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 this project, preliminary hazard identification and risk assessment were 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.

Fire Safety

Black liquor (generated in-house), indigenous, imported coal, lignite, furnace oil and pet coke are the fuels proposed to be used Post MEP. Furnace oil with producer gas or with pet coke will be used in lime mud reburning kiln and furnace oil will be used in start-up and stabilizing the operations of chemical recovery boiler. Since the existing facility is currently using the above-mentioned fuel except pet coke, the adequate storage and safety systems are already in place. The same will be utilized post MEP.

Necessary permission will be obtained for the usage of pet coke during MEP. Dedicated storage yard with necessary sprinkler system will be provided. Additional closed storage sheds coal with water sprinkler arrangements will be provided as the existing coal storage will not be adequate during the post project scenario.

Other combustible chemicals such as paper plant additives will be stored in sealed drums and stored in secured warehouse so that the possibility of exposure to fire hazards will be

minimal. However there exists some remote possibility of fires in the raw material handling operations.

Combustible chemicals- The facility is handling only "C" type combustible chemicals such as additives and lube oils, whose flash point will be greater than 200°C as per the National Fires Safety Code, USA and these chemicals will not fall under any of the hazard chemical category under the Schedule 1 of the Manufacture, Storage and Import of Hazardous Chemical Rules, issued by Govt. of India. These chemicals are stored in drums and placed in secured areas in the warehouse. Required number of fire hydrant systems and extinguishers are placed in the warehouse.

Fire Protection and Fire Fighting Systems

The mill has adequate fire-fighting facilities with full-fledged fire safety systems at the existing facility as per the National Building Codes and other good engineering practices. The existing fire-fighting arrangements will be suitable augmented during the MEP program of the existing plant. Photographs showing the fire hydrant systems in the existing facilities are presented in **Figure 8.1.**

Figure Error! No text of specified style in document.**-1 Existing Fire Safety Systems**

The following firefighting facilities are installed at the facility:

- Electrical fire pump: 137m^3/hr& 250 m^3/hr, diesel pump: 137 m^3/hr & 250 m^3/hr and Jockey pump: 1080 m^3/hr.
- Fire water ring main system has been provided across the plant, storage area etc.
- About 119 numbers of fire hydrants are installed as per building codes.
- 15 water sprinklers were installed at coal storage area.
- 220 fire extinguishers are installed across the facility.

- 20 numbers of first aid facilities are placed at all critical locations.
- Necessary vacuum system and scrubbers are provided at Chlorine tonner area.
- Chlorine gas detectors are placed near the chlorine plant, and three self-breathing operators (oxygen masks) are made available.
- Fire engine vehicle is in place.

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. Coal stock yard fires can be avoided by providing proper stacking design to prevent air movement inside the coal lumps, minimizing 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 minimize, 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 minimize 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 pulverized 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.