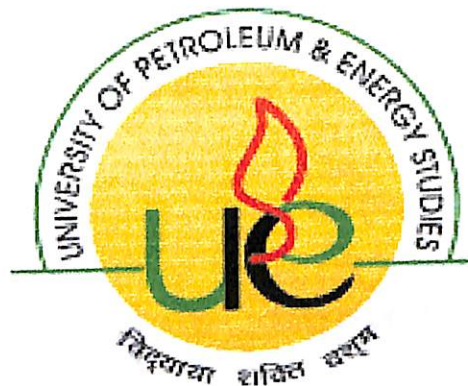


**A PROJECT REPORT ON
GAP ANALYSIS OF O.N.G.C COLONY
Based on
ENVIRONMENT MANAGEMENT SYSTEM-14001**

By
Braj Mohan Singh
M.Tech(H.S.E)
Roll. No- R070206004



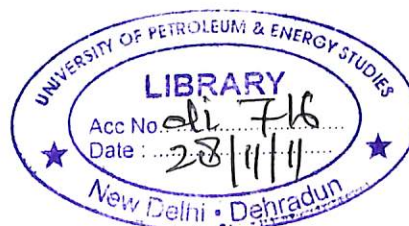
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**Based on
ENVIRONMENT MANAGEMENT SYSTEM-14001**

By
Braj Mohan Singh
M.Tech(H.S.E)

Under the guidance

1- Dr Sanjay Bhutani
Chief Chemist
Tel Bhavan(O.N.G.C)

2- Dr N.A Siddiqui
H.O.D of HSE Department

Approved



Dean Signature

College of Engineering
University of Petroleum & Energy Study
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CERTIFICATE

This is to certify that the work contained in this thesis titled **GAP ANALYSIS of O.N.G.C COLONY** based on Environment Management System-14001 has been carried out by **Braj Mohan singh M.Tech(H.S.E)** Under our supervision and has not been submitted elsewhere for a degree..

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Jamal
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UNIVERSITY OF PETROLEUM & ENERGY STUDIES

(ISO 9001:2000 Certified)

Certificate

This is to certify that Mr Braj Mohan Singh , a student of M.Tech(Health safety&Environment Engineering), bearing R.No- R070206004 at University of Petroleum&Energy Study, Dehradun has carried out final semester Project titled Gap Analysis of ONGC Colony based on EMS-14001, at ONGC(Tel Bhawan). The work is Certified to be bonafide-

Dr. N.A Siddiqui

Internal guide

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The inspiration for this project work had been fueled by the initiative of **Mr, Sanjay Bhutani Chief Chemist Tel Bhavan(O.N.G.C)**. I acknowledge his leadership, management and unyielding support that have made this project report possible and take its present shape.

I would like to thank all the individuals of the staff that granted their valuable time to use and reproduce figures, data and other material in this project report.

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Brajmoham Singh
29-05-2008

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INTRODUCTION

O.N.G.C.: Oil and Natural Gas Corporation Ltd.

ONGC has institutionalised research and development in the oil & gas, and allied sectors and established separate institutions to carry out specific activities in key areas of exploration, drilling, reservoir management, production technology, ocean engineering, safety and environment protection in the form of **9 independently managed R&D centres**. Regional laboratories also support these institutes. These R & D institutes with experienced and highly qualified manpower support exploration and production activities of ONGC. These institutes and canters are:

- 1. GEOPIC:** Geodata Processing and Interpretation Centre, DehraDun
- 2. KDMIPE:** Keshav Deva Malaviya Institute of Petroleum Exploration, DehraDun
- 3. IDT:** Institute of Drilling Technology, DehraDun
- 4. IEOT:** Institute of Engineering and Ocean Technology, Mumbai
- 5. ONGCA:** Oil and Natural Gas Corporation Academy, DehraDun
- 6. INBIGS:** Institute of Biotechnology & Geotectonics Studies, Jorhat.
- 7. IOGPT:** Institute of Oil & Gas Production Technology, Mumbai

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- 6. INBIGS:** Institute of Biotechnology & Geotectonics Studies, Jorhat.
- 7. IOGPT:** Institute of Oil & Gas Production Technology, Mumbai
- 8. IPSHEM:** Institute of Petroleum Safety, Health & Environment Management, Goa.
- 9. IRS:** Institute of Reservoir Studies, Ahmadabad

ONGC institutions/offices situated in DehraDun are:

1. ONGC headquarters, Tel Bhawan.
2. Geodata Processing and Interpretation Centre, Kaulagarh Road.
3. Exploration and development Directorate, Anveshan Bhawan, Kaulagarh road.
4. Keshav Deva Malaviya Institute of Petroleum Exploration, Kaulagarh Road.
5. ONGC Academy, Kaulagrh Road.
6. Institute of Drilling Technology, Kaulagarh Road.
7. ONGC Hospital, Ballupur Road.

Literature Review

The Project has established important to Environment performance requirements for structure , system , components based on the identification and categorization of event sequences that may result in a radiological release.

This Gap Analysis is based on Environment Management System-14001 and its implementation and application . According , identification of Environment aspects & impacts & present practices beyond those defined within Environment Management System is based on ISO-14001, that may be subject to further development during details. Furthermore several aspects in normal, abnormal & emergency conditions alternative may still be under consideration to satisfy certain Environment performance & final selection WILL Not be determined until further development has occurred. Therefore , for completeness alternative aspects currently under consideration will be discussed throughout this study.

This Gap Analysis will evaluate each standard identified to ensure performance requirement is fully satisfied . When a performance requirement is not fully satisfied , a Gap is highlighted.

This study will identify requirements to supplement or standard to meet performance requirements. Further , this Gap analysis will identify non standard area . of the Non conformity that will be subject to develop plan.

Non standard components are defined as areas of the design that do not follow standard practices or codes.

This Gap analysis is prepared by Project team and is intended for the sole use of the Engineering department in work regarding the emplacement gantry.

EMS-14001- Gap Analysis----

The National Energy Board has chosen to adopt the principle of ISO-14001, AN INTERNATIONAL GUIDING FRAMEWORK for Environment Management System-

Gap Analysis of the Current Environment management system elements-

The Gap analysis consisted of

An assessment of the EMS elements currently in place & the gaps between these & the requirements of ISO-14001

Recommendation on the action required to build element of the EMS that will conform with the requirements of ISO-14001

A Step by step plan to address existing Gaps

The scope of the Project included both the activity , products and services undertaken by PROJECT staff directly and consideration of the influence of the board on NEB Regulated companies.

While the scope has been defined as Gap Analysis for the Environment Management system

Information obtained was evaluated using cumulative frequency distributions to compare individual constituent concentrations in various waste streams and by using data qualifiers to enable assessment of parameters that might affect single source waste stream composition.

To supplement information on the single source water quality and primary treated effluent composition, state agencies responsible for onsite wastewater regulation were contacted to assess the prevalence of different system types installed and in operation. Selected demographics that capture differences in lifestyle habits that could affect raw wastewater composition were also assessed.

A large amount of data was captured by this literature review, however information gaps were identified. The information presented here will be used to guide future project monitoring and assessment of modern raw wastewater waste streams

EPA has conducted a study to identify whether is a quantifiable gap between projected clean water and drinking water investment needs over the 10 year period from 2000 to 2010 and current levels of spending .

INITIAL ENVIRONMENTAL REVIEW

As a part of implementation of EMS based on ISO 14001 at ONGC Colony an Initial Environment Review (IER) was conducted.

The Initial Environment Review is the means by which an organization establishes its current position with regard to environment. The IER helps to identify strengths, weaknesses, risk and opportunity before organization and generates the base for developing EMS.

are for key areas which are mainly addressed during IER.

01. Identification and evaluation of the potential environmental issues and concerns arising from the operation.
02. Examination of existing management and operational practices and procedures.
03. Previous environmental accidents, incidents, fines / penalties and resultant abatement measures.
04. Legislative and regulatory requirements and the status of the operation with respect to these requirements.

