GREAT EARTH WOOD INDUSTRY Co. LIMITED

PLYWOOD, MARINEBOARD AND
VENEER PROCESING FACTORY

GREAT EARTH WOOD INDUSTRY COMPANY LIMITED
P. O. Box 42450
DAR ES SALAAM

BUSINESS PLAN

INTRODUCTION

Industry Status

There are so many plywood manufacturing industrial units functioning in Tanzania especially in Njombe and Iringa Region. The capital investment of these industries vary from 45 to 500,000 USD. Total turnover per annum is about Rs. 305 Crores. Plywood industry in Njombe District is creating employment opportunities directly to 1000 persons and indirectly to 2500 persons.

The power requirement per each unit is around 60 to 150 HP. About 15% of their products are exported to Middle East countries. Presently around 24 small scale plywood industries have formed a consortium under the name and style of 'Great Earth Wood Industry Co. Limited. Ltd. The remaining units will become the members of this consortium immediately. Major Issues and Immediate Solution The main raw material required for plywood manufacturing are core veneer, face veneer, urea formaldehyde resin (Bonding gum) etc. The core veneer are required for manufacturing interior core of plywood. The both sides of the core veneers are pasted with face veneers. Presently most of the plywood manufacturing units in this cluster have inhouse facility to manufacture rubber wood based core venner. But there is no facility to manufacture face veneer in this cluster.

So they have to incure heavy transportation cost and quality of face veneer is not assured. The total annual requirement of face veneer is 714 lakhs sq. mtrs. valued at Rs. 85.68 Crores.

So a common facility centre for peeling face veneer is essential for this cluster, so that transportation overhead and middle level persons in the supply chain can be avoided. By starting this common facility centre the cluster can save around 16% cost in face veneer. The other raw material required for plywood manufacturing is Urea formaldehyde resin for bonding core veneers and face veneers. The annual requirement of urea formaldehyde resin for this cluster is 38250 MT valued at Rs. 42.07 Crores. Presently there is no facility to manufacture bonding resin in this cluster. By starting this common facility centre the cluster can save around 38% cost in bonding resin. The consortium is planning to import methanol directly from foreign countries such as Saudi Arabia, Malaysia, Singapore, Iran, Iraq etc. and convert this methanol into formalin and then urea is added. The above cost saving is derived by the bulk import of methanol and minimizing transporting overhead. Presently there is no capacity to manufacture high density plywood in this cluster. The high density plywood have specific application in special industries and Indian Railways. It is not practically possible to install 1500 MT capacity heavy duty hydraulic hot press by individual units. So a centralized facility for manufacturing high density plywood is essential for this cluster. Since this is a specialized product, it has high value addition. The consortium can supply the high density plywood directly to Indian Railways and other industries, so that high margin is assured.

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In this context the consortium decided to establish a centralized common facility center for face veneer peeling, urea formaldehyde resin making, and high density plywood pressing to overcome above problems. The consortium implemented common facility center for face veneer peeling as phase I with their own sources.

BRIEF DESCRIPTION OF NATURE, SIZE, LOCATION OF THE PROJECT

Nature, Size & Location of the Project

The project site is situated at Idofi among MSD Road Makambako, located at 100 Meters from Idofi Secondary School also its approximately 300 Meter from Main Road A104, Makambako Town Council. And lies between the Latitude: -8.791966, 34.863794° & Longitude -8.794319, 34.864665. The location of the project site index, and google image and topo map is appended in **Figure 1 &2**. The project salient Features are represented in the follow- ing **Table 1.**

S.Na.	Latitude	Longitude
1	8°47'32.3"S 34°51'45.2"E	**8°47'34.4"S 34°51'49.2"E**
2	8°47'38.8"S 34°51'52.5"E	**8°47'30.6"S 34°51'51.3"E**
3	8°47'38.3"S 34°51'47.1"E	**8°47'34.6"S 34°51'54.4"E**

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Salient features of the project

