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ROYAL AUDIT AUTHORITY  
*Bhutan Integrity House*



ENVIRONMENT  
AUDIT REPORT

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## Audit of Industries on environmental compliance





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ROYAL AUDIT AUTHORITY

*Bhutan Integrity House*

Reporting on Economy, Efficiency & Effectiveness in the use of Public Resources



RAA (TAD-EAS)/ 2009-10/16522

23<sup>rd</sup> October 2009

**The Hon'ble Deputy Minister,  
National Environment Commission,  
Thimphu.**

**Sub: Audit Report of Industries on environmental compliance.**

Hon'ble Dasho,

Enclosed herewith please find a copy of the *Environmental Audit Report* on the compliance of Environmental Standards of industries in Pasakha and Gomtu. The audit was conducted on the principles of *Performance Audit* and in line with the mandates of the Royal Audit Authority (RAA) as enshrined in the Constitution of the Kingdom of Bhutan and the Audit Act of Bhutan 2006. The main objective of this audit was to ascertain the compliances of environmental norms and adequacy of existing compliance assurance and monitoring mechanism instituted at various levels.

The copies of the draft reports were issued to the Secretary, Ministry of Economic Affairs, Managing Director, PCAL, Managing Director, Lhaki Cement Works, Managing Director, Bhutan Carbide and Chemicals Ltd. and Managing Director, Bhutan Ferro Alloys Ltd., Pasakha for comments and factual confirmation. However, the RAA received comments only from Bhutan Ferro Alloys Ltd., which is duly incorporated in the report.

The RAA is pleased to note existence of relevant laws, rules and regulations as well as evidence of occasional monitoring carried out by the relevant authorities and compliances of environmental norms to a large extent by the industries.

There were, however, cases of non-compliances of some of the environmental norms which included inappropriate disposal of wastes, river pollution, air pollution and inadequacies in strict enforcement and monitoring of environmental norms which had both visible and invisible adverse environmental impacts.

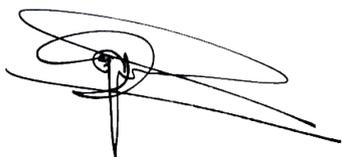
On the basis of the audit findings the RAA has made series of recommendations that are desirable for promoting compliance of environmental standards and norms. The recommendations may also be relevant and useful while undertaking development of new industrial estates in future.

*"Every individual must strive to be principled. And individuals in positions of responsibility must even strive harder."*  
- His Majesty The King Jigme Khesar Namgyel Wangchuck

The RAA would remain grateful, if Dasho could direct the agencies involved including the NEC Secretariat to submit a detailed action plan with clear and definite timeframe for implementing the audit recommendations and instituting appropriate controls and corrective measures on or before **25<sup>th</sup> January 2010**.

We would like to acknowledge the co-operation and assistance extended to the auditors by the officials of the audited agencies.

Yours Sincerely,



(Ugen Chewang)  
**Auditor General of Bhutan**

Copy to:

1. The Hon'ble Prime Minister, Royal Government of Bhutan, Thimphu for kind information;
2. The Hon'ble Minister, Ministry of Agriculture, Thimphu;
3. The Hon'ble Minister, Ministry of Economic Affairs, Thimphu;
4. The Hon'ble Minister, Ministry of Education, Thimphu;
5. The Hon'ble Minister, Ministry of Finance, Thimphu;
6. The Hon'ble Minister, Ministry of Foreign Affairs, Thimphu;
7. The Hon'ble Minister, Ministry of Health, Thimphu;
8. The Hon'ble Minister, Ministry of Home and Cultural Affairs, Thimphu;
9. The Hon'ble Minister, Ministry of Information and Communication, Thimphu;
10. The Hon'ble Minister, Ministry of Labour and Human Resources, Thimphu;
11. The Hon'ble Minister, Ministry of Works and Human Settlement, Thimphu;
12. The Hon'ble Speaker, National Assembly, Thimphu;
13. The Hon'ble Chairman, National Council, Thimphu;
14. The Chairperson, Public Accounts Committee, Thimphu;
15. The Secretary to His Majesty, His Majesty's Secretariat, Thimphu;
16. The Secretary, Ministry of Economic Affairs, Thimphu;
17. The Secretary, GNH Commission, Thimphu;
18. The Dzongda, Samtse Dzongkhag Administration, Samtse;
19. The Dzongda, Chukha Dzongkhag Administration, Chukha;
20. The Director, Bhutan Trust Fund for Environment Conservation, Thimphu;
21. The Executive Director, Royal Society for the Protection of Nature, Thimphu;
22. The Managing Director, PCAL, Gomtu;
23. The Managing Director, Lhaki Cement Works, Gomtu;
24. The Managing Director, Bhutan Carbide and Chemicals Ltd., Pasakha;
25. The Managing Director, Bhutan Ferro Alloys Ltd., Pasakha;
26. Estate Manager, Industrial Estate, Pasakha;
27. PPAARD, RAA, Thimphu; and
28. Office copy.

*"Every individual must strive to be principled. And individuals in positions of responsibility must even strive harder."*  
- His Majesty The King Jigme Khesar Namgyel Wangchuck

## TITLE SHEET

1. REPORT NAME : **Report on Audit of Industries in Pasakha and Gomtu on Environmental Compliance**

2. EXECUTING AGENCY : 1. Bhutan Ferro Alloys Limited;  
2. Bhutan Carbide and Chemicals Limited;  
3. New Industrial estate, Pasakha;  
4. Penden Cement Authority Limited; and  
5. Lhaki Cement Works

3. NAME OF AUDITEE OFFICIALS:

SL. No.	NAME OF AUDITEE AGENCY
1.	Pasakha Industrial Estate
2.	Bhutan Ferro Alloys Limited
3.	Bhutan Carbide and Chemicals limited
4.	Penden Cement Authority limited
5	Lhaki Cement Works

4. PERIOD COVERED BY AUDIT : January 2005 to December 2007

5. SCHEDULE OF AUDIT EXECUTION : 25/11/08 to 14/12/08

6. NAME OF INSPECTING TEAM:

SL. No.	NAME	DESIGNATION
1	Chandra Bdr. Gurung	Senior Audit Officer
2	Sonam Wangmo	Audit Officer
3	Tenzin Chhoedup	Asstt. Audit Officer

7. SUPERVISING OFFICERS:

SL. No.	NAME	DESIGNATION
1	Tashi	Chief Audit Officer
2.	B.B. Chhetri	Deputy Auditor General



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#### **DISCLAIMER NOTE**

The coverage of this audit does not include financial auditing. The audit was confined to Multilateral Environmental Agreements on meeting environmental compliances. This audit was based on Audit Planning set by the Royal Audit Authority and facts & information made available and accessible to the audit team by National Environmental Commission Secretariat, National Soil Service Centre, Ministry of Agriculture, and Ministry of Foreign Affairs.

