8.1.1. Risk Assessment Study and Risk Mitigation Measures

According to the standard ToR items 7(xiii) and 8 (i to iv) of the Terms of Reference (ToR) issued for the project, preliminary hazard identification and risk assessment was undertaken to quantify the possible fire and occupational health risks associated with the operation of the project at the designated location. The good engineering practices suggested by the Central Pollution Control Board for risk assessment in industries (CPCB document Probes/133/2009-10) and CPR-18E risk assessment procedures' guidelines which are widely accepted by the Ministry of Environment Forests and Climate Change (MoEF&CC) India, have been adopted while assessing the residual risks associated with the operations of the project with specific reference to fire hazards, chemical exposure hazards, occupational hazards and natural hazards

As part of the risk assessment, a preliminary review on the hazardous materials and chemicals proposed to be handled at the site were reviewed and the storage capacities and design features of such hazardous materials were also reviewed while assessing the residual risks. Occupational health hazards such as exposure to dust emissions, thermal stress and work-zone levels were also studied. Qualitative analysis of risks associated with natural hazards such as earth quakes, floods and cyclones were also undertaken.

Based on the findings of the risk assessment study, a preliminary risk management plan has been developed as per the applicable rules and guidelines; wherever possible, good engineering and management practices are suggested to minimise any intolerable risks.

8.1.2. Fire Hazards and Risk Mitigation Plan

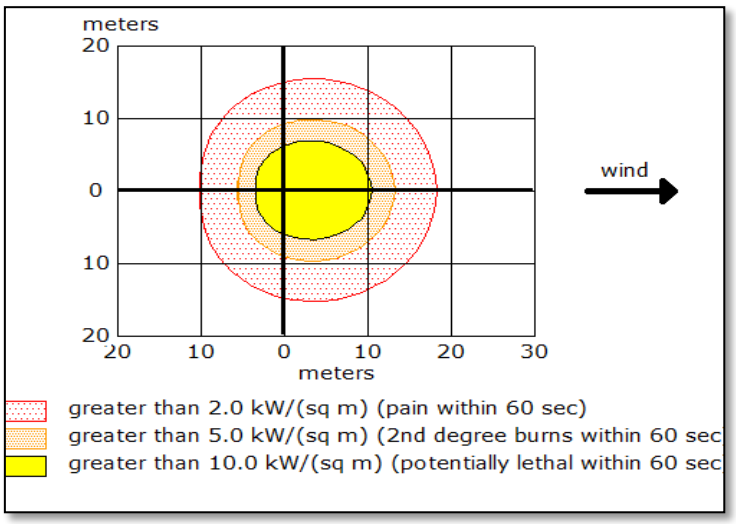
8.1.2.1. Fire Hazards

The proposed project does not handle any major flammable materials except furnace oil for the operation of Recovery boiler and kiln. The raw materials such as ready pulp do not fall under fire hazard goods classification. The project will be handling significant quantities of coal which is a combustible material. Apart from the above, small quantities of combustible materials such as lube oils and latex and synthetic thickeners will be used in the Mill, which will be received in sealed drums and will be stored at dedicated locations in the stores as per the National Building Codes.

Furnace oil falls under Class 3b and Class 3c combustible material as per NFPA (National Fire Protection Agency, USA) and Occupational Safety and Health Administration (OSHA, USA). Hence, the fuel will undergo only pool fire scenario in the presence of any ignition source.

In order to assess the heat radiation from the pool fire scenario of accidental spills from furnace oil (full bore rupture of the storage tank), consequence modeling was undertaken using ALOHA software, which is recommended by Ministry of Environment and Forests, India. For the purpose of the consequence modeling, it

has been assumed that due to mechanical failure of the tank, entire inventory of the furnace oil will be retained in the dyke. In the presence of external fire such as electrical fire or vehicular exhaust sparks etc, the contents in the dyke will catch fire and release thermal energy. The figure below presents the model results indicating the heat radiation contours.