S.Na	Particular	Details
1	Name of the Project	Great Earth Wood Industry Co. Limited
2	Production Capacity	Existing Plywood Production Details: Plywood – 350 TPM Veneer – 500 TPM
3	Total Land Area	The plant is spread over a total area of 2.93 Acres
4	Location of the Project	MSD Road Makambako Idofi Village Mlowa Street
5	Nearest habitation	Mlowa Street (Centre)
6	Nearest town / city	Makambako Town Council
7	Nearest High-way	300 Meter from High Way
8	Reserved / Protected Forests	100 Meter from Idofi Secondary School

LAND AREA BREAK-UP

S. No.	Facility	Area
1	Builtup area (Existing)	4754.0 Sq.m.
2	Builtup area (Proposed)	116.13 Sq.m.
4	Greenbelt (Existing)	2492.40 Sq.m.
5	Greenbelt (Proposed)	1469.28 Sq.m.
6	Open area	2916.12 Sq.m.
7	Parking Area	131.42 Sq.m.
	Total	**11879.35 Sq.m.**

EXISTING PRODUCTION DETAILS AS PER CFO ORDER:

S.No	Name of the Product	Quantity
1	Veneer	500 TPM
2	Plywood	350 TPM

PROPOSED PRODUCTION DETAILS:

S.No	Name of the Product	Quantity
1	Phenol formaldehyde Resin/Urea Formaldehyde Resin/Melamine Urea Formaldehyde Resin/Melamine For-maldehyde Resin	3.5 Tons/Day (or) 1000 Tons/annum

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MANUFACTURING PROCESS:

Existing Plywood Manufacturing Process:

The manufacture of plywood consists of the following processes:

1. Log storage,
2. Log de- barking and bucking,
3. Peeling the logs into veneers,
4. Drying the veneers,
5. Gluing the ve- neers together,
6. Pressing the veneers in a hot press,
7. Plywood cutting, and other finishing processes such as sanding.

Log de- barking and bucking,

Peeling the logs into veneers,

Wooden logs in appropriate sizes are received from local suppliers. The initial step of debarking is accomplished by feeding logs through one of several types of debarking machines. The purpose of this operation is to remove the outer bark of the tree with- out substantially damaging the wood.

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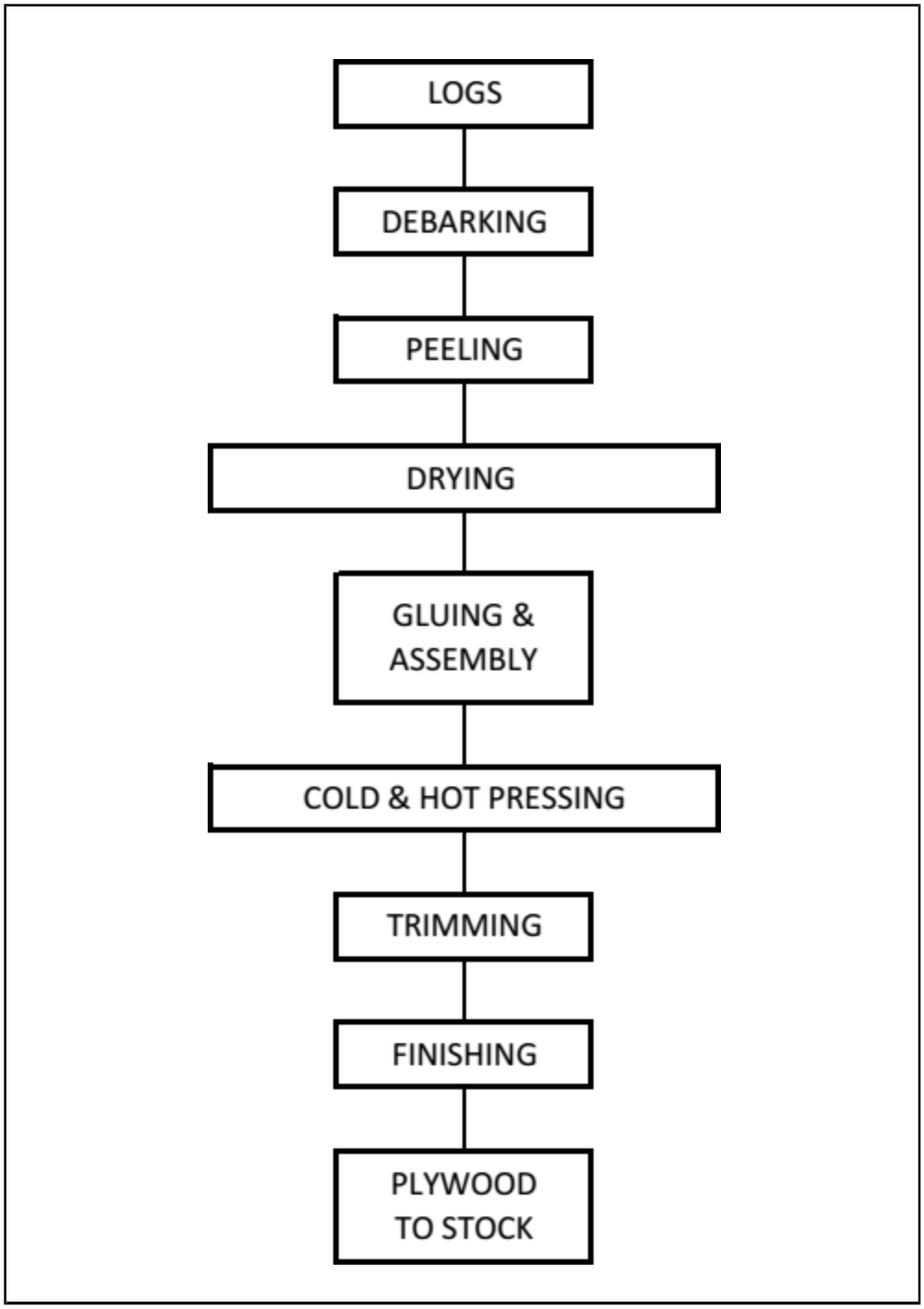
Veneer moisture is checked against the target moisture level as the veneer exits the veneer dryer. Veneer redryers may be used to redry the veneer that did not reach the target moisture content. After drying, veneers are glued together on the edges to form larger sheets of veneer. This process is called composing. Narrow veneer slices must be composed before they are used in plywood panels or other products requiring wider veneer sheets. When the veneers have been dried to their specified moisture con- tent, they are conveyed to a layup operation, where resin is spread on the veneers.