This is also to state that the auditors during the audit had neither yielded to pressure, nor dispensed any favor or resorted to any unethical means that would be considered as violation of the Royal Audit Authority's Code of Good Conduct, Ethics and Secrecy.

# 1

## Executive Summary

### WHY AUDIT INDUSTRIES?

Article 25.1 of the Constitution of the Kingdom of Bhutan and Section 3 of the Audit Act of Bhutan 2006 state that “***There shall be a Royal Audit Authority to audit and report on the economy, efficiency and effectiveness in the use of public resources***”. The Royal Audit Authority is, therefore, required to ascertain and report as to whether Government agencies adhere to the standards of economy and efficiency in their operations and achieve the intended objectives for which they are established and resources are allocated to them. Conservation of Environment is one of the pillars of the Gross National Happiness, the development philosophy of Bhutan. The Royal Government has always emphasized that economic development must not take place at the expense of our natural resources.

Industrialization is taking place at a rapid pace in Bhutan. For instance, the government has already developed an industrial estate in Pasakha and more are in the pipeline. Environmental issues like air pollution, water pollution, waste generation, land degradation, etc are inevitable consequences of industrialisation. However, with systematic and best practices in place, the negative effects can be minimized to the desired level. The Royal Audit Authority accordingly, conducted the audit of operations of industries with an environmental perspective to ascertain the compliances of environmental requirements and visible impacts and other ramifications of non-compliances of environmental norms by the industries.

The Royal Audit Authority took up the study on New Industrial Estate of Pasakha, Bhutan Carbide and Chemicals Ltd (BCCL) and Bhutan

Ferro Alloys Ltd (BFAL) at Pasakha, Penden Cement Authority Ltd (PCAL) and Lhaki Cement at Gomtu.

The audit was conducted with the following objectives;

- To ascertain whether the industries complied with the environmental standards set by the National Environment Commission (NEC);
- To ascertain the adequacy of existing monitoring mechanism of environmental compliances;
- To ascertain whether the waste management system in the industries is adequate and appropriate;
- To ascertain the visible impacts of non-compliances of environmental norms; and
- To review the system of occupational health and safety of workers in the industries.

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## WHAT RAA FOUND?

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The RAA came across certain good practices and some noteworthy achievements as presented hereunder:

- ✓ Bhutan became party to Vienna Convention (1985) and Montreal Protocol (1987) in August 2004 and under this treaty Bhutan is obligated to phase out Ozone Depleting Substances (ODS) by the year 2010. Good progress in this direction has been made indicating that the industries would be able to phase out the ODS by 2010;
- ✓ The NECS, though constrained by limited man power take annual monitoring visits to industries and were fairly able to create environmental awareness amongst industries;
- ✓ Industries are providing employments to large numbers of both national and non-national workers. It was found that, generally the villagers have economically benefited from industries through employment; and

- ✓ Large scale industries especially, BCCL, BFAL and PCAL were generally aware of the environmental concerns and were found to adhere to most of the terms and conditions of the Environmental Clearance.

Notwithstanding the aforementioned good practices and achievements, the Royal Audit Authority also noted some deficiencies and weaknesses, as briefly highlighted below:

- ✘ There is no clarity of roles and responsibilities between NECS and MoEA (competent authority) which could lead to duplication of efforts and blurring accountability;
- ✘ Pollution abatement devices were either not found installed in many industries or not utilized optimally emitting beyond the standards set by NEC;
- ✘ Non-compliance of clauses contained in the environmental clearance was also observed;
- ✘ There is no standardized and regular approach in implementing environmental awareness programmes amongst Industries;
- ✘ Due to the collective emissions or discharges there is no one point source responsible for the growing environmental impacts. Some of the issues noted were disposal of solid and chemical waste, servicing of vehicles in the river, open transportation of raw materials etc.;
- ✘ Workers were found without their protective gears though safety and risk information were displayed in and around almost all the factories;
- ✘ The only school in Pasakha was located in the close vicinity of the new industrial estate posing risks on the health of school children and teachers and other employees; and
- ✘ There were no budgetary provisions for environmental management in the financial statements of the companies.

The study indicated that lack of policy framework, weak implementation of Rules and systematic monitoring by environmental agencies were the

principal causes for industries violating the environmental norms and standards.

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## WHAT RAA RECOMMENDS?

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Based on the findings of the study, the RAA has made certain recommendations that could aid government and agencies (both regulatory and implementing) in addressing the deficiencies and weaknesses. The report also provides some of the best environmental management practices. Recommendations contained in the report include the following:

- ✎ Government needs to develop Acts on air quality and appropriate rules and regulations;
- ✎ The roles and responsibilities of NECS and MoEA (competent authority) should be defined for clarity and better accountability;
- ✎ NECS and the competent authority (MoEA) should develop a clear strategy for air quality monitoring specifying proper timeline besides the surprise checks being conducted at present;
- ✎ Considering the vast mandate, the competent authorities (MoEA) need to study the adequacy and augment their human resource;
- ✎ The terms and conditions contained in the Environmental Clearance need to be enforced strictly;
- ✎ Public consultation needs to be enhanced before any project is proposed;
- ✎ Environmental Impact Assessment needs to be carried out more thoroughly and scientifically; and
- ✎ Industrial Infrastructure Development Division of MoEA and NECS should work in close co-ordination for developing any industrial estate in Bhutan.

# 2

## Introduction

The Royal Government of Bhutan has always placed the conservation of environment over socio-economic development for centuries. Such policies are resoundingly enshrined in all environmental acts and importantly in the Constitution of the Kingdom of Bhutan. While the policies, visions and institutions are in place, it is also logical to take stock of realities and take appropriate measures of any shortfalls on time. Industrialization is taking place at a rapid pace in Bhutan. An industrial estate in Pasakha has already been developed and more are in the pipeline. Environmental issues like air pollution, water pollution, waste generation, land degradation, etc are inevitable consequences of industrialisation. However, with systematic and best practices in place the negative effects can be minimized to the desired level.