It may be inferred from the model heat radiation contours with 2 kW/m^2 would occur within 20 m from furnace oil tank which is within the facility boundary and hence the overall impacts due to any fire accidents will be less significant. As per the published literature (CP18E and CPCB Manual for fire risk assessment)1, the possible frequency of occurrence of such accidents will be less than 40 in one Million events. Hence, the overall risk due to handling of such a small quantity of furnace oil at the Mill site will be insignificant.

- Pumps will be with flame proof motors.
- No-man (restricted zone) distance of 5 m shall be provided around furnace oil storage tank as per the heat radiation contours presented in above Figure**.**
- Since the heat radiation contour 10 kW/m^2 falls within the dyke area, no major threat is envisaged on the neighboring buildings and electrical installations near the furnace oil storage area
- It has been recommended to provide a hand-held foam tender and fire water hydrant line in the vicinity of the storage tank.

8.1.3. Risks due to Storage and Handling of Coal and Risk Control Measures

Although coal fires are infrequent, there is a possibility of coal fires at the coal stock yards during the summer conditions due to burning of volatile compounds.

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1 *Provide adequately designed dykes to retain the entire inventory of the spill in the tank. As per the National Building Code, the size of the dyke shall be at least 110% of the tank capacity. This means that the volume of the dyke for furnace oil shall be at least 30 m^3 capacity. A minimum dyke side wall height of 0.5 m shall be maintained*

Coal stock yard fires can be avoided by providing proper stacking design to prevent air movement inside the coal lumps, minimising the duration of coal storage at the site and water sprinkling operations to maintain adequate moisture.

Captive co-generation power plants store, transfer, and use coal; therefore, careful handling is necessary to mitigate fire and explosion risks. Recommended measures to prevent minimise, and control fire hazards at captive co-generation power plants include:

- Use of automated combustion and safety controls
- Proper maintenance of boiler safety controls
- Implementation of start-up and shutdown procedures to minimise the risk of suspending hot coal particles (e.g., in the crusher) during start-up
- Regular cleaning of the facility to prevent accumulation of coal dust (e.g., on floors, ledges, beams, and equipment)
- Removal of hot spots from the coal stockpile (caused by spontaneous combustion) and spread until cooled, avoid loading of hot coal into the pulverised fuel system
- Use of automated systems such as temperature gauges or carbon monoxide sensors to survey solid fuel storage areas to detect fires caused by self-ignition and to identify risk points
- For planned outages, operators should take every precaution to ensure that all idle bunkers and silos are completely empty and also verify by visual checks. Bunkers and silos should be thoroughly cleaned by washing down their interior walls and any interior structural members but not their horizontal surfaces. Idle bunkers and silos that contain coal/ lignite should be monitored frequently for signs of spontaneous combustion by using CO monitors, infrared scanning, or temperature scanning.
- Fire fighting systems and fire hydrant systems shall be installed at all hazard prone areas such as coal stock yards, bunkers and silos as per the applicable fire safety standards.

8.1.4. Occupational Health and Noise Management Plan

Based on the noise mapping data presented in Chapter 5 of this report, the major noise generating sources are paper machine area, vaccum pumps in the paper machine area, air compressor, chippers and turbo generatorsTNPL will be procuring the equipment with guaranteed noise levels less than 85 dBA at one (1) metre distance from the respective machines/equipment. The predicted noise levels indicate that additional noise emissions from the proposed project is insignificant and well within the standards prescribed by the CPCB. In addition to the noise control programme proposed to be adopted by TNPL as stated in

Chapter 5 of this report, the following occupational noise management plan shall be adopted:

1. Noise abatement measures inside the Mill site shall be undertaken, if noise levels are above 85 dB(A); measurements must be taken and assessed by a competent person. Such measurements should be repeated at appropriate intervals.

2. If noise level is above 85 dB(A) then the following procedures shall be adopted:

    - Inform employees of the noise levels present and measures taken to reduce exposure
    - Make ear protection available and provide training in its use
    - Hearing checks must be made available to employees exposed to noise levels in excess of 85 dB(A) over an 8 hour period
    - Although ear-plugs and ear-muff will be provided to the persons working in the Mill area, as a part of the good management practices, work rotation scheme will be adopted for the persons working in the high noise generating areas.

3. If noise levels near the machinery exceed 90 dB(A), then the following corrective procedure shall be adopted:

    - Identify reasons for excess noise and draw up a plan in place to reduce
    - Identify and clearly designate hearing conservation zones
    - Ear protection must be worn and its use supervised
    - Employees must be trained in the hazards of noise and the correct use of hearing protection.

8.1.5. Occupational Safety Management and Surveillance Programme

The Ministry of Labour and Employment, Government of India has a nodal organisation, viz. Directorate General Factory Advice Service and Labour Institutes (DGFASLI), in dealing with Occupational Safety and Health issues

in Industries. The DGFASLI is the technical arm of the Ministry on matters connected with

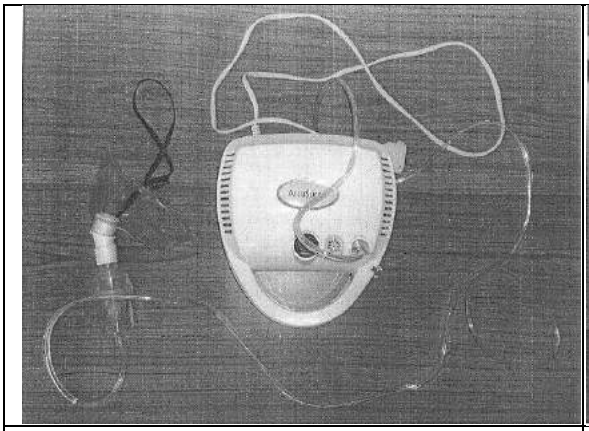
Occupational Health in the manufacturing and port sectors.

The Factories Act, 1948, provides for appointment of qualified Medical Practitioners and Certified Surgeons to examine young persons engaged in dangerous manufacturing processes and to ensure medical supervision in case of illness due to the nature of manufacturing processes. The Factories Act, 1948, also provides for notification of certain occupational diseases as listed in the Third Schedule of the Act. As per Section 90 of the Factories Act, 1948, the State Government is vested with the powers to appoint a Competent Person to conduct inquiry into the causes of any accident or notifiable diseases.

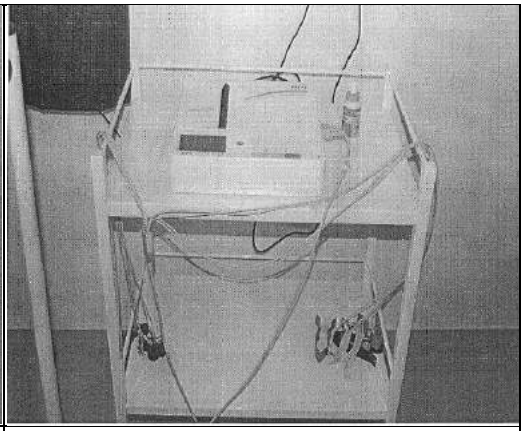
As discussed in Chapter 2, TNPL has full fledged Occupational Health Centre within the mill premises. OHC is manned by a qualified one Medical Officer supported with 3 paramedical staffs. The facilities available at TNPL OHC are given below.

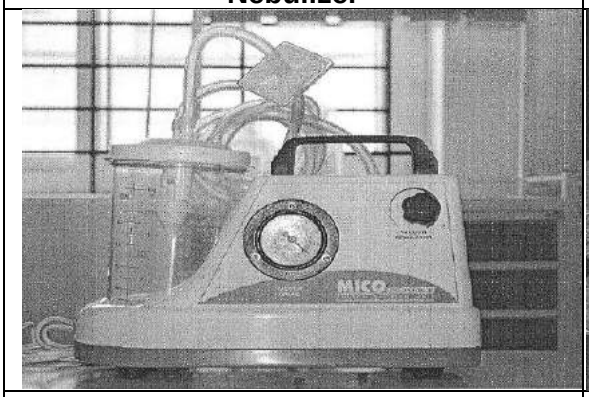
- Minimum facilities such as an oxygen cylinder for emergency medical use,
- Clean room with two (2) beds for first aid applications, with first aid kits as per the Factories act
- Nebulizer for treatment of COPD, Asthma and other pulmonary diseases
- ECG machine
- Suction apparatus
- IR lamp
- Otoscope
- BP apparatus
- Clinical Laboratory, Routine blood and urine test facility
- Ultra –Sound Scanning Machine
- Well Socked Pharmacy

The hospital has an ambulance which is equipped with oxygen cylinder and other emergency items and manned by trained drivers as per the Factories Rules, Rule 88N.

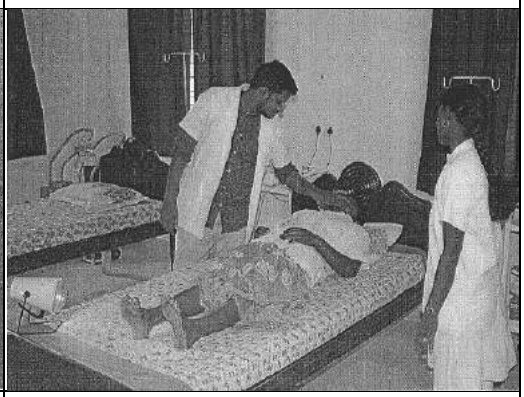


Nebulizer

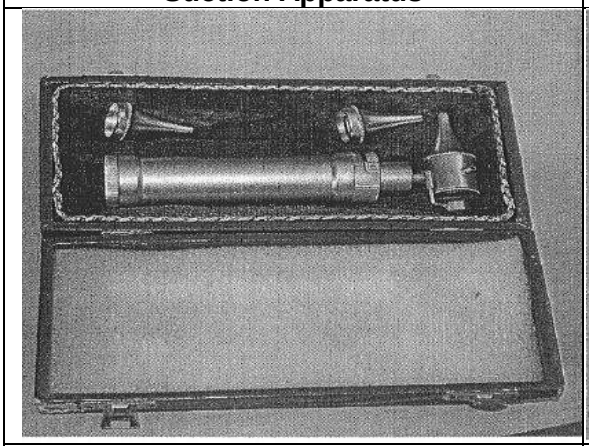




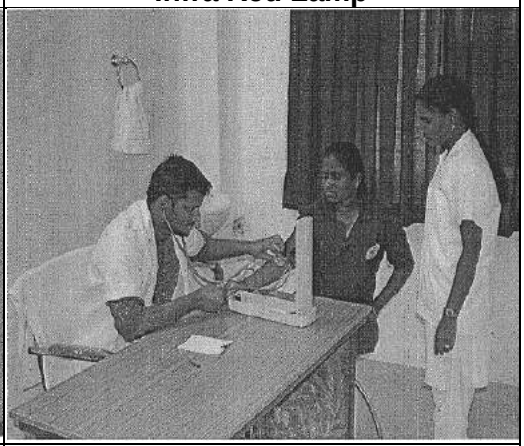
Suction Apparatus



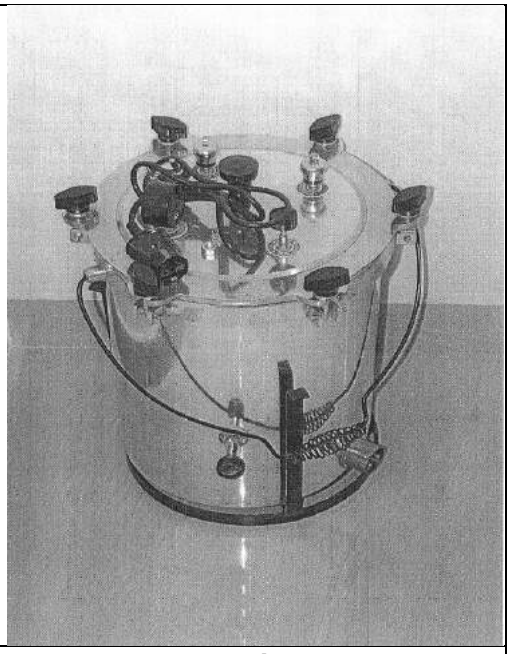
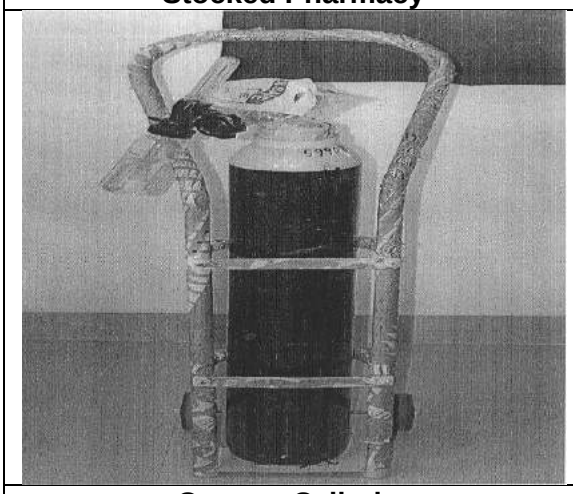
Infra Red Lamp



Otoscope



BP Apparatus

	
Stocked Pharmacy	**Autoclave**
	
Oxygen Cylinder	**Ambulance**

Health Awareness Programme by a qualified Doctor from outside on various diseases is conducted every month for the benefit of employees. As a part of the surveillance programme, the following minimum medical examination is being undertaken during the pre-employment phase:

- General physical examination and blood pressure, X-Ray of chest & ECG
- Sputum examination, Detailed routine blood & urine examination
- Audiometry
- Spirometry
- Eye tests for the workers and drivers
- Various health awareness camps and programs are organized every year for the workers

- All worker are covered under ESI and also all employees are reimbursed the medical expenses as per the company policy

As part of the routine and annual medical examinations on the persons working in the high noise generating areas, stress areas and dust exposure areas, a comprehensive surveillance programme may be adopted. Some of the good management practices are suggested in **Tables 8.1** and **8.2.**

Table 8-1 Suggested Frequency of Medical Examination under Occupational Health Surveillance Programme

Age (yrs)	Periodicity	Duration of exposure	Periodicity
< 30 yrs	Once in five years	< 10 yrs	Once in five years
31-40	Once in four years	10 to 20	Once in four years
41-50	Once in three years	21-30	Once in three years
> 51	Once a year	> 31	Once a year

Table 8-2 Suggested Medical Tests under Occupational Health Surveillance Programme

S.No.	Disorder	Tests to be conducted
1	Heart Diseases	ECG, Blood for Lipid Profile, Stress Test, 2D-Echo and other required Tests
2	Anemia	Hb%, TC,DC, ESR & Stool for Occult Blood, Ova and Cyst
3	Lung Diseases	Sputum, X-Ray Chest, Spirometery
4	Diabetes	Random Blood sugar, Urine sugar, if positive, BSL-Fasting/PPBS diabetic profile
5	Hypertension	Blood pressure reading; If required, renal profile + ECG and stress test.
6	Urine Examination	Routine and Microscopic
7	Hearing loss	Audiometric test, Audiological Interpretation

Medical records - A record-keeping system for holding the results of medical examinations and reports of symptoms is maintained as part of the health surveillance scheme. These are confidential medical records relating to individuals. As part of the health surveillance programme, employees should be informed of the confidential results of each assessment and of any implications of the findings, such as the likely effects of their continuing to work.