressure is more than 570 mm. mercury.	Volatile organic compounds	The tanks must be provided with fixed ceilings having floating internal cover or it must be provided with floating ceilings of close ventilation. Further, must be supplied with a system for relieving steam so that emission rate should be decreased by 95% minimum or equivalence.
4-4 Fuel tanks of more than 1000 barrel capacity and its steam pressure is less than 24 mm. mercury or 500 barrel capacity and more than 116 mm mercury steam pressure.	Volatile organic compounds	It must be provided with closed ventilation system to relieve the steam so that the emission must be reduced by 95% minimum.
5- Fertilizers factories:		
5-1 Exhaust gases	Volatile organic compounds	The vapors may be disposed by burning or by any other appropriate system so that the emission may be decreased at 99%.
5-2 Ammonia fertilizer industry (Ammonia fertilizers)	Urea granules	0.45 Kg per every ton of the product
5-3 Refrigeration towers (urea fertilizers industry)	Urea granules	1 Kg/ton of product

6- Cement factories		
6-1 Cement furnaces	Suspended particulates	0.15 Kg/ton of product
6-2 Clinker chillers	Suspended particulates	0.05 Kg/ton of product
6-3 Furnace chimneys	Opacity	Maximum of 20%. This percentage must not be exceeded for more than 3 minutes per hour
6-4 Chiller chimneys	Opacity	Maximum of 10%. This percentage must not be exceeded for more than 3 minutes per hour
7- Stainless steel factories:		
7-1 Electric spark furnace	Suspended particulates Opacity	12 mg/Cubic dry meter 3% of the gas coming out of control units 10% of the gas coming out from dust collection units
8- Primary aluminum reduction factories:		
8-1 Reduction vessels	Total fluorides Opacity	1 Kg/ton of produced aluminum 10%
8-2 Heating installations having positive electrode	Fluorides Opacity	0.05 kg/ton of produced aluminum 20%
9- Secondary lead foundry And acid batteries industry		
9-1 Foundries		
9-1-1 electric spark and explosion furnaces	Suspended particulates Opacity	50 mg/ cubic dry meter It must not exceed a maximum of 20%
9-1-2 Melting furnaces of more than 250 Kg. capacity	Opacity	It must not exceed a maximum of 10%

9-2 Acid batteries industry		
9-2-1 Mesh casting	Lead	0.40 mg/cubic dry meter
9-2-2 Lead oxides industry	Lead	5 mg/Kg of lead
9-2-3 Circulation of lead	Lead	4.5 mg/cubic dry meter
9-2-4 Mixing paste	Opacity	Must not exceed a maximum of 5%
9-2-5 Other operations	Lead	1 mg/cubic dry meter
10- Treatment and production in the non-metal industry:		
10-1 Treatment of metals		
* Grinders, sieve, conveying belt.	Suspended particulates	50 mg/cubic dry meter
* Emitting of stone crushers	Opacity	15%
10-2 Rotating milestone furnaces	Suspended particulates Opacity	0.3 Kg/ton (input) 15%
10-3 Treatment of raw materials (bricks and pottery industry)		
❖ Grinding raw material	Suspended particulates	38 Kg/ton of product
❖ Raw material dryers	Suspended particulates	35 Kg/ton of product
❖ Raw material storage	Suspended particulates	17 Kg/ton of product
10-4 Asphalt and concrete units	Suspended particulates Opacity	90 mg/cubic dry meter It must not exceed 20%
11- Benzene storage warehouses:		
11-1 Stations of more than 75,700 liter loading capacity per day	Volatile organic compounds	Benzene loading stations must be provided with a system for collecting steam. Further, strictly closed tank wagons must be used to prevent the leakage of steam
11-2 Organic steam collection system	Volatile organic compounds	35 mg./liter of loaded benzene
11-3 Pressure gauge in the tank wagons		It must be less than 4500 Pascal
11-4 Release of pressure from steam gathering system		So that it must not exceed 4500 Pascal