The two main types of resins are phenol-formaldehyde, which is used for softwood plywood and exterior grades of hardwood plywood, and urea-formaldehyde, which is used to glue interior grades of hardwood plywood. The resins are applied by glue spreader systems. Spreaders have a series of rubber-covered grooved application rolls that apply the resin to the sheet of veneer. Generally, resin is spread on two sides of one ply of veneer, which is then placed between two plies of veneer that are not coated with resin. Assembly of the plywood panels must be symmetrical on either side of a neutral center in order to avoid excessive warpage.

For example, a five-ply panel would be laid up in the following manner. A back, with the grain direction parallel to the long axis of the panel, is placed on the assembly ta-ble. The next veneer has a grain direction perpendicular to that of the back, and is spread with resin on both sides. Then, the center is placed, with no resin, and with the grain perpendicular to the previous veneer (parallel with the back). The fourth veneer has a grain perpendicular to the previous veneer (parallel with the short axis of the panel) and is spread with resin on both sides. The final, face, veneer with no resin is placed like the back with the grain parallel to the long axis of the plywood panel. The laid-up assembly of veneers then is sent to a hot press in which it is consolidated under heat and pressure. Hot pressing has two main objectives: (1) to press the glue into a thin layer over each sheet of veneer; and (2) to activate the thermosetting resins. Typical press temperatures range from 132° to 165°C (270° to 330°F) for softwood plywood, and 107° to 135°C (225° to 275°F) for hardwood plywood. Press times generally range from 2 to 7 minutes. The time and temperature vary depending on the wood species used, the resin used, and the press design. The plywood then is taken to a finishing process where edges are trimmed; the face and back may or may not be sanded smooth. The type of finishing depends on the end product desired



PLYWOOD PROCESS FLOW DIAGRAM

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Proposed Resin Plant Manufacturing Process:

Manufacturing process including chemical reaction, mass balance and process flow diagram is described below;

Phenol Formaldehyde Resin (Single Stage):