On the basis IER findings, a detailed Environmental Management Programme (EMP) will be developed for addressing environmental aspects.

Objective of initial Environment Review

- 1) To establish current position (Performance) of organization with regard to environment.
- 2) To identify strength , weakness, risk, and opportunities before organization , and
- 3) To generate the base for developing EMS.

While addressing these key areas the IER should cover both normal, & abnormal, operation as well as possible emergency conditions will need to be defined (such as fire, flood, earthquake, spillage).

The emphasis will be on the environment aspects of the organization. the relevance of these aspects is determined by evaluating the relevance of the environmental impacts that are a result of the environment aspects.

It is normally not necessary to conduct studies and evaluations as are normally done in environmental impacts assessments to the relevance of environmental aspects.

DETAILS OF MOTORS & PUMPS

Sl. No.	Description of equipment	Qty	Location	Remarks
1.	Pump House No. 1		Near C-12 Block	
A	30 HP Motor with Pump	2		
B	20 HP Motor with Pump	1		
C	25 HP Motor with pump	1		
2	Pump House No. 2		Near Civil maintenance office	
A	15 HP Motor with Pump	2		
B	30 HP Motor with Pump	1		
3	Pump House No. 3		Near IDT gate	
A	20 HP Motor with Pump	2		
B	30 HP Motor with Pump	1		
4	Submersible Motor & Pump		Behind community center South side colony	1 stand by
A	Tube well No. 1 62 HP Capacity with	2		
B	Tube well No. 2 70 HP Capacity	2		

Total water Pumped through the above system for Resi. Colony, Central School, Central Stores, Officers Club, Anveshen Bhavan, Mahila Polytechnic is 11 to 12 lac liter / day

Disposal of sewage is through sewer lines which have been connected to the municipal sewer system.

The solid waste generated during maintenance i.e. dismantled rubbish etc. is disposed through mechanical transport outside the city limits.

Types of Generators

There are two main types of generators: synchronous generators and induction generators. These categories differ in their design and purpose; synchronous generators are capable of handling round-the-clock power needs if necessary; induction generators are only used for producing power above and beyond what a synchronous generator produces, usually to cover above-the-norm power needs or to cover the baseline needs only.

Generators can be extremely large, producing power for entire city blocks, or very small when needed only as backup by a home or small office in case of a power outage. The size of the generator and how regularly it will be used will impact what type of fuel it uses, whether it is hydroelectric, steam, solar, geothermal, or driven by wind, burning natural gas, other fuel oils, or coal. The age of a generator will also have a large impact in its design, since the technology of power generation is continually changing and developing in response to various factors, from efficiency to environmental friendliness and resource depletion.

Classes of Generators

Some of the smallest generators available are well-suited to run basic appliances when camping or otherwise away from a power source, when electrical needs are minimal. These generators may be used to run lighting, televisions, portable cooking devices, and heaters; they usually run on gasoline, which is readily available and relatively inexpensive.

A step up from these portable generators are those that provide backup power to homes and offices when the usual power source is unavailable. Running on diesel, natural gas, or other similar fuels, these generators are usually permanently installed outside of the structure and can automatically detect when the power goes out, resupplying electricity within just a few seconds.

Larger generators ensure that businesses and factories that are mission critical will never go without power, and can provide nearly seamless operation when the regular power

goes out. Many types of businesses that require refrigeration units and other appliances to run constantly, or hospitals that simply cannot afford to be without power, will have one or more of these generators installed permanently.

Generator Fuels

There are advantages and disadvantages to all types of generators, but consumer generators most often run on either gasoline, diesel, or propane. Knowing the characteristics of these fuels can lead to a wiser choice when selecting a generator for home use.

Gasoline-powered generators are familiar, and fuel is readily available and relatively inexpensive. Gasoline also offers the most power per weight unit, and works in most common generators. However, there can be condensation problems in cold weather, and gas generators may require more frequent maintenance. Propane generators usually require less frequent maintenance, and have no condensation problems, but can be slightly more expensive, less efficient, and have special transport requirements. Diesel is a popular choice for fueling generators, and offers low maintenance, fuel-efficiency, and is quite easy to acquire. Diesel generators do, however, tend to be noisier, fuel may be more expensive, and these generators can be more difficult to start in cold weather.

Generators offer a level of safety and security when a power supply is unstable. They can ensure that a home's most essential appliances remain running at all times, that a business's stock remains intact, and lend a touch of convenience even when the surroundings are rustic and wild.

Transformer

A transformer is not just an 1980s cartoon and toy of robots transforming into tanks. Before that brilliant marketer thought of that idea, transformers were, and are, electronic devices without any moving parts that are generally used to convert voltage from high to low, or vice versa.

More Than Meets the Eye

A transformer consists of two coils of wire wound on two sides of a donut-shaped core that is usually steel, but could be ceramic or silicon, depending on the application. Electricity

comes in through one coil (the input coil) and goes out the second coil on the other side (the output coil). A process called mutual induction causes the voltage to be induced on the second coil. The transforming part comes in because the amount of voltage being produced on the second coil can change.

The amount of electricity being produced depends on the number of times the coil is wound around the core. The more times it's wound around, the higher the voltage. So if the input coil has more loops and the output coil has a couple of loops, the input coil will be a higher voltage than the output coil. If the coils have an equal number of loops, their input and output will be equal.

If the output coil has more voltage, it's called a "step-up transformer." If the input coil has more voltage, it's called a "step-down transformer."

There are three transformer types. All work on the same principle. These are:

- Power transformers. Usually you find these on your outlet plugs. The plug has a transformer that takes your home voltage and changes it into the appropriate voltage for the appliance.

Audio transformers. Takes the AC signal and couples it with minimal loss.

RF transformers. These fall into two categories: band pass filters (used in IF amplifier filters to reject all but the intended frequency) and broad band transformers (used for impedance matching).

Transformers can be homemade, but the cost of components is more expensive than just buying a transformer off the shelf.

Pumps have been around for a very long time, and represent one of the ways Man's mechanical ingenuity has improved the quality of life the world over. From Archimedes screw, the first pump invented, to the mega-horse power trash pumps of today, pumps are designed simply to move liquid or gas from one place to another, and can be used for such mundane but important tasks as moving dirty or hazardous materials away from living environments to an area where it is no longer dangerous. Pumps are also the power source responsible for

such spectacular effects as water fountains, falls and displays.

There are a variety of pumps for many different uses, although many of these devices can pull double duty for different kinds of chores; the mechanics may work differently for different jobs, however. They are used in everything from refrigerators and washing machines to cars and trucks to construction sites. The best way to determine what kind of pump a homeowner or gardener might need is to decide first what function it will serve.

Drainage

For removing accumulated water from under a structure a sump pump works best. A sump pit is a hole dug in the ground, usually in the basement of a home, to collect water; this is typically done where basement flooding is common, but also to reduce dampness caused by water condensing under the foundation. The pump then pulls the water out of the sump pit and draws it away, depositing it in a municipal storm drain or dry well.

Sump pumps can be submersible, which means they are specially sealed to protect electronics and can be in and under the liquid to be moved, or in pedestal form, which means the mechanics are mounted outside of the sump pit, with piping leading to the liquid. In most cases sump pumps are hardwired into the home's electrical system.

Landscaping

Whether you want a pump to keep water circulating in your koi pond or you have a water feature that includes jetting columns of water, the best kind of pond or water pump will be submersible, keeping the mechanics hidden and maximizing the atmospheric effect.

Waste removal

To handle semi liquid waste, a high-powered trash pump should be on your short list. These heavy duty pumps can handle moving a great deal of waste, and some of the more powerful pumps can be used for maximum water pressure situations like irrigation or firefighting.

Pump glossary

When dealing with pumps, whether you are installing your own sump pump or searching for the right submersible for your water fountain, it helps to understand some basic terminology. Once you have familiarized yourself with the terms below and decided what your pump needs are, you are ready to talk to your pump dealer.