The Royal Audit Authority accordingly, conducted the audit of operations of industries with an environmental perspective to ascertain the compliances of environmental norms and visible impacts and other ramifications of non-compliances of environmental norms by the industries.

Therefore, the RAA took up the audit of industries with an environmental perspective to see as to how our young industries are complying with environmental standards to help government achieve its goal of preserving our pristine environment. The RAA, however, could not cover those industries such as S.D Eastern Coal Company in Samdrupjongkhar for want of resources. Therefore only those nearby industries located in Paskha and Gomtu, namely Bhutan Ferro Alloys Ltd, Bhutan Calcium and Carbide Ltd, New Industrial Estate in Pasakha (P/ling) and Penden Cement Authority Ltd & Lhaki Cement at Gomtu were selected for the purpose of audit..

The methodologies used for auditing were reviewing of Environmental Acts, relevant rules and regulations, visual inspection, discussions, interviews and

review of documents of industries. Further, the team also took note of the expert view from various environmental officials stationed in different industries. The Team also consulted environmental officials from the National Environment Commission and Ministry of Economic Affairs for technical issues in order to provide a balanced view on the report.

# 3

## Observations

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### **3.1 Overlapping functions and duties of NECS and MOEA**

The Secretariat of the National Environment Commission and the Competent Authority of Ministry of Economic Affairs are vested with almost similar duties and functions. Amongst others, the duty to monitor and control compliance with the terms of environmental clearance stands prominent as enshrined in *article 34 and 39* of the Environmental Assessment Act 2000.

Though the Secretariat and the competent authority liaise closely at present, there is a need for clear mandate and chain of reporting since these officials work independently under different administration. It could lead to overlapping and duplication of duties if not coordinated well. Further, visits by secretariat and competent authority officials at different period of time could hamper the daily activities of industries and factories.

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### **3.2 Inadequate environmental impact assessment**

Section 11, chapter III of the Environmental Assessment Act,2000, states that ‘any person who seeks to carry out a project that requires a development consent shall include in the application to the competent authority a description of the potential environmental effects of the project’.

Though the Act and the subsequent regulations clearly define procedures on Environmental Assessment, it sometimes becomes a mere formality especially when the proponent of a project is a Government agency. The Environmental Clearance is sought at a very last moment or sometimes when the project is already operational. Environmental Assessment is a tool and aid for decision making as to whether the proposed project should go ahead or continued further. Moreover, the

current Environmental Assessment practice seems to focus only on environment and not much on social and economic aspects thus defeating the overall or all inclusive objective of carrying out purpose EIA. At present, the proponents submit just the information on physical environment without the information about the possible impact of the project on environment.

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**3.3 Issue of Environmental Clearance without installation of Pollution abatement device.**

The Pollution Abatement Devices (PAD) are those designed particularly to combat pollution by reducing the amount or concentration of, or eliminating pollution. One of the prerequisites for obtaining an environmental clearance is the installation and operation of PAD at all times during the operation of the plant. It is therefore mandatory for every industry to identify and install a pollution control devices to minimize pollution. Gas cleaning plant (bag filter) is one of the most important pollution control equipment used by industries in Bhutan. Since, dust is a major pollutant in all the industries and the workers if, continuously exposed to dust could result in respiratory problems such as silicosis, lung cancer and bronchitis, etc. besides polluting the atmosphere.

During the site inspection, the audit team came across factories that were issued with an environmental clearance without having installed a pollution abatement device. For instance, the NEC had issued an Environmental Clearance to Ugen Ferro Alloys limited (UFAL), when there was no Pollution abatement device installed in the factory.

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**3.4 Emission of Suspended Particulate Matter (SPM) beyond allowable standards**

NECS and MoEA had recently conducted two rounds of stack emission monitoring during December 2008 and January 2009 for the industries in Pasakha and Phuentsholing areas with technical assistance from Central Pollution Control Board (CPCB) from India. As pointed out in the joint report 40% of the stack sampled for Suspended Particulate Matter (SPM) measured beyond the maximum allowable limits under

the emission standards adopted by the government in 2007. Emission measurement results can be known from Annexure I.

The quarterly emission reports submitted by industries also suggests that the emission standards set by government is not met by most of the industries.

The principal reasons that were observed both by the audit team and the teams from NECS and MoEA for not meeting the emission standards were non-usage of pollution abatement equipment and using of mediocre pollution control equipment. Based on the monitoring conducted by NECS and MoEA, M/s Druk Cement Pvt Ltd. was amongst the highest polluter whereas M/s Bhutan Concast Pvt Ltd. polluted the least.

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### **3.5 Inadequate information on air quality**

According to Chapter III, Article 419(b) of the National Environment Protection Act of Bhutan, 2007, the Secretariat is responsible for, monitoring the state of the environment including ambient air and water quality and land use changes. NEC Secretariat and environmental officials from MoEA (competent authority) carries out periodic compliance monitoring and emission data collection of all the industries in Bhutan.

BFAL, BCCL and PCAL have their own air quality monitoring device. No system is in place to make air quality information regularly available to the public and the parliament. The sampling results are not made known to the people as such they are unaware as to whether the level of air pollution in the locality is a concern or not. The likely impacts of air pollution generated from these different industries on the environment and human health are yet to be known. There is lack of information on air pollution or studies conducted to measure and assess air pollution. The likely impacts of the air pollution can be known from the Annexure II.

**3.6  
Inadequate  
environmental  
awareness.**

With rapid industrialization, growth in infrastructure development and urbanization, there is an urgent need to raise public awareness on environmental issues and its impacts on both the environment and human health.

Environmental awareness though crucial for citizens at large, it becomes imminently important for those who are directly affected by pollution hazards, namely the factory workers and the residence who live in the vicinity of such industrialized areas. On interviewing, auditors were made to understand that the floor workers were not aware of the risks involved in working in cement plant, a chemical factory or a steel factory. Many of the industries have put up occupational health and safety signs in and around the factory premises but did not create the intended impact. Lack of adequate awareness amongst workers about the safety and environmental issues would not only pose possible threat to their health and safety as well as people in the vicinity but their actions or inactions could also be environmentally damaging.

**3.7 Non  
compliance  
identified  
against the  
environmental  
clearance.**

An Environmental Clearance is issued upon an agreement between the NEC and the company, which requires the company to follow and adhere to certain terms and conditions specified in the clearance.

While the industries have complied with almost all the terms and conditions (80% on average), there were a few instances where the audit team noted non or partial compliance of environmental terms and conditions that were laid down in the Environmental Clearance (EC) as presented below.

Terms and conditions	PCAL	BFAL	LHAKI	BCCL	Others
Vehicles used for transportation of raw materials/products not found covered					
No routine medical checkup for the workers					
No separate meters to check the operation of the pollution control					
OHS measures not implemented					

No yearly environmental budget					
GCP not in operation (JUNE 19 <sup>TH</sup> , 2008)					

*(Shadowed boxes represent non-compliances)*

Industries responded that despite their best efforts, it is difficult to achieve cent percent of all the terms and conditions laid down in the Environmental Clearance.

### **3.8 Emerging environmental Concerns.**

The growing environmental effects depend mainly upon the number, size and location of industries. With increased number of industries especially in the Pasakha area, the cumulative environmental impacts are bound to increase such as increase in air emissions, increase of pollutants discharged to a common water body, storage and disposal of wastes, industrial accidents, spills, and noise.

Some of the emerging issues and concerns which were observed by the audit team during their visits are as follows:

#### **3.8.1 Servicing of vehicles transporting raw materials:**

After unloading the raw materials, the servicing of the vehicles are usually carried out in the river flowing near the industries. Other equipment which contains oil and grease are also washed which is likely to contaminate the water.



*Raw material transportation vehicles found servicing in the river*

### 3.8.2 Disposal of solid waste:

Clause 3.7.8, Chapter Solid water requirement, of the Water and Sanitation Rules, 1995 clearly states that “*No industry shall store and dispose off its industrial waste except in a manner that does not threaten the environment or the health and safety of its workers and the public*”.



*Industrial waste disposed below the road side*

Contrary to the above mentioned rule, solid waste could be seen along the road side, backyard of the factory premises and also in front of the school gate, as depicted in the picture above. Besides the potential environmental hazards these industrial wastes pose, the aesthetic look of the area is greatly disturbed. It was learnt that the Ministry of Economic Affairs and NEC is surveying some potential area to designate a landfill site.



*Industrial waste disposed at the entrance of the only school in Pasakha.*

### 3.8.3 Vehicles carrying raw materials and products not covered.

One of the terms and conditions stated in the environmental clearance for almost all the industries is that “*the holder shall ensure that vehicles carrying raw materials and products are totally covered/closed*”.



*Raw material transport vehicle at the weighing bridge at PCAL.*

Non-compliance of this particular terms and condition was particularly noted in the PCAL. The vehicles transporting raw materials for PCAL were found uncovered. These vehicles were found running at very high speed emitting lots of dust thereby aggravating the dust pollution both in the town and factory premises.

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**3.9 Absence of separate electricity meters for pollution abatement device.**

One of the terms and conditions, amongst others, laid down in the Environmental Clearance is to install and operate separate energy meters for all pollution control devices. The amount of electricity bill paid for the pollution abatement equipments would testify that the equipments had been used for required number of hours.

Despite frequent and strict instructions issued by the NEC and MoEA, the industries had not installed separate electricity meters for pollution abatement equipments. Therefore, the audit team could not verify whether the pollution abatement equipments were run round the clock to control atmospheric pollution. Nevertheless, some of the large scale industries like BFAL, BCCL and PCAL justified to the audit team by stating that they have centralized computer system wherein one can see the log to verify the number of hours the equipments have run. The adherence and implementation to the NEC's instructions and follow up actions is yet to be known in this regard.

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**3.10 Inadequate Public consultation**

As per the article 86 of National Environment Protection Act (NEPA) of Bhutan 2007, "*the citizens are entitled to participate in the decision-making processes concerning the environment which is further elaborated in Regulation for the Environmental Clearance of Projects and Strategic Environmental Assessment*". However on interviewing, many of the local residents felt that they were not consulted while the industries were developed. Many of them were of the view that they would not understand the adverse impacts of such industries, even if they were consulted. Rather, they felt that the project proponents or the

regulatory authority should have explained to them in details of such implications.

They generally felt that their crop yields have reduced comparatively over the years. They have even put up the issue in GYT. Further, the people also felt that the instances of people contracting diseases like red eyes, fever, cough and diarrhea have also increased. Other effects are the noise and the dust pollution. Nevertheless, the local residents in general felt that economically they have gained through employment in nearby industries.

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### **3.11 Absence of Disaster Management Plan**

Pasakha houses the maximum number of industries in the country. The new industrial estate alone houses 29 different industries sprawling in an area of 108 acres with investments worth millions of Ngultrums. The number of employees and workers runs into several thousands.

Considering the size of investments and employees and workers it is imperative that these industries have comprehensive Disaster Management Plan. Amongst others, the flash floods are the most urgent concern to be addressed. The industrial area was hit by flash floods in 1996 and 2000 in which properties were destroyed and human lives lost. BFAL and BCCL dredge the nearby river annually and also have constructed some river protection wall, but these measures do not seem adequate if we had to consider the scale of floods in the past. Other disasters could be Earthquake, Industrial accidents, fire, heat waves, spillage and leakages etc. Existing more of a reactive approach towards disaster management could prove to be too costly in absence of adequate Disaster Management Plan in place.

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### **3.12 Workers found without protective gears**

The entire process of production in a cement, ferro alloy and chemical industries involves many intrinsic hazards and risks. Hazards and risks

mainly depend upon the atmosphere where employees work, the nature of operation, reactors and machinery used.

	Description of hazards
Physical hazards	noise, vibration, heat and coal stress, emission, etc.
Chemical hazards	inhalable gases/vapor/dust/fumes, asbestos, insulation wools etc.
Safety hazards	limited space, electrical/ mechanical/ hydraulic/pneumatic sources of energy, machineries prone to accident including cranes and hoist, falling weights and dangerous objects, slips, trips and falls

It is therefore imperative that adequate safeguard measures are in place to ensure the health and safety of workers engaged in the industries. The RAA observed the following health and safety concerns either not addressed or adhered to by the industries and workers.

### 3.12.1 Regular workers found without protective gears

While the safety and risk specification were displayed in and around almost all the factories, the workers (regular) were found not using the protective gears issued by the companies. A BCCL worker working near a furnace of approx. 2000°C has been depicted as an example.



*A regular worker working near a furnace without protective gears, BCCL.*

The BCCL and BFAL have a system of imposing fine in case a worker is found without protective gears. The adherence and implementation to the OHS measures was found generally lacking. Many of the workers responded that protective gears were not comfortable while working, especially during summer.

### **3.12.2 Contract workers not issued with protective gears**

*As per the general rules and regulations chapter VI, clause 24.1 on occupational health and safety (OHS) in construction, manufacturing, mining and service industries, 2006, an employer shall be responsible for providing, at no cost to the worker, all items of personal protective equipment required by these Rules and Regulations. The list of the personal protective equipment are as detailed in the **Annexure III**.*

In addition to the general rule and regulation on OHS issued by the MoLHR the companies draws an agreement with the Contractor before the award of the contract specifically highlighting that, “*the contractor shall provide the required tools and safety items like, gloves, helmets, duster clothes, shoes/boots, etc to the workers engaged in the contractors cost, any such item are taken from the company’s store on exceptional cases, the cost of the items will be deducted from the bill of the contractor*”.

While interviewing the contract workers and also through observation, it was clear that most of the contract workers were not supplied with necessary protective gears thus exposing the workers to unnecessary risks to their health and safety. Those that were found with some protection had bought it themselves from the local market. However, the contractor justified that many of those contract labourers are on temporary basis and would imply a huge cost if all of them were to be issued with such protective gears.



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### **3.13 Pasakha school located in industrial area.**

The only school in Pasakha (as depicted in the picture on the right side) was constructed by BCCL and BFAL mainly for the education of the employees' children.



Considering the health and safety of the school going children the school was located almost 3 kilometres away from the factory site. However, with the development of the new industrial estate, the school is now just a hundred metre away. Moreover, the new industrial estate houses 29 industries, all of which emits high level of dust and other particulate matters. The list of the factories is as attached in *Annexure IV*.

Recent study conducted by NECS and MoEA shows that the emission level of SPM is especially very high in the school area. Audit team, during the site visit, found that the children had to wear protective mask and were found eating their pack lunch in the open air full with dust and smoke. Besides, the industrial wastes were also found dumped in the vicinity of the school.

NECS and MoEA had also constantly raised this issue but could not reach the decision as there was no consensus on who would bear the relocation cost and also due to difficulty in finding the new site.

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### **3.14 Inadequate Housekeeping**

Housekeeping is a basic requirement of an industry for the health and safety of the workers. The state of housekeeping reflects the administrative competence of the company as a whole. The general housekeeping of the industries was assessed by means of site visits and interviewing with workers. Cleaners list was also collected to see if adequate cleaners were employed.

The team observed accumulation of dust around the site including the processing plant in almost all the industries. Factory wastes and house hold wastes were found disposed within the factory premises. The management attributed inadequate housekeeping to illiteracy of workers and their attitude and explained that they had put their best efforts to educate workers on the issue.

# 4

## Recommendations

### 1. Institute legal instrument ( Clean Air Act)

Though the NEC has developed National Standards for Ambient Air Quality, Industrial Emission, Workplace Emission and Noise Levels for Bhutan 2007, there is a need for a Clean Air Act and its regulations. This would provide a legal and regulatory framework for enforcing standards and norms.

### 2 NEC should have clear strategy on air quality management

NEC and the competent authority needs to develop a clear strategy for air quality management monitoring specifying proper timelines for long, medium and short term plans and strategies.

### 3 Define specific roles and responsibilities and accountability

Lack of clarity in the roles and responsibilities would create confusion amongst the ministries and enforcing agencies with resultant non-monitoring and non-compliances of environmental norms. Thus the roles and responsibilities of NEC and competent authorities of line ministries should be clearly specified for better enforcement, monitoring and accountability.

### 4. MoEA should enhance Human Resource Capacity in Environmental Unit section

As per the EA Act 2000, the competent authorities in the line ministries have a vast mandate to monitor and report the compliance of environmental norms. MoEA has currently only three personnel in the unit which is not adequate to

effectively monitor and report on such issues. The MoEA needs to strengthen their Human Resource capacity.

#### **5. Introduce fiscal instruments**

NEC as an apex environmental institute should look in to the possibilities of providing fiscal incentives for those industries using environmentally friendly technologies, code of best practices and eco-labeling. Industries that provide environmental services and manufacture environmentally friendly products should be provided with tax incentives. Customs and other duties could be reduced for import of environmentally friendly and energy efficient technologies.

#### **6. Strict Enforcement of Environmental Clearance**

Most of the findings by the audit team were non-adherence to the Environmental Clearance. Therefore, the NEC and the MoEA should work out proper mechanisms to monitor these non-adherences. One of the ways could be to station officials in the industrial area permanently for physical monitoring and vigilance.

#### **7. NEC and MoEA should conduct proper check on EIA**

NEC should intervene by way of proper verification of EIA, if the proposed project is likely to have adverse impacts on social, economic and environmental issues. This is critical since most of our industries are located or are planned in the border areas and could have regional and trans-boundary impact.

#### **8. Relocate the School**

The authorities should review the appropriateness of continuance of the school in the present location at the Pasakha industrial area in view of dust and other environmental pollutions adversely affecting the students, teachers and other employees. The possibility of relocating the existing school in an appropriate place in Pasakha should be considered.

### **9. Environmental Performance reporting by industries**

Often, environment is taken by industries in isolation. There is a need to integrate environment with the over all functions of the industries and report appropriately. Such reports should specify the performance of the industries against the various standards set forth by Environmental agencies.

### **10. Improving social responsiveness**

Though some industries have contributed to society in some form or other, there is much more they can do to the society and the nation. There do not seem to exist proper co-ordination among the industries as to how they can be more responsive to the society. Environmental agencies could play a crucial role in bringing the industries together in pooling resources and educating them on the long term benefits and impacts of on their business of such initiatives. Nonetheless, there are no legal obligations for these industries to do so.

### **11. Revision of Current penalty slab**

The existing penalty slab of Nu. 5,000.00 – 50,000.00 may be reviewed. Firstly, the fines levied should be sufficiently deterring for the pollution and should discourage repeated violation. Secondly, the discretion to levy either 5,000.00 or 50,000.00 provide scope for undue negotiation between the enforcing agency and the defaulter negating the sanctity of the rule.



## **GLOSSARY**

BAIL	<i>Bhutan Agro Industries Limited</i>
BCCL	<i>Bhutan Carbide and Chemicals Limited</i>
BFAL	<i>Bhutan Ferro-Alloys Limited</i>
CO	<i>Carbon monoxide</i>
CO <sub>2</sub>	<i>Carbon dioxide</i>
DRC	<i>Department of Revenue and Customs</i>
EA	<i>Environmental Assessment</i>
EC	<i>Environmental Clearance</i>
EIA	<i>Environmental Impact Assessment</i>
GCP	<i>Gas cleaning plant</i>
IIDD	<i>Industrial Infrastructure Development Division</i>
LCW	<i>Lhaki Cement Works</i>
MoEA	<i>Ministry of Economic Affairs</i>
MoLHR	<i>Ministry of Labour and Human Resources</i>
MoWHS	<i>Ministry of Works and Human Settlement</i>
NEC	<i>National Environment Commission</i>
NEPA	<i>National Environment Protection Act</i>
NO <sub>2</sub>	<i>Nitrogen oxide</i>
ODS	<i>Ozone Depleting Substances</i>
OHS	<i>Occupational Health and Safety</i>
PCAL	<i>Penden Cement Authority Limited</i>
RAA	<i>Royal Audit Authority</i>
RTO	<i>Regional Trade Office</i>
SO <sub>2</sub>	<i>Sulphur dioxide</i>
SPM	<i>Suspended Particulate matter</i>
UFAL	<i>Ugen Ferro-Alloys Limited</i>



# APPENDIX



### AUDIT MANDATE, SCOPE, CRITERIA & METHODOLOGY

The Royal Audit Authority (RAA) conducted the audit on operation of Industries – an environmental perspective (BCCL, BFAL, PCAL & LCW) in accordance with the Constitution of the Kingdom of Bhutan (*article 25*) and Audit Act of Bhutan 2006 (*Chapter 2b*). The RAA is mandated to report on the functions and operations of the Government Agencies and other organizations and recommends measures to improve their efficiency and effectiveness.

#### **Scope**

The audit was performed to review and assess the operation of industries in an environmentally friendly manner. In the process, the RAA took up the audit of BCCL, BFAL, PCAL, LCW & new industrial estate in Pasakha). Wherever possible site visits were also made based on the need and requirement.

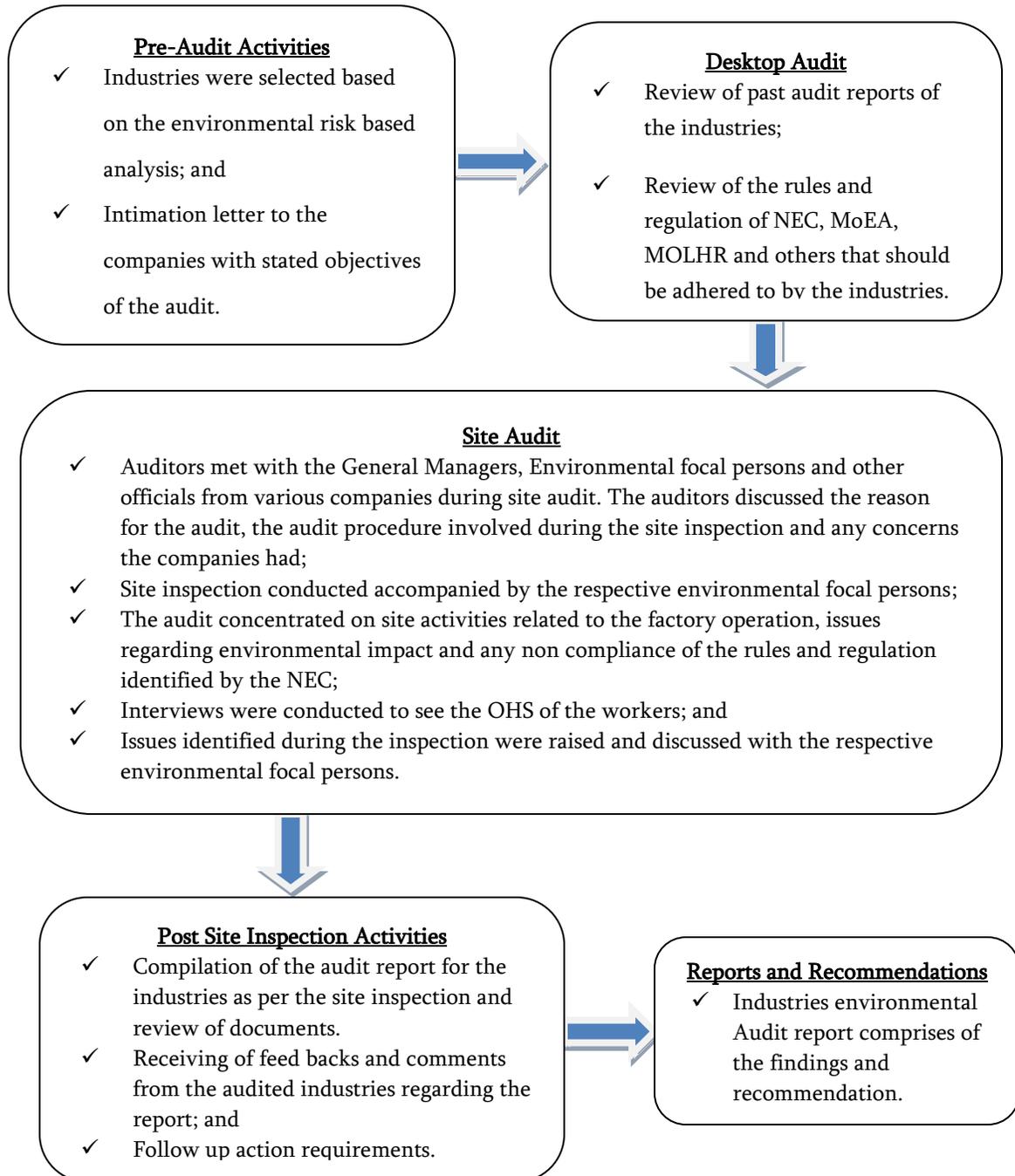
#### **Sources of Audit Criteria**

The RAA prepared the audit criteria based on the following sources;

1. Environment Assessment of Existing Industries, 1999;
2. Environment Assessment Act, 2000;
3. National Environment Protection Act of Bhutan, 2007;
4. Environment Act 2004;
5. Ninth plan Document (2002-2007);
6. Bhutan 2020 – A vision for peace, prosperity and Happiness;
7. Application for environmental clearance guideline for the preparation of industrial project reports;
8. Regulation for the environmental clearance of projects and regulation on strategic environmental assessment;
9. Water and Sanitation Rules, 1995; and
10. General rules and regulations on occupational health and safety (OHS) in construction, manufacturing, mining and service industries, 2006; and
11. Labour and employment act of Bhutan, 2007.

## Methodology

The main methods used for this audit include Document Review, Physical Observation, Interviews, Walk through Tests and Questionnaires. However, due to lack of records, mainly the interviews and site visits were used.



## **Study Design**

The audit was an explorative study. The team reviewed documents of the various industries. For the purpose of gathering primary information, the team interviewed several Industry managers and officials. A well-structured questionnaire forms was also designed separately for the management, workers and local people. However, since most of the workers and locals were un-educated interviews were the only option.

Secondary data were collected from the reports of the Industries.

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ANNEXURE



## ANNEXURE I

### EMISSION MEASUREMENT RESULTS

The table below shows the SPM concentration from different stacks of the Industries:

Sl.No.	Industries	Observed Conc (mg/NM3)	Std Conc (mg/NM3)
1	BCCL Lime Kiln	240	150
2	Druk Cement Kiln I	925.4	150
3	Druk Cement Kiln II	2100	150
4	Druk Cement Raw Mill	14.6	150
5	Druk Cement Raw Mill Duplicate	13.6	150
6	Druk Iron and Steel	73.4	150
7	Druk Iron and Steel rolling Mill	219	150
8	Bhutan Concast	1.4	150
9	Bhutan Ferro Industries	16.3	150
10	Bhutan Wood Panel Industries	37.3	150
11	Green Wood Manufacturing	70.29	150

## IMPACT OF AIR POLLUTION

<b>On local scale</b>	<ul style="list-style-type: none"><li>✘ health impacts ranging from premature deaths to chronic illness;</li><li>✘ damage to vegetation;</li><li>✘ water quality impacts;</li><li>✘ damage to buildings; and</li><li>✘ Reduced visibility.</li></ul>
<b>Regional Level</b>	<p>Transboundary air pollution and acid rain have become areas of concern due to impact on:</p> <ul style="list-style-type: none"><li>✘ Health impacts;</li><li>✘ crops and vegetation;</li><li>✘ Ecological imbalance; and</li><li>✘ Monuments corrosion</li></ul>
<b>Global Scale</b>	<ul style="list-style-type: none"><li>✘ Depletion of the earth's ozone layer – a natural shield against the sun's harmful UV rays; and</li><li>✘ Global warming or the greenhouse effect leading to climate change.</li></ul>

**ANNEXURE III**

**PERSONAL PROTECTIVE EQUIPMENT (PPE)**

**1. PPE Classified by Work**

Sl.	No.	Type of Work
1	Elevated work	Safety helmet, safety belt (height greater than 20ft) footwear for elevated work
2	Handling work	Safety helmet, leather safety shoes, work gloves
3	Welding and cutting work	Eye protectors, shield and helmet, protective gloves
4	Grinding work	Dust respirator, earplugs, eye protectors
5	Work involving handling of chemical substances	Dust respirator, gas mask, chemical-proof gloves,
6	Wood working (sawmill)	Hard Hat, eye protectors, hearing protection, Safety footwear, leather gloves and dust respirator
7	Blasting	Hard hat, eye and hearing protection
8	Concrete and masonry work (construction)	Hard hat, glove, eye protection, respiration for cement and lime dust, safety boots
9	Excavation	Hard hat, safety boots, gloves, hearing protection
10	Heavy equipment, motor graders, and bulldozer operation	Hard hat, hearing and eye protection, boots
11	Others	Appropriate PPE depending on the nature of the work

**2. PPE Classified by Body Part**

Sl.	No.	Body Part
1	Head Protection	Safety helmet
2	Eye protection	Eye protectors, eye protectors for radiations, shield and helmet
3	Ear protection	Earplugs, ear muffs
4	Inhalation prevention (nose, mouth)	Dust respirator, gas mask, self-contained breathing apparatus
5	Hand protection	Standard work gloves, cutting gloves, leather work gloves, heat protective gloves, anti vibration gloves
6	Body protection	Standard work clothing, chemical-proof clothing, heat protective clothing
7	Foot protection	Safety shoes, chemical-proof boots
8	Other	Safety belts, personal protective equipments for radiation protection, back support belts

## Minimum Safety Standards for the Construction Industry

For any construction, renovation/alteration, painting (including traditional painting) of structures, the employer is responsible for health and safety of the employees. The employer shall initiate and maintain this standard to provide good working environments in their construction site.

The Standards contained in this part shall apply with respect to employments performed in a workplace/construction site in Bhutan.

### 1. Personal protective and life saving equipments:

The employer shall be responsible for providing suitable personal protective equipment or clothing, based on the type of work and risk, without cost to workers.

(a) **Helmet** shall be provided to all workers, or visitors visiting the site for protection of head against impact or penetration of falling or flying objects.

(b) **Safety belt** shall be provided to workers working in heights (more than 20ft) such as roofing, painting and plastering.

(c) **Safety boots** shall be provided to all workers for protection of feet from impact or penetration of falling objects on feet.

(d) **Ear protecting devices** shall be provided to all workers and to be used during the occurrence of extensive noise.

(e) **Eye and face protection equipments** shall be provided to all welders to protect against sparks of fire.

(f) **Respiratory protection devices** shall be provided to all workers during occurrence of fumes, dusts, or toxin gas/vapor.

(g) **Safety nets** shall be provided when workplaces are more than 25 feet (7.5m) above the ground or other surfaces where the uses of ladders, scaffolds, catch platforms, temporary floor or safety belts is impractical.

(h) **First aid** kits shall be made available at all times throughout the entire construction period. Arrangement shall be made to ensure medical attention for workers who have met with an accident or sudden illness at any time during the construction period.

2. **Fire protection:** the employer shall be responsible for a fire protection and prevention throughout all phases of the construction or demolishing works.

3. **Hand and power tools:** Conditions of all hand and power tools like belts, gears, shafts, pulleys, sprockets, spindles, chains or other reciprocating, rotating or moving parts of equipments shall be maintained by the employer in a safe condition to prevent any accidents.

4. **Signs, signals and barricades:** Appropriate signs and symbols shall be required to be put up at work places. Barricades shall be put up all around the construction site at all times during construction or demolishing period to deter the passage of vehicles or persons to the construction site.

## **5. Material handling, storage, use and disposal**

- (a) All materials stored in shall be stacked, racked, blocked, interlocked, or otherwise secured to prevent sliding, falling or collapse.
- (b) Aisles and passageways shall be kept clear to provide for free and safe movement of material handling equipment and workers. Material if stored/stacked at roadside must not hinder free movement of vehicles and persons.
- (c) The areas used for construction shall be kept in good repair to ensure safe movement of vehicle or person.
- (d) Maximum safe load limits of floors within buildings and structures shall be conspicuously posted in all storage areas.
- (e) Materials shall not be stored on scaffold.
- (f) Brick stacks shall not be more than 7 feet in height and for concrete blocks they shall not be more than 6 feet high.
- (g) All scrap timber, waste material, and rubbish must be removed from the immediate work area as the work progresses.

## **6. Scaffolds**

- (a) Each scaffold or its components shall be capable of supporting its own weight and at least 4 times the maximum intended load applied or transmitted to it.
- (b) In case of direct connection of adjustable suspended scaffolds to roof or floor for balance, it shall be capable of resisting at least 4 times the tipping movement imposed. The rope should be capable of supporting at least 6 times the maximum intended load applied or transmitted to that rope.
- (c) Pole scaffolds over 60feet (5.6m) in height shall be designed by a registered professional engineer and shall be constructed and loaded in accordance with that design.
- (d) The platform/scaffold plank shall be at least 15 inches (46cm) wide and 1.5 inches thick.
- (e) The ends of platform, unless wedged, shall extend over the centerline of its supports at least 6 inches (15cm) for fully decked platform. For 10 feet or less platforms the extension should be designed and installed so that the cantilevered portion of the platform is able to support workers without tripping. Guardrails must be constructed to block the access to cantilever ends.
- (f) The front edge of all platforms shall not be more than 14 inch (36cm) from the face of the work.
- (g) For fully decked platform the lapped (minimum of 12inch and nailed) or abutted should be supported with separate support surface.
- (h) Platform should not deflect more than 1/60 of the span when loaded.
- (i) Ramp or walkway should be at least 6feet (1.8m) wide having slip resistance threads and must not be inclined more than a slope of 1 vertical and 3 horizontal.
- (j) A rail consisting of a top and middle bar shall be provided on open sides of the ramp scaffolds and should provide adequate handhold for employees grasping them to avoid falling.
- (k) Workers should not be made to work on scaffolds covered with snow, ice or other slippery materials except as necessary for removal of such materials.
- (l) Workers should not be made to work on the scaffolds during storm or high wind.

(m) Makeshifts devices and ladders shall not be used on top of scaffolds to increase the working level height for workers.

(n) While working on roof, roofing brackets shall be constructed to fit the pitch of a roof. A catch platform shall be installed below the working area of roof where the height is more than 16 feet above the ground level and the roof slope is more than 4/12. The worker shall wear the safety belt all the time while working on truss/roof.

(o) The rope used to securing brackets and scaffolds or as an anchorage shall be damage free and strong.

## **7. Excavations**

(a) Excavated earth must be stacked away (at least 2 feet) from the pit to avoid from falling back or rolling into the excavation and burring the workers or injuring the workers from rolling loose rock unless a protective barricades/retaining devices is provided to prevent falling earth.

(b) When the adjoining building/structure is endangered by excavation operation, support systems such as shoring, bracing or underpinning shall be provided to ensure the stability of such structures.

## **8. Electrical works**

(a) All Electrical equipment and installation shall be constructed, installed and maintained by a competent person, and so used as to guard against risk of electrical shocks and electrocution.

(b) Adequate steps shall be taken to ascertain the present of and to guard against dangers to workers from any live electrical cable, which may be under, on or above the construction site.

## **9. Sanitation and Hygiene**

(a) Facilities such as toilets, drinking water, and waste bins shall be adequately installed at the workplace.

## ANNEXURE IV

LIST OF INDUSTRIES IN PASAKHA INDUSTRIAL ESTATE			
Sl.no.	Industry	Area (sq.ft.)	Status (as of 25/11/08)
1	Bhutan Brewery	305038	under production
2	RSA Pvt. Ltd	98984	under production
3	Bhutan Concast Pvt. Ltd	159175	under production
4	Bhutan Metals Pvt. Ltd	65184	under production
5	Druk Ferro Alloys Pvt. Ltd	301311	plant shut down
6	Druk Wang Alloys Ltd	291677	plant shut down
7	Bhutan Rolling Mills Pvt. Ltd	218142	under production
8	Quality gases	42673	under production
9	Ugen Ferro Alloys Ltd	299374	under production
10	Kenpa Pvt. Ltd	126472	plant shut down
11	Bhutan Health Food Products	95396.79	plant shut down
12	Mega Pvt. Ltd	130681	plant shut down
13	Lhaki Steel and Rolling Mills	321809	no production
14	Bhutan ferrro Industries	291417.59	under production
15	Bhutan Butimen Industries	47734	plant shut down
16	Samphel Norbu Products Pvt	21797	plant shut down
17	Rabten Wire Industry	34830	under production
18	K.K Steel Pvt. Ltd	87956	under production
19	KLS Wires & Cables	33976.94	plant shut down
20	Tashi Norbukhang Plastic Ex	43951	No work
21	Bhutan Jute products Ltd	30056	No work
22	United Industries	136586	Construction stopped
23	Kimpex Pvt Ltd	65340	under construction
24	Bhutan Bricks Pvt Ltd	53995	under production
25	Saint Goban Ceramics bhutan	434146	under construction
26	Tashi Metals and Alloys	291683	No work
27	Met Trade Bhutan Pvt Ltd	131166.46	No work
28	Dralha R.P Steel Co.	169800	Site Cleared
29	Noryang Variety Chips	11761	No work
	<b>TOTAL</b>	<b>4342112.78</b>	