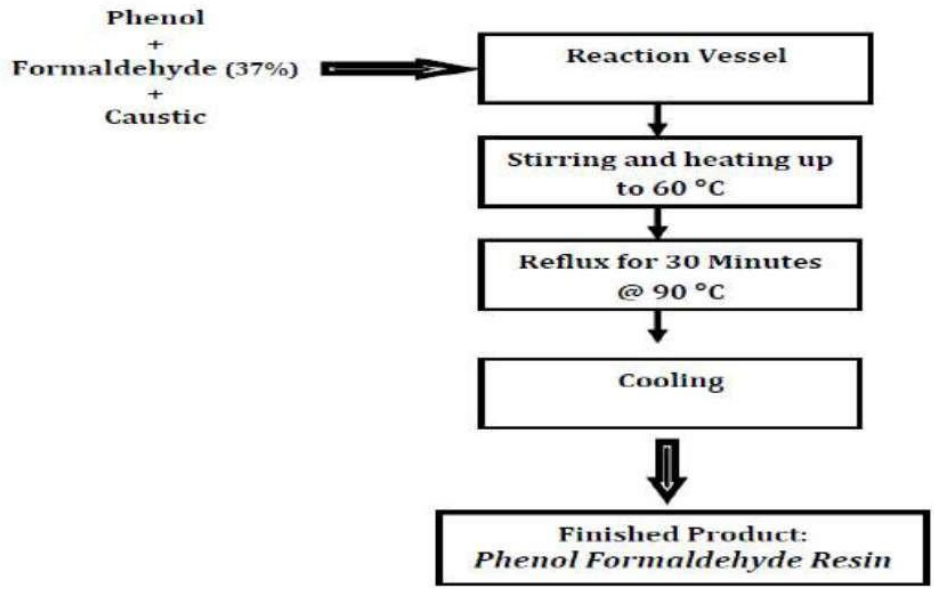
a. Manufacturing Process

The manufacturing process is summarized below:

- Take required quantity of Phenol, Formaldehyde (37%) and Caustic Soda in the reaction vessel and start steam heating until the temperature reaches at 58 °C to 60 °C.
- Temperature will increase up to 90 °C. Once the temperature reaches up to 90 °C then cut the steam supply. Reflux process will be start at this point to achieve required water tolerance.
- After achieving required water tolerance, start cooling to decrease temperature up to 60 °C. Once the temperature reach at 60 °C stop cooling and start heating for distillation process for required quantity of resin.

  After achieving required amount of resins start cooling to obtain final product. Final product will be checked for the properties like viscosity, pH, gel time etc.

Process Flow Diagram:



Requirement of material:

ONE TON BASIS

Phenol	340 kgs
Formalin	612 kgs
Caustic Soda	21 kgs
Water	42 litres

Phenol Formaldehyde Resin (Double Stage):

Manufacturing Process

The manufacturing process is summarized below:

- Step 1 - 320 kgs of phenol, 180 kgs of formalin and 18 kgs of caustic soda is add- ed along with 60 litres of water in the kettle. Temperature is raised up to 90 de- grees for 1½ hours and then it is brought down to 55 degrees.
- Step 2 – 24 kgs of Caustic + 120 liters of water + 5 kgs PVA is added and again temperature is brought down to 50 degrees. Then remaining part of formalin i.e., 330 kgs is added, and temperature is maintained at 84 – 86 degrees for two hours. When required viscosity is received, cooling is started brought down up to room temperature and the finished

product is unloaded.

ONE TON BASIS

Phenol	320 kgs
Formalin	510 kgs
Caustic Soda	42 kgs
Water	180 litres
PVA	5 kgs

Melamine Formaldehyde Resin:

The manufacturing process is summarized below:

Manufacturing Process:

- The Formaldehyde (37%) is charged into reaction vessel and raises its pH up to 8.5 – 9.0 by adding Caustic Soda solution.
- Then Melamine is charged into vessel thoroughly to maintain the pH up to 8.5 – 9.0. Heat is supplied and raised temperature up to 82 °C. Maintain 82°C at pH 8.5 – 9.0 for 90 minutes till the precipitation is observed.
- Check the flow time in hot condition with B4 cup till it around 14.5 sec. Then take reaction at pH 9.0 by adding Caustic Soda solution. The mixture is cooled at 60 °C and cooling continued up to 40 °C by circulating cold water.
- Finally, check viscosity, tolerance, pH, turbidity etc. to obtain desired product property.