- *Capacity*: The capability of a pump to move water, expressed as gallons per minute (GPM) or gallons per hour (GPH).
- *Cleanout Cover*: On a trash pumps it is the removable cover that allows for debris.
- *Dewatering*: Removing non-hazardous, unwanted water.
- *Diffuser*: A stationary housing that enables the pump to produce higher pressures.
- *Discharge Hose*: A hose used to move the water discharged from the pump.
- *Discharge Port/ Outlet*: The point where the discharge hose connects to the pump.
- *Drain Plugs*: Used to drain water from the pump when not in use.
- *Flapper Valve*: A movable seal that prevents water from assing into or out of the system at the wrong time.
- *Frame*: Many pumps are surrounded by a hollow metal frame that protects the engine and makes it easier to handle.
- *Impeller*: A disk used to create the centrifugal pressure needed to move water through the pump.
- *Prime*: To create a vacuum inside the pump casing.
- *Thermal Overload Sensors*: Built into the motor of submersibles that prevents operation if it overheats.
- *Weep Hole*: A small opening on the pump bottom that allow the detection of a leak.

NOISE SAMPLING REPORT IN RESIDENTIAL AREA

Instrument : DG Set in on condition

Sr. No.	Parameter	Min	Max	L(eq)	SEL
1	Near Hostel Block	54.2	69.6	57.0	72
2	In front Geology Division	54.9	61	60	73
3	DG Set Back Side	67	72.7	69.3	80
4	East of DG Set	93.6	94.2	94.3	106
5	South of DG Set	94.9	98.6	96.7	96
6	West of DG Set	92.4	94.6	93.3	
7.	North of DG Set	97.7	99.9	98.5	

All results are in dB.

NOISE SAMPLING REPORT

Instrument : DG Set in **off** condition

Sr. No.	Parameter	Min	Max	L(eq)	SEL
1	Location Outside DG Set 1 meter	47.0	52.1	49.4	67.1
2	Near Hostel Block	46.4	59	54.6	67
3	In front Geology Division	53.7	61.4	57.9	59
4	DG Set Back Side	65.2	70.6	67.4	79.5

Air quality parameter in Residential Area.

Dilutants	Concentration (In ambient air in Residential area)	SO2 concentration during monitoring	Nox during monitoring condition)	Site of monitoring
Sulphur Dioxide (SO ₂) & Oxides of Nitrogen as (NO _x)	80 µg/m ³	2 µg/m ³	8 µg/m ³	East(D.G set)
	80 µg/m ³	3 µg/m ³	12 µg/m ³	West(D.G Set)
	80 µg/m ³	7 µg/m ³	18 µg/m ³	North(near road side)
	80 µg/m ³	6 µg/m ³	21 µg/m ³	South(near of stack height of D.G set)

Pollutant	<u>Concentration in ambient air of SPM IN RESIDENTIAL AREA</u>	CONCENTRATION OF SPM DURING MONITORING	SITE OF MONITORING
Suspended Particulate Matter (SPM)	200 µg/m ³	130.45 µg/m ³	East(D.G set)
	200 µg/m ³	139.67 µg/m ³	West(D.G set)
	200 µg/m ³	270.86 µg/m ³	North(near road side)
	200 µg/m ³	300.94 µg/m ³	South(near of stack height of D.G set)

The samples of water are taken by different site of O.N.G.C Colony

Sample1

Sample2

Sample3

Sample4

Sample5

(KDMIPE2nd flor)

	Sample1	Sample2	Sample3	Sample4	Sample5
	7.2	6.8	7.4	7.1	6.7
ness	130	110	180	200	210
ide	180	130	200	165	118
	9.731	10.039	8.419	9.315	
ate	99.01	83.57	59.34	64.22	
	8	7	8	6	7

All units are in mg/l except pH

GAP ANALYSIS OF O.N.G.C COLONY

Based on

Environment Management system - 14001

ENVIRONMENT ASPECTS - NORMAL(N), ABNORMAL(AN) & EMERGENCY(E) CONDITIONS

Sl.No	Environmental Aspect	Aspect resulting from	Impact on the Environment	Present Practice	Recommendations/Remarks
	WATER SUPPLY SYSTEM				
	Pump House No. 1: (Near C-12 Block)				
	(A) 30HP Motor with Pump -2 (B) 20 HP Motor with Pump - 1(C) 25 HP Motor with Pump -1				
N1	Generation of Noise	Running of water supply pumps	Noise pollution & Health hazard	No noise level survey has been conducted.	Noise level survey to be conducted to find out level of noise. If noise level is found more than the laid down limits, Adequate protection (ear muffs, ear plugs etc.) to be provided. Written procedure to be prepared to operate in noise prone area.

N2	Quality of water	Cleaning of tanks.	Health hazard	Cleaning of tanks and chlorination are being done however there does not exist a written procedure for these jobs.	Written procedure to be developed for periodic cleaning of water tanks and chlorination. Storage tanks ought to be kept covered all the time to prevent contamination.
AN1	Leakage of water.	Leakages from flanges; joints of water pumps and water flow lines as well as bursting of water lines.	Resource loss	Maintenance jobs are carried out based on the complaints.	Quantity: High Periodic maintenance of water supply system to be practiced through a written procedure.
AN2	Spillage of lube oil	Bursting of gaskets of water supply pumps and its subsequent replacement	Land contamination/ Water pollution / resource loss	No written procedure.	Quantity: Less Procedure to be developed for replacing the gaskets avoiding the spillage of lube oil & collection of spilled lube oil.

N3	Generation of spent lube oil.	Replacement of lube oil of water supply pumps.	Land contamination/ water pollution/ resource loss	No written procedure.	Quantity: Less Procedure to be developed for collecting, storing the spent lube oil and its subsequent recycling /disposal.
AN3	Consumption of water.	Indiscriminate use of water.	Resource loss.	Water is being used inappropriately.	Quantity: MODERATE Awareness and motivation by way of distribution of circulars periodically. Water to be metered and meters to be periodically checked for their proper functioning.
N4	Consumption of power	Running of motor	Resource loss.	Present practice continues.	Pump house to be operated for fixed duration.

Pump House No. 2: (Near Civil Maintenance Office) (A) 15HP Motor with Pump -2 (B) 30 HP Motor with Pump

N5	Generation of noise	Running of water supply pumps	Noise pollution & Health hazard	No noise level survey has been conducted.	Noise level survey to be conducted to find out level of noise. If noise level is found more than the laid down limits, Adequate protection (ear muffs, ear plugs etc.) to be provided. Written procedure to be prepared to operate in noise prone area.
N6	Quality of water	Cleaning of tanks.	Health hazard	Cleaning of tanks and chlorination are being done however there does not exist a written procedure for these jobs.	Written procedure to be developed for periodic cleaning of water tanks and chlorination. Storage tanks ought to be kept covered all the time to prevent contamination.

AN4	Leakage of water.	Leakages from flanges, joints of water pumps and water flow lines as well as bursting of water lines.	Resource loss	Maintenance jobs are carried out based on the complaints.	Quantity: High Periodic maintenance of water supply system to be practiced through a written procedure.
AN5	Spillage of lube oil	Bursting of gaskets of water supply pumps and its subsequent replacement	Land contamination/ Water pollution / resource loss	No written procedure.	Quantity: Less Procedure to be developed for replacing the gaskets avoiding the spillage of lube oil & collection of spilled lube oil.
N7	Generation of spent lube oil.	Replacement of lube oil of water supply pumps.	Land contamination/ water pollution/ resource loss	No written procedure.	Quantity: Less Procedure to be developed for collecting, storing the spent lube oil and its subsequent recycling /disposal.
AN6	Consumption of water.	Indiscriminate use of water.	Resource loss.	Water is being used inappropriately.	Quantity: MODERATE Awareness and motivation by way of distribution of circulars periodically. Water to be metered and meters to be periodically checked for their proper functioning.
N8	Consumption of power	Running of motor	Resource loss.	Present practice continues.	Pump house to be operated for fixed duration.

Pump House No. 3: (Near IDT Gate) (A) 20HP Motor with Pump -2 (B) 30 HP Motor with Pump -1

N9	Generation of noise	Running of water supply pumps	Noise pollution & Health hazard	No noise level survey has been conducted.	Noise level survey to be conducted to find out level of noise. If noise level is found more than the laid down limits, Adequate protection (ear muffs, ear plugs etc.) to be provided. Written procedure to be prepared to operate in noise prone area.
N10	Quality of water	Cleaning of tanks.	Health hazard	Cleaning of tanks and chlorination are being done however there does not exist a written procedure for these jobs.	Written procedure to be developed for periodic cleaning of water tanks and chlorination. Storage tanks ought to be kept covered all the time to prevent contamination.
AN7	Leakage of water.	Leakages from flanges, joints of water pumps and water flow lines as well as bursting of water lines.	Resource loss	Maintenance jobs are carried out based on the complaints.	Quantity: High Periodic maintenance of water supply system to be practiced through a written procedure.

AN8	Spillage of lube oil	Bursting of gaskets of water supply pumps and its subsequent replacement	Land contamination/ Water pollution / resource loss	No written procedure.	Quantity: Less Procedure to be developed for replacing the gaskets avoiding the spillage of lube oil & collection of spilled lube oil.
N11	Generation of spent lube oil.	Replacement of lube oil of water supply pumps.	Land contamination/ water pollution/ resource loss	No written procedure.	Quantity: Less Procedure to be developed for collecting, storing the spent lube oil and its subsequent recycling /disposal.
AN9	Consumption of water.	Indiscriminate use of water.	Resource loss.	Water is being used inappropriately.	Quantity: MODERATE Awareness and motivation by way of distribution of circulars periodically. Water to be metered and meters to be periodically checked for their proper functioning.
N12	Consumption of power	Running of motor	Resource loss.	Present continues.	Pump house to be operated for fixed duration.

Sl.No	Environmental Aspect	Aspect resulting from	Impact on the Environment	Present Practice	Remarks
GAS STORAGE AREA					
AN10	Generation of foul smell	Loading, unloading and supply of cylinders	Air pollution, Queasy feeling and health hazards	Nothing is done	Procedures to be developed to avoid leakage of gas during loading and unloading.
AN11	Generation of plastic	Seal on gas cylinders that is removed and thrown	Land pollution	Waste is collected and thrown in the dustbin.	Written procedure to be developed for this waste to be segregated from other wastes and disposed off.
AN12	Leakage of gas	Inappropriate handling of cylinders	Air pollution, uneasiness	Nothing is done	Written procedure to be developed to avoid leakage of gas during handling of cylinders
E1	Explosion and fire	Inappropriate handling of cylinders combined with gas leakage and human error like smoking.	Death/injury, air pollution, land pollution	No written procedure exists.	Emergency preparedness plan to be developed.
E2	Earthquake	Tectonic activity of the earth in maximum cases	Death/injury, fire, air pollution, land pollution	No written procedure exists.	Earthquake resistance to be given to the station

Sl.No	Environmental Aspect	Aspect resulting from	Impact on the Environment	Present Practice	Remarks
	ELECTRICAL CONTROL ROOM AND DIESEL GENERATOR Generators of 500KVA – 02 Nos. (installed at North Colony) Generator of 312.5KVA – 01Nos. (installed at North Colony) Generators of 160KVA – 01Nos. (installed at South Colony)				
N13	Generation of noise	Running of diesel generator	Health and noise pollution.	Ear muffs are used by operator.	Noise survey of generator room and ambience should be carried out. Written procedure to be developed and displayed for safe operating practices in noise prone area.
N14	Generation of heat	Running of diesel generator	Unusual ambience and uneasiness	No practice	Written procedure to be developed for proper maintenance of generator.

N15	Consumption of diesel	Running of diesel generator	Air pollution and resource consumption.	Generator is being run on diesel.	Quantity: Less Procedure for regular maintenance of generator.
N16	Generation of lead acid batteries	Replacement of used up lead acid batteries	Land contamination	Used up lead batteries are stored in backyard of the control room.	Quantity: Less Place to be identified for storage of replaced lead batteries. Procedure to be developed for safe storage and disposal (recycling by giving these back to the vendors)
AN13	Release of air pollutants (CO2 & NOx)	Burning of diesel/improper maintenance.	Air pollution & Greenhouse effect	Generator is checked once in a month.	Written procedure to be developed to minimize the air pollution.

AN14	Spillage of spent lube oil.	Replacement of lube oil.	Land contamination and resource loss	Replaced lube oil is collected in barrels.	Quantity: Less Procedure to be developed for replacement, collection, storage and recycling of spent lube oil for avoiding spillage.
Sl.No	Environmental Aspect	Aspect resulting from	Impact on the Environment	Present Practice	Remarks
TRANSFORMER – (a) 01No. Of 500KVA (b) 01No. Of 750KVA					

N17	Generation of noise	Running of transformer.	Health hazard and noise pollution.	Operator uses earmuffs.	Noise survey of transformer room and ambience should be carried out. Written procedure to be developed and displayed for safe operating practices in noise prone area.
N18	Generation of lead acid batteries	Replacement of used up lead acid batteries	Land contamination	Used up lead batteries are stored in backyard of the control room.	Quantity: less Place to be identified for storage of replaced lead batteries. Procedure to be developed for safe storage and disposal (recycling by giving these back to the vendors)
AN15	Release of air pollutants (CO2, NOx, etc.)	Burning of diesel/ Improper maintenance.	Air pollution, Greenhouse Effect decreased visibility, suffocation	Generator is checked once in a month.	Written procedure to be developed to minimize air pollution.

AN16	Spillage of spent lube oil.	Replacement of lube oil.	Land contamination and resource loss	Replaced lube oil is collected in barrels.	Quantity: Less Procedure to be developed for replacement, collection, storage and recycling of spent lube oil avoiding spillage.
AN17	Spillage of transformer oil	Replacement /recycling/topping up of transformer oil.	Land contamination and resource loss.	Transformer oil is being topped up every year.	Quantity: Less Procedure to be developed for Replacement /recycling/topping up of transformer oil avoiding spillage.
Sewage disposal system					
N19	Generation of noise	Running of sewage pumps.	Health hazard and noise pollution.	No noise level survey has been conducted.	Noise level survey to be conducted to find out level of noise. If noise level is found more than the laid down limits, Adequate protection (ear muffs, ear plugs etc.) should be provided. Written procedure to be prepared to operate in noise prone area.

AN18	Leakage and spillage of sewage	Leakages from, ruptured gasket, flanges, joints of sewage pumps and flow lines as well as their replacement. During clearing the choking in the sewage lines.	Water pollution, Bad odour and health hazard.	Maintenance jobs are taken up as per the requirement.	Quantity: Less Periodic maintenance of sewage supply system to be practiced through a written procedure.
AN19	Spillage of lube oil	Bursting of gaskets of sewage water pumps and its subsequent replacement	Land contamination/ Water pollution	No written procedure.	Quantity: Less Procedure to be developed for replacing the gaskets avoiding the spillage of lube oil.
N20	Generation of spent lube oil.	Replacement of lube oil of sewage water supply pumps.	Land contamination	Spent lube oil is collected in barrels.	Quantity: Less to moderate. Procedure to be developed for collecting, storing the spent lube oil and its subsequent recycling /disposal

SI.No	Environmental Aspect	Aspect resulting from	Impact on the Environment	Present Practice	Remarks
RESEIDENTIAL QUARTERS					
N21	Generation of house keeping waste (including left over food)	General activities in residential quarters, Shishu Vihar school and temple	Discomfort, foul smell, diseases, etc	House keeping waste is collected in a bin.	Quantity: high Procedure to be developed for segregation of bio degradable and non-biodegradable waste and collection in separate bins. Systematic disposal to be followed.
N22	Tree plantation and development of gardens.	Tree plantation and development of gardens for aesthetics.	Positive impact	Tree plantation and gardens are being maintained but formalized procedure of maintenance is not being practiced.	Formal procedure for periodic maintenance of trees and gardens to be developed.

N23	Conservation of Water.	General activities in residential quarters, Shishu Vihar school and temple.	Resource conservation.	Procedure to be developed for judicious use of water. Wastewater generated from kitchen and bath room may be used for watering kitchen garden after necessary treatment (Soak pits may be planned for treatment of waste water.)
N24	Conservation of electricity.	General activities in residential quarters, Shishu Vihar school and temple.	Resource conservation.	Procedure to be made for judicious use of electricity.
N25	General cleanliness	Cleaning of roads, drains, etc.	Health hazard.	Written procedure to be developed for general cleanliness.
AN20	Generation of combustible litter.	Shed from trees & bushes	Reduced aesthetic value.	Written procedure to be developed for cleaning litter.
AN21	Release of CFC	During maintenance of old AC's.	Ozone depletion	Residents to be encouraged to buy electrical appliances with CFC free technology.

Sl.No	Environmental Aspect	Aspect resulting from	Impact on the Environment	Present Practice	Remarks
OFFICERS CLUB					
N26	Generation of house keeping waste.	General activities.	Reduced aesthetic value.	House keeping waste is collected in a bin.	Quantity: less Written procedure to be developed for collection and suitable disposal of house keeping waste.
N27	Conservation of water.	General activities.	Resource conservation.		Procedure to be developed for judicious use of water.
N28	Conservation of electricity.	General activities.	Resource conservation.		Procedure to be made for judicious use of electricity.

AN22	Discharge of untreated water. (From swimming pool)	Improper treatment.	Water pollution	Water is treated before discharge.	Written procedure to be developed for suitable treatment of water before discharge.
N29	Generation of empty bottles. (Bar)	General activities	Reduced aesthetic value	Empty bottles are collected.	Written procedure to be developed for collection and disposal of bottles
AN23	Leakage of gas. (Mess)	Negligence/use of gas pipe for more than prescribed time limit.	Air pollution	Gas pipe is replaced as per the specified limits.	Written procedure to be developed timely replacement of gas pipes.

Sl.No	Environmental Aspect	Aspect resulting from	Impact on the Environment	Present Practice	Remarks
WOMEN'S POLYTECHNIC					
N30	Generation of house keeping waste.	General activities.	Reduced aesthetic value.	House keeping waste is collected in a bin.	Quantity: Medium Written procedure to be developed for collection and suitable disposal of house keeping waste.
N31	Conservation of Water.	General activities.	Resource conservation.		Procedure to be developed for judicious use of water.
N32	Conservation of electricity.	General activities.	Resource conservation.		Procedure to be made for judicious use of electricity.

Sl.No	Environmental Aspect	Aspect resulting from	Impact on the Environment	Present Practice	Remarks
PLAYGROUNDS/PARK					
N33	Generation of litter (grass).	Cutting of grass.	Reduced aesthetic value.	Litter is collected and removed.	Quantity: high Written procedure to be developed for periodic cutting and removal of litter.
AN24	Generation of house keeping waste. (Including plastics, food wastes, cotton used in first aid, etc.)	Player's activities.	Foul smell, diseases and reduced aesthetic value.	Waste is collected and removed.	Quantity: low Procedure to be developed for segregation of bio degradable and non-biodegradable waste and collection in separate bins. Systematic disposal to be followed.

MISCELLANEOUS

Sl.No	Environmental Aspect	Aspect resulting from	Impact on the Environment	Present Practice	Remarks
N34	Generation of noise and gaseous emission	Plying of vehicles.	Noise and Air pollution.	Speed of plying of vehicles in the colony has been controlled by putting speed breakers at important places.	PUC (Pollution under control) certificate for all the vehicles plying in the colony to be ensured. Display boards depicting awareness for safe driving and upkeep of environment may be located at appropriate places.
N35	Generation of tube lights, fused bulbs & wires	Use & maintenance of electrical appliances.	Land contamination, aesthetics degradation.	Being stored within premises & disposed off.	An area to be identified & designated for storage & disposal of waste. Procedure to be developed for storage of discarded electrical materials in the designated area.

N36	Generation of dust.	Civil construction and digging for lying under ground amenities.	Nuisance	Residential areas are not being curtained of from the civil construction activities.	Procedure to be developed for curtaining of the residential areas from civil construction/ digging activities.
N37	Upkeep of residential quarters and other settlements.(temple and school)	White washing of residential quarters and other settlements	Good health and hygiene.	White washing and cleanliness of human and other settlements are done on regular basis.	Written procedure to be developed for white washing and cleanliness at appropriate intervals.
AN25	Diseases spread by mosquitoes	Thriving of mosquitoes in stagnant water and other vulnerable areas.	Health hazard	Precautionary measures like spraying of mosquitocide chemicals etc.	Procedure for regular spraying, removal of stagnant water, changing water in desert coolers etc. to be developed.
AN26	Diseases and nuisance by stray dogs and monkeys.	Frequent damage of water tanks and float system and contamination of tank water by monkeys.	Health hazard	Nothing is done to regulate the rising stray animal population.	Plan to get rid of stray dogs and monkeys in consultation with municipal board and forest department respectively.
N38	External communication	Communication with interested stake holders	Complaints pertaining to environmental performance	Complaints are received at main gate of the colony and passed on to the pertinent personnel	Procedure to be developed for receiving environmental complaints at main gate .A register to file complaints to be maintained.

N39	Environmental education & motivation	Internal communication	Enhanced environmental performance.	Plan and procedure may be developed for educating and motivating residents as well as working personnel.
N40	General health of residents.		Good health	Plan may be made for developing forest corridor, eco huts etc.
E3	Environmental damages (Emissions, water and land contamination and solid waste etc.)	Fire and earth quake.	Air, water, land pollution.	Procedure to be developed for withstanding, the earliest mitigation and restoration.

SI.No	Environmental Aspect	Aspect resulting from	Impact on the Environment	Present Practice	Remarks
INDIRECT ASPECTS					
AN27	Spillage of house keeping waste.	During transportation.	Nuisance, diseases and reduced aesthetics.	Spilled waste is collected by sweepers and thrown in dustbin.	Quantity: low Written procedure to be developed for periodic collection and disposal of spilled waste.

SI.No	Environmental Aspect	Aspect resulting from	Impact on the Environment	Present Practice	Remarks
POTENTIAL ASPECTS					
AN28	Generation of dust.	During repair of houses.	Air pollution.	Curtain is not provided.	Quantity: low Written procedure to be developed to minimize exposure of dust to the residents.

ENVIRONMENTAL ASPECTS EVALUATION CRITERIA

CRITERIA OF EVALUATION FOR NORMAL AND ABNORMAL ASPECTS:

High: Above 300 points

Medium: 100-300 points

Low: Below 100 points

Solid waste Per annum:

Less than 50 kg.	-	Low,
50 kg & above	-	Moderate,
500Kg & above	-	High,
2 tons & above	-	Very high,
5 tons & above	-	Excessive

CRITERIA OF SIGNIFICANT ASPECT UNDER EMERGENCY CONDITIONS: - SCORE POINTS 20 AND ABOVE.

CRITERIA OF EVALUATION OF ASPECTS UNDER NORMAL AND ABNORMAL CONDITION

CRITERIA OF EVALUATION OF ASPECTS UNDER NORMAL AND ABNORMAL CONDITION

ASPECT NO.	ASPECTS	QUANTITY (A)	LEGISLATION/CORP. OR LOCAL ENVT. POLICY (B)	FREQUENCY OF OCCURRENCE (C)	IMPACT (D)	CONTROL (E)	DETECTION / PREVENTIVE MECHANISM (F)	SCORE (G) = A*B*C* D*E*F	SIGNIFICANCE
		Excessive: 5 Very High: 4 High: 3 Moderate: 2 Low: 1	Under legislation: 10 Not under legislation: 1	Continuous: 5 Several Times: 4 Once a day: 3 Once a week: 2 Once a month or less: 1	Fatal to human life: 5 Human health effect: 4 Environmental effect / Resource loss: 3 Discomfort to human life: 2 Less impact: 1	Absence or not effective: 3 Mechanism in place but not reliable: 2 Available and effective: 1	More than 24 hrs: 5 More than 12 hrs: 4 More than 6 hrs: 3 More than 1 hr: 2 Immediately: 1		High: H Medium: M Low: L

EVALUATION OF ASPECTS UNDER EMERGENCY CONDITIONS:-

ASPECT NO.	ASPECT	OCCURRENCE PROBABILITY (A) High: 4 Moderate : 3 Low : 2 Very low : 1 Negligible : 0.1	FREQUENCY OF DETECTION (B) Real time / continuous: 0.1 Within 1 hr : 1 Within 8 hrs : 2 Within 24 hrs. : 3 More than 24 hrs. : 4	NATURE OF CONSEQUENCE (C) Insignificant : 0.1 Very low : 1 Low : 3 Moderate : 5 High : 10	SCORE = (A+B)*C

EVALUATION OF ASPECTS UNDER NORMAL CONDITIONS

ASPECT NO.	ASPECTS	QUANTITY (A)	LEGISLATION/CORP. OR LOCAL ENVT. POLICY (B)	FREQUENCY OF OCCURRENCE (C)	IMPACT (D)	CONTROL (E)	DETECTION / PREVENTIVE MECHANISM (F)	SCORE (G) = A*B*C* D*E*F	SIGNIFICANCE
N1, N5, N9,	Generation of Noise from pump houses.	Excessive: 5 Very High: 4 High: 3 Moderate: 2 Low: 1	Under legislation: 10 Not under legislation: 1	Continuous: 5 Several Times: 4 Once a day: 3 Once a week: 2 Once a month or less: 1	Fatal to human life: 5 Human health effect: 4 Environmental effect / Resource loss: 3 Discomfort to human life: 2 Less impact: 1	Absence or not effective: 3 Mechanism in place but not reliable: 2 Available and effective: 1	More than 24 hrs: 5 More than 12 hrs: 4 More than 6 hrs: 3 More than 1 hr: 2 Immediately: 1	480	H
N2, N6, N10	Quality of water supplied from pump houses.	4	10	2	4	2	1	640	H

N3, N7, N11	Generation of spent lube oil from pump houses.	1/2	10	1	3	2	1	60/120	L/M
N4, N8, N12	Consumption of power in pump houses.	3	10	4	3	2	1	720	H
N13, N17	Generation of Noise from generators and transformer.	3	10	4	4	2	1	960	H
N14	Generation of heat from generators.	1	1	5	2	2	1	20	L
N15	Consumption of diesel by generators.	1	10	5	3	2	1	300	H
N16	Generation of lead acid batteries from generators.	1	10	1	4	2	1	80	L
N18	Generation of house keeping waste (including left over food) from residential quarters.	3	10	4	2	2	4	1920	H

N19	Tree plantation and development of gardens around residential quarters.	3	10	2	4	2	1	480	H
N20	Conservation of Water in residential quarters.	3	10	5	3	2	1	900	H
N21	Conservation of electricity in residential quarters.	3	10	5	3	2	1	900	H
N22	General cleanliness in quarters and around.	1	10	3	2	2	2	240	M
N23	Generation of house keeping waste in officer's colony.	1	10	3	2	2	1	120	M
N24	Conservation of Water in officer's colony.	3	10	5	3	2	1	900	H

N25	Conservation of electricity in officer's colony.	3	10	5	3	2	1	900	H
N26	Generation of empty bottles in officer's colony. (Bar)	3	1	4	2	2	1	48	L
N27	Generation of house keeping waste in women's polytechnic.	2	10	3	2	2	1	240	M
N28	Conservation of Water in women's polytechnic.	2	10	4	3	2	1	480	H
N29	Conservation of electricity in women's polytechnic.	2	10	4	3	2	1	480	H
N30	Generation of litter (grass) in playgrounds/park.	1	10	1	1	2	3	60	L

N31	Generation of noise and emission of gases from plying of vehicles	2	10	4	4	2	1	640	H
N32	Generation of tube lights, fused bulbs & wires.	3	10	1	3	2	1	180	M
N33	Generation of dust in the colony as a whole.	1	1	1	2	2	4	16	L
N34	Upkeep of residential quarters and other settlements.	4	10	1	2	2	1	160	M
N35	External communication.		10						
N36	Environmental education & motivation		10						
N37	General health of residents.		10						

EVALUATION OF ASPECTS UNDER ABNORMAL CONDITIONS:

ASPECT NO.	ASPECTS	QUANTITY (A) Excessive: 5 Very High: 4 High: 3 Moderate: 2 Low: 1	LEGISLATION/CORP. OR LOCAL ENVT. POLICY (B) Under legislation: 10 Not under legislation: 1	FREQUENCY OF OCCURRENCE (C) Continuous: 5 Several Times: 4 Once a day: 3 Once a week: 2 Once a month or less: 1	IMPACT (D) Fatal to human life: 5 Human health effect: 4 Environmental effect / Resource loss: 3 Discomfort to human life: 2 Less impact: 1	CONTROL (E) Absence or not effective: 3 Mechanism in place but not reliable: 2 Available and effective: 1	DETECTION / PREVENTIVE MECHANISM (F) More than 24 hrs: 5 More than 12 hrs: 4 More than 6 hrs: 3 More than 1 hr: 2 Immediately: 1	SCORE (G) = A*B*C*D*E*F	SIGNIFICANCE High: H Medium: M Low: L
AN1, AN4, AN7	Leakage of water from water Supply system.	2	10	2	3	2	1	240	M
AN2, AN5, AN8	Spillage of lube oil from water supply pumps.	1	10	1	3	2	1	240	M

AN3, AN6, AN9	Consumption of water.	2	10	4	3	2	2	2	960	H
AN10	Generation of foul smell from gas storage area.	3	10	3	4	2	2	1	720	H
AN11	Generation of plastic from gas storage area. (Cylinder seals, etc.)	3	10	3	4	2	2	2	1440	H
AN12	Leakage of gas from gas storage area.	2	10	3	2	2	2	1	240	M
AN13, AN15	Release of air pollutants (CO ₂ & NO _x) from generators and transformer.	3	10	4	4	2	2	1	960	H

AN14, AN16	Spillage of spent lube oil from generators and transformer.	2	10	1	3	2	1	120	M
AN17	Spillage of transformer oil.	1	10	1	3	2	1	60	L
AN18	Leakage and spillage of sewage.	1	10	1	4	2	1	80	L
AN19	Generation of combustible litter.	3	1	2	1	2	3	36	L
AN20	Release of CFC from residential quarters.	1	10	1	3	2	5	300	H
AN21	Discharge of untreated water. (From swimming pool of Officer's Club)	3	10	3	4	2	2	1440	H
AN22	Leakage of gas. (Mess)	1	10	4	2	2	1	160	M
AN23	Generation of house keeping waste in and	3	10	3	4	2	2	1440	H

	around playground.																		
AN24	Diseases spread by mosquitoes	2	10	1	5	2	5	2	5	1000									H
AN25	Diseases and nuisance by stray dogs and monkeys.	3	10	1	4	2	5	2	5	1200									H
AN26	Spillage of house keeping waste.	2	1	2	2	2	2	2	2	32									L
AN27	Generation of dust.	1	1	1	2	2	2	2	4	16									L

EVALUATION OF ASPECTS UNDER EMERGENCY CONDITIONS:-

ASPECT NO.	ASPECT	OCCURRENCE PROBABILITY (A) High: 4 Moderate : 3 Low : 2 Very low : 1 Negligible : 0.1	FREQUENCY OF DETECTION (B) Real time / continuous: 0.1 Within 1 hr : 1 Within 8 hrs : 2 Within 24 hrs. : 3 More than 24 hrs. : 4	NATURE OF CONSEQUENCE (C) Insignificant : 0.1 Very low : 1 Low : 3 Moderate : 5 High : 10	SCORE = (A+B)*C
E1	Explosion and fire	1	1	10	(1+1)x10=20
E2	Earthquake	1	1	10	(1+1)x10=20
E3	Environmental damages (Emissions, water and land contamination and solid waste etc.)	1	1	10	(1+1)x10=20

4 Environmental management system requirement

4.1 General requirements

The organization shall establish, document, implement, maintain and continually improve an environmental management system in accordance with the requirements of this International Standard and determine how it will fulfil these requirements.

The organization shall define and document the scope of its environmental management system.

4.2 Environmental policy

Top management shall define the organization's environmental policy and ensure that, within the defined scope of its environmental management system, it

- a) is appropriate to the nature, scale and environmental impacts of its activities, products and services,
- b) includes a commitment to continual improvement and prevention of pollution,
- c) includes a commitment to comply with applicable legal requirements and with other requirements to which the organization subscribes which relate to its environmental aspects,
- d) provides the framework for setting and reviewing environmental objectives and targets,
- e) is documented, implemented and maintained,
- f) is communicated to all persons working for or on behalf of the organization, and
- g) is available to the public.

4.3 Planning

4.3.1 Environmental aspects

The organization shall establish, implement and maintain a procedure(s)

- a) to identify the environmental aspects of its activities, products and services within the defined scope of the environmental management system that it can control and those that it can influence taking into account planned or new

developments, or new or modified activities, products and services, and

b) to determine those aspects that have or can have significant impact(s) on the environment (i.e. significant environmental aspects).

The organization shall document this information and keep it up to date.

The organization shall ensure that the significant environmental aspects are taken into account in establishing, implementing and maintaining its environmental management system.

4.3.2 Legal and other requirements

The organization shall establish, implement and maintain a procedure(s)

a) to identify and have access to the applicable legal requirements and other requirements to which the organization subscribes related to its environmental aspects, and

b) to determine how these requirements apply to its environmental aspects.

The organization shall ensure that these applicable legal requirements and other requirements to which the organization subscribes are taken into account in establishing, implementing and maintaining its environmental management system.

4.3.3 Objectives, targets and programme(s)

The organization shall establish, implement and maintain documented environmental objectives and targets, at relevant functions and levels within the organization.

The objectives and targets shall be measurable, where practicable, and consistent with the environmental policy, including the commitments to prevention of pollution, to compliance with applicable legal requirements and with other requirements to which the organization subscribes, and to continual improvement.

When establishing and reviewing its objectives and targets, an organization shall take into account the legal requirements and other requirements to which the organization subscribes, and its significant environmental aspects. It shall also consider its technological options, its financial, operational and business requirements,

and the views of interested parties.

The organization shall establish, implement and maintain a programme(s) for achieving its objectives and targets. Programme(s) shall include

- a) designation of responsibility for achieving objectives and targets at relevant functions and levels of the organization, and
- b) the means and time-frame by which they are to be achieved.

4.4 Implementation and operation

4.4.1 Resources, roles, responsibility and authority

Management shall ensure the availability of resources essential to establish, implement, maintain and improve the environmental management system.

4.4.2 Competence, training and awareness

The organization shall ensure that any person(s) performing tasks for it or on its behalf that have the potential to cause a significant environmental impact(s) identified by the organization is (are) competent on the basis of appropriate education, training or experience, and shall retain associated record

The organization shall identify training needs associated with its environmental aspects and its environmental management system. It shall provide training or take other action to meet these needs, and shall retain associated records.

The organization shall establish, implement and maintain a procedure(s) to make persons working for it or on its behalf aware of

- a) the importance of conformity with the environmental policy and procedures and with the requirements of the environmental management system,
- b) the significant environmental aspects and related actual or potential impacts associated with their work, and
- c) the environmental benefits of improved personal performance, their roles and responsibilities in achieving conformity with the requirements of the environmental management system, and

d) the potential consequences of departure from specified procedures.

4.4.3 Communication

With regard to its environmental aspects and environmental management system, the organization shall establish, implement and maintain a procedure(s) for

- a) internal communication among the various levels and functions of the organization,
- b) receiving, documenting and responding to relevant communication from external interested parties.

The organization shall decide whether to communicate externally about its significant environmental aspects, and shall document its decision. If the decision is to communicate, the organization shall establish and implement a method(s) for this external communication.

4.4.4 Documentation

The environmental management system documentation shall include

- a) the environmental policy, objectives and targets,
- b) description of the scope of the environmental management system,
- c) description of the main elements of the environmental management system and their interaction, and reference to related documents,
- d) documents, including records, required by this International Standard, and
- e) documents, including records, determined by the organization to be necessary to ensure the effective planning, operation and control of processes that relate to its significant environmental aspects.

4.4.5 Control of documents

Documents required by the environmental management system and by this International Standard shall be controlled. Records are a special type of document and shall be controlled in accordance with the requirements given in 4.5.4.

The organization shall establish, implement and maintain a procedure(s) to

- a) approve documents for adequacy prior to issue,
- b) review and update as necessary and re-approve documents,
- c) ensure that changes and the current revision status of documents are identified,

d) ensure that relevant versions of applicable documents are available at points of use,

e) ensure that documents remain legible and readily identifiable

4.4.6 Operational control

The organization shall identify and plan those operations that are associated with the identified significant environmental aspects consistent with its environmental policy, objectives and targets, in order to ensure that they are carried out under specified conditions, by

a) establishing, implementing and maintaining a documented procedure(s) to control situations where their absence could lead to deviation from the environmental policy, objectives and targets, and

b) stipulating the operating criteria in the procedure(s), and

c) establishing, implementing and maintaining procedures related to the identified significant environmental aspects of goods and services used by the organization and communicating applicable procedures and requirements to suppliers, including contractors.

4.4.7 Emergency preparedness and response

The organization shall establish, implement and maintain a procedure(s) to identify potential emergency situations and potential accidents that can have an impact(s) on the environment and how it will respond to them.

The organization shall respond to actual emergency situations and accidents and prevent or mitigate associated adverse environmental impacts.

The organization shall periodically review and, where necessary, revise its emergency preparedness and response procedures, in particular, after the occurrence of accidents or emergency situations.

The organization shall also periodically test such procedures where practicable.

4.5 Checking

4.5.1 Monitoring and measurement

The organization shall establish, implement and maintain a procedure(s) to monitor and measure, on a regular basis, the key characteristics of its operations that can have a significant environmental impact. The procedure(s) shall include the documenting of information to monitor performance, applicable operational

controls and conformity with the organization's environmental objectives and targets.

The organization shall ensure that calibrated or verified monitoring and measurement equipment is used

4.5.2 Evaluation of compliance

4.5.2.1 Consistent with its commitment to compliance, the organization shall establish, implement and maintain a procedure(s) for periodically evaluating compliance with applicable legal requirements.

The organization shall keep records of the results of the periodic evaluations.

4.5.2.2 The organization shall evaluate compliance with other requirements to which it subscribes. The organization may wish to combine this evaluation with the evaluation of legal compliance referred to in 4.5.2.1 or to establish a separate procedure(s).

The organization shall keep records of the results of the periodic evaluations

4.5.3 Nonconformity, corrective action and preventive action

The organization shall establish, implement and maintain a procedure(s) for dealing with actual and potential nonconformity(ies) and for taking corrective action and preventive action. The procedure(s) shall define requirements for

- a) identifying and correcting nonconformity(ies) and taking action(s) to mitigate their environmental impacts,
 - b) investigating nonconformity(ies), determining their cause(s) and taking actions in order to avoid their recurrence,
 - c) evaluating the need for action(s) to prevent nonconformity(ies) and implementing appropriate actions designed to avoid their occurrence,
 - d) recording the results of corrective action(s) and preventive action(s) taken, and
 - e) reviewing the effectiveness of corrective action(s) and preventive action(s) taken.
- Actions taken shall be appropriate to the magnitude of the problems and the environmental impacts encountered.

The organization shall ensure that any necessary changes are made to environmental management system documentation.

4.5.4 Control of records

The organization shall establish and maintain records as necessary to demonstrate conformity to the requirements of its environmental management system and of this International Standard, and the results achieved.

The organization shall establish, implement and maintain a procedure(s) for the identification, storage, protection, retrieval, retention and disposal of records. Records shall be and remain legible, identifiable and traceable.

4.5.5 Internal audit

The organization shall ensure that internal audits of the environmental management system are conducted at planned intervals to

a) determine whether the environmental management system
1) conforms to planned arrangements for environmental management including the requirements of this International Standard, and

2) has been properly implemented and is maintained, and
b) provide information on the results of audits to management.

Audit programme(s) shall be planned, established, implemented and maintained by the organization, taking into consideration the environmental importance of the operation(s) concerned and the results of previous audits.

Audit procedure(s) shall be established, implemented and maintained that address

— the responsibilities and requirements for planning and conducting audits, reporting results and retaining associated records,

— the determination of audit criteria, scope, frequency and methods.

Selection of auditors and conduct of audits shall ensure objectivity and the impartiality of the audit process.

4.6 Management review

Top management shall review the organization's environmental management system, at planned intervals, to ensure its continuing suitability, adequacy and effectiveness.

Reviews shall include assessing opportunities for

improvement and the need for changes to the environmental management system, including the environmental policy and environmental objectives and targets. Records of the management reviews shall be retained.

Input to management reviews shall include

- a) results of internal audits and evaluations of compliance with legal requirements and with other requirements to which the organization subscribes,
- b) communication(s) from external interested parties, including complaints,
- c) the environmental performance of the organization,
- d) the extent to which objectives and targets have been met,
- e) status of corrective and preventive actions,
- f) follow-up actions from previous management reviews,
- g) changing circumstances, including developments in legal and other requirements related to its environmental aspects, and
- h) recommendations for improvement.

INTERNATIONAL STANDARD of ISO 14001

This International Standard is based on the methodology known as Plan-Do-Check-Act (PDCA). PDCA can be briefly described as follows.

— Plan: establish the objectives and processes necessary to deliver results in accordance with the organization's environmental policy.

— Do: implement the processes.

Check: monitor and measure processes against environmental policy, objectives, targets, legal and other requirements, and report the results.

Act: take actions to continually improve performance of the environmental management system.

Many organizations manage their operations via the application of a system of processes and their interactions, which can be referred to as the "process approach". ISO 9001 promotes the use of the process approach. Since PDCA can be applied to

all processes, the two methodologies are considered to be compatible.

ENVIRONMENT MANAGEMENT SYSTEM

1 Scope

This International Standard specifies requirements for an environmental management system to enable an organization to develop and implement a policy and objectives which take into account legal requirements and other requirements to which the organization subscribes, and information about significant environmental aspects. It applies to those environmental aspects that the organization identifies as those which it can control

and those which it can influence. It does not itself state specific environmental performance criteria.

This International Standard is applicable to any organization that wishes to

a) establish, implement, maintain and improve an environmental management system,

b) assure itself of conformity with its stated environmental policy,

c) demonstrate conformity with this International Standard by

1) making a self-determination and self-declaration, or

2) seeking confirmation of its conformance by parties having an interest in the organization, such as

customers, or

3) seeking confirmation of its self-declaration by a party external to the organization, or

4) seeking certification/registration of its environmental management system by an external organization.

All the requirements in this International Standard are intended to be incorporated into any environmental management system. The extent of the application depends

on factors such as the environmental policy of the organization, the nature of its activities, products and services

and the location where and the conditions in

which it functions. This International Standard also provides, in Annex A, informative guidance on its use.

2 Normative references

No normative references are cited. This clause is included in order to retain clause numbering identical with the previous edition (ISO 14001:1996).

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

auditor

person with the competence to conduct an audit
[ISO 9000:2000, 3.9.9]

3.2

continual improvement

recurring process of enhancing the **environmental management system** (3.8) in order to achieve improvements in overall **environmental performance** (3.10) consistent with the **organization's** (3.16) **environmental policy** (3.

NOTE The process need not take place in all areas of activity simultaneously.

3.3

corrective action

action to eliminate the cause of a detected **nonconformity** (3.15)

3.4

document

information and its supporting medium
NOTE 1 The medium can be paper, magnetic, electronic or optical computer disc, photograph or master sample, or a combination thereof.

NOTE 2 Adapted from ISO 9000:2000, 3.7.2.

3.5

Environment

surroundings in which an **organization** (3.16) operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation

NOTE Surroundings in this context extend from within an **organization** (3.16) to the global system.

3.6

environmental aspect

element of an **organization's** (3.16) activities or products or services that can interact with the **environment**

(3.5)

NOTE A significant environmental aspect has or can have a significant **environmental impact** (3.7).

3.7 environmental impact

any change to the **environment** (3.5), whether adverse or beneficial, wholly or partially resulting from an **organization's** (3.16) **environmental aspects** (3.6)

3.8 environmental management system

EMS
part of an **organization's** (3.16) management system used to develop and implement its **environmental policy**

(3.11) and manage its **environmental aspects** (3.6)
NOTE 1 A management system is a set of interrelated elements used to establish policy and objectives and to achieve

those objectives.
NOTE 2 A management system includes organizational structure, planning activities, responsibilities, practices, **procedures** (3.19), processes and resources.

**3.9
environmental objective**
overall environmental goal, consistent with the **environmental policy** (3.11), that an **organization** (3.16)

sets itself to achieve

**3.10
environmental performance**
measurable results of an **organization's** (3.16) management of its **environmental aspects** (3.6)

NOTE In the context of **environmental management systems** (3.8), results can be measured against the **organization's** (3.16) **environmental policy** (3.11), **environmental objectives** (3.9), **environmental targets** (3.12) and other environmental performance requirements.

3.11

environmental policy

overall intentions and direction of an **organization** (3.16) related to its **environmental performance** (3.10) as formally expressed by top management

NOTE The environmental policy provides a framework for action and for the setting of **environmental objectives** (3.9) and

environmental targets (3.12).

3.12

environmental target

detailed performance requirement, applicable to the **organization** (3.16) or parts thereof, that arises from the **environmental objectives** (3.9) and that needs to be set and met in order to achieve those objectives

3.13

interested party

person or group concerned with or affected by the **environmental performance** (3.10) of an **organization** (3.16)

3.14

internal audit

systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which the environmental management system audit criteria set by the **organization** (3.16) are fulfilled

NOTE In many cases, particularly in smaller organizations, independence can be demonstrated by the freedom from responsibility for the activity being audited.

3.15

nonconformity

non-fulfilment of a requirement
[ISO 9000:2000, 3.6.2]

3.16

Organization

company, corporation, firm, enterprise, authority or institution, or part or combination thereof, whether incorporated or not, public or private, that has its own functions and administration

NOTE For organizations with more than one operating unit, a single operating unit may be defined as an organization.

3.17

preventive action

action to eliminate the cause of a potential **nonconformity**
(3.15)

3.18

prevention of pollution

use of processes, practices, techniques, materials, products, services or energy to avoid, reduce or control (separately or in combination) the creation, emission or discharge of any type of pollutant or waste, in order to reduce adverse **environmental impacts** (3.7)

NOTE Prevention of pollution can include source reduction or elimination, process, product or service changes, efficient use of resources, material and energy substitution, reuse, recovery, recycling, reclamation and treatment.

3.19

procedure

specified way to carry out an activity or a process

NOTE 1 Procedures can be documented or not.

NOTE 2 Adapted from ISO 9000:2000, 3.4.5.

3.20

record

document (3.4) stating results achieved or providing evidence of activities performed

NOTE Adapted from ISO 9000:2000, 3.7.6.

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