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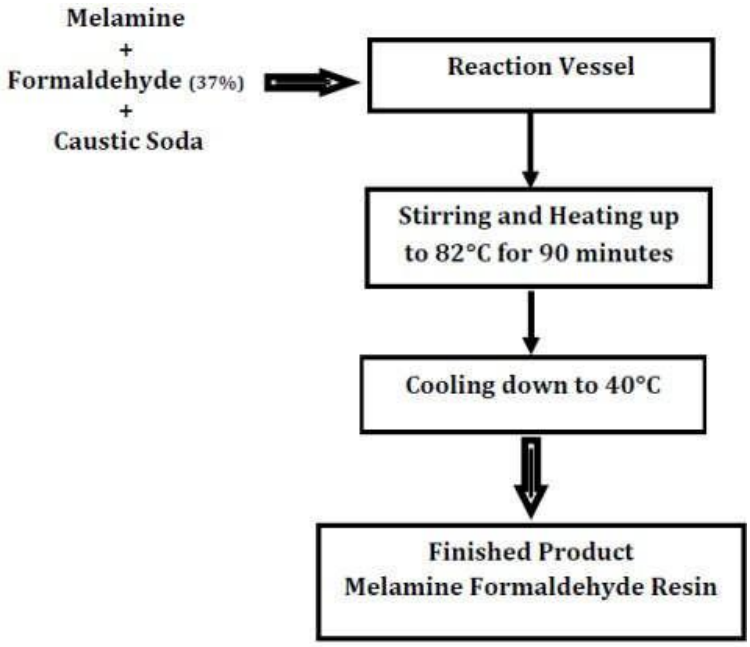
Process Flow Diagram:



ONE TON BASIS

Formalin	650 kgs
Melamine	325 kgs
Caustic Soda	3 kgs
Water	6 litres

Urea Formaldehyde Resin:

Manufacturing Process:

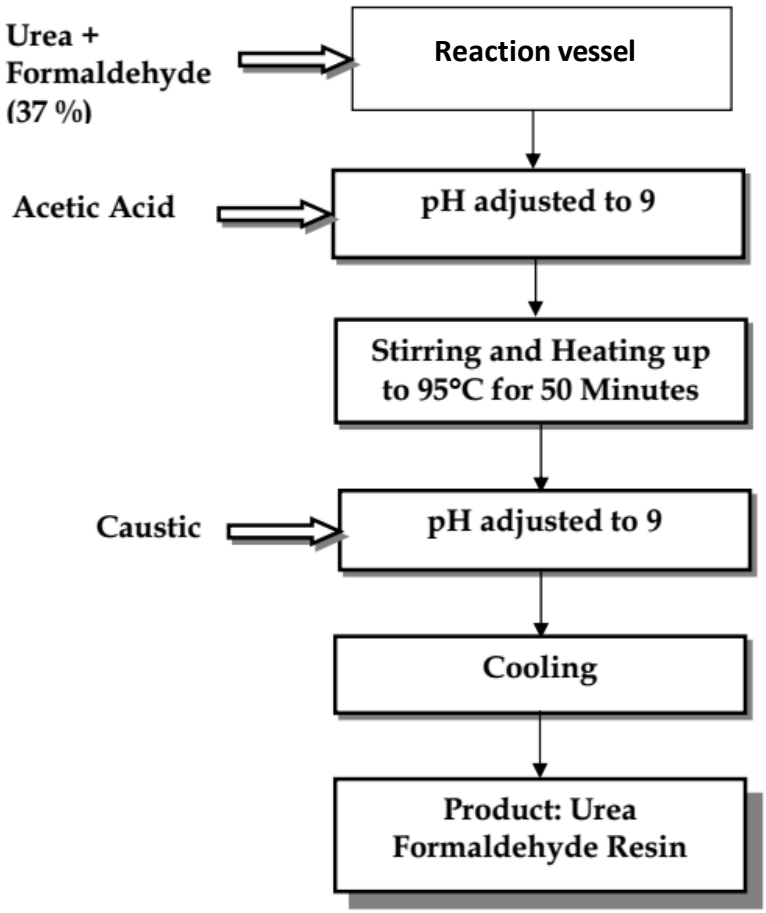
The manufacturing process is summarized below:

- The polymerization reaction of Urea Formaldehyde Resin takes places in two stages. The first stage is an addition polymerization in which Urea & Formaldehyde (37%) undergo addition reaction, which takes place in neutral or slightly alkaline condition at pH 7.5 to 8.0 at elevated temperature 95 °C to 100°C.
- Methyl Urea formed in the first stage are allowed to reach further by

lowering pH 4 to 6 using Acetic Acid where reaction takes place faster and leads to the formation of long chain polymer.

- The reaction is allowed to proceed further up to the desired viscosity and the reaction is arrested midway by raising the pH of the resin solution to 7.5 to 8.0 using Caustic Soda and then the reaction is cooled down to the room temperature and stored in sealed container.
- Check viscosity, tolerance, pH, gel time of the required batch of the resin.

PROCESS FLOW DIAGRAM



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ONE TON BASIS

Formalin	700 kgs
Technical Urea	300 kgs
Caustic Soda	4 kgs
Water	4 litres
Acetic acid	2 kgs

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Melamine Urea Formaldehyde Resin:
Manufacturing Process:
The manufacturing process is summarized below:

- Urea and formaldehyde are charged to reactor.
- Than caustic soda solution is added to maintain pH. 9-9.5 with stirring.
- Thereafter required quantity of Melamine is added and reaction temperature is maintained at 95°C.
- Reflux is done for 30 minutes.
- After obtaining turbidity increase pH 9-9.5 by adding caustic soda solution. After getting desired water tolerance 1:3-1:4, start cooling.
- Add 2nd batch urea of 70°C & 3rd batch urea at 60°C.
- Cool the whole mass at 40°C and maintain pH 8-8.5 and store it as final product.

ONE TON BASIS

Formalin	645 kgs
Melamine	225 kgs
Urea	150 kgs
Caustic	4 kgs
Water	4 litres

UTILITIES, RESOURCE REQUIREMENTS AND ASSOCIATEDFACILITIES

WATER CONSUMPTION

Water is required for process & washings and domestic purposes. The required water will be withdrawn from water tankers. The details of water requirement are tabulated below:

Fresh water requirement for existing:

S.No.	Description	Fresh water requirement
1.	Washings	0.1 KLD
2.	Domestic	0.5 KLD
3.	Industrial Cooling (Re-circulation)	2.0
	Total	**2.6 KLD**

Fresh water requirement for Proposed

S.No.	Description	Fresh water requirement
1.	Process & Washings	1.0 KLD
2.	Domestic	0.7 KLD
3.	Cooling tower makeup	0.6 KLD
4	Gardening	1.5 KLD
	Total	**3.8 KLD**

Note:

For gardening purpose storage pond water will be utilized and greenbelt will be developed with less water consumption plants.

Waste water generation for existing

S.No.	Description	Waste water generation	Point of disposal
1	Domestic	0.3 KLD	Septic tank followed by soak pit
2	Washings	--	After treatment shall be utilized for on land irrigation
	Total	**0.6 KLD**	

Waste water generation for Proposed

S.No.	Description	Waste water generation	Point of disposal
1.	Process& Washings	0.5 KLD	Washings water will be recycled
2.	Domestic	0.56 KLD	Septic tank followed by soak pit
	Total	**1.06 KLD**	

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Effluent characteristics before and after treatment

S.No.	Parameter	Value
1	pH	6.0-11.0
2	TSS (mg/l)	500-700
3	TDS (mg/l)	4000-6000
4	COD (mg/l)	11000-13000
5	BOD (mg/l)	5000-6500

RAINWATER HARVESTING AND STORM WATER MANAGEMENT

The industry proposes to develop water harvesting structure to harvest the run-off water for recharge of ground water. Roof top water collection will be adopted wherever possible and collected rainwater returned to raw water storage tank to reuse for plant operations. The storage tank and the sump shall get refilled during intense rain fall periods, and the stored water shall be reused mainly during monsoon and post monsoon seasons.

AIR QUALITY MANAGEMENT

In this unit, flue gas emission will be the main source of air pollution. There will not be any type of process gas emissions during the manufacturing of resins. There will be chances of fugitive emission due to raw material handling, transportation and manufacturing activity. Various potential of air pollution are described below under respective heading.

S.No.	Details of Stack	Stack-1	Stack-2	Stack-3
1	Attached to	Thermic Fluid Heater	DG Set	DG Set
2	Capacity	2x10 Lakh K. cal/hr	1 x 185 KVA	1 x 63 KVA
3	Fuel	Furnace Oil	HSD	HSD
4	Control Equipment	Bag Filter	Acoustic Enclosure and adequate Stack height	Acoustic Enclosure and adequate Stack height

Fugitive emissions

Due to raw material handling, transportation and manufacturing activity, there will be chances of fugitive emissions. However, unit will take all the necessary precau- tions and control measures to take care of the fugitive emissions due to the proposed project:

- All the raw materials will be stored in isolated storage area and containers will be kept tightly closed.
- All the motors of pumps for the handling of hazardous chemicals will be flame proof and provided with suitable mechanical seal with stand-by arrangement.
- The control of all parameters on a continuous basis will be done by adequate control valves, pressure release valves and safety valves etc.
- All the flange joints of the pipe lines will be covered with flange guards.
- Precautionary measures will be taken while handling various hazardous chemicals. There will also be provision of adequate ventilation system in process plant and hazardous chemical storage area.
- A regular preventive maintenance will be planned to replace or rectify all gaskets, joints etc.
- TREM card will be provided to the driver during the transportation of Hazardous raw materials/products.
- Sufficient information and training regarding characteristics and immediate actions in case of any spillage or accident during transportation of hazardous chemical will be provided to the driver.
- The unit will also develop green belt area within the factory premises to control the fugitive emissions from spreading into surrounding environment.
- Unit will install portable detection system for hazardous chemical like Phenol, and Formaldehyde in process area.
- Moreover, Unit will carry out regular work place monitoring.

MANPOWER

The manpower requirement for the existing and present proposal is expected to generate some permanent jobs and secondary jobs for the operation and maintenance of plant. This will increase direct/ indirect employment opportunities and ancillary business development to some extent for the local population. The manpower requirement including both technical and non-technical personnel is presented in Table Below.

S.Na.	Description	Existing	Proposed
1.	Employment	87	6
Total		**87**	**6**

NOISE QUALITY MANAGEMENT

Noise – unwanted and unpleasant sound.

The main source of noise in the plant is due to the operation of machineries & D.G. sets. However, unit will take following adequate precautionary measure for noise and vibration control;

- Latest technology based low noise D.G. set with acoustic enclosures installed.
- All the vibrating parts will be checked periodically and serviced to reduce the noise generation.
- Proper and timely oiling, lubrication and preventive maintenance will be carried out for the machineries and equipment to reduce noise generation. Ear muffs/ earplugs will be provided to the workers working under high noise area to minimize the adverse effect on the health.
- The transport contractor will be informed to avoid unnecessary speeding of vehicles inside the premises.
- Noise monitoring will be done regularly at prominent places in the plant.
- Proposed greenbelt area will help to prevent the noise pollution outside the premises.

SOLID WASTE MANAGEMENT

The details of hazardous waste generation and handling / Management are given in below table.

S.No	Description	Existing Quantity	Proposed Quantity	Mode of disposal
1.	Used Oil	100 LPM	--	APPCB authorized agencies
2.	Carboys	--	100 Nos/annum	APPCB authorized agencies
3.	Drums	--	50 Nos/annum	APPCB authorized agencies

Mitigation Measures for Impacts on Environment during Construction Phase

During construction phase, major impacts anticipated will be increase in dust contamination and noise. However, the impacts of the construction period will be localized and limited up to the construction phase. Impacts during construction phase and its mitigated measures.

Attributes	Impacts causing factors/Impacts	Mitigative Measures
Air	Vehicular emissions – smoke, gaseous and PM PM emissions from site activities and handling and storage of construction materials	Specific control measures on vehicular- movement, emissions and noise from vehicles Good practices for construction, loading and unloading of materials, Storage in pre-designated areas Enclosures/barriers around site activities and storages
Noise	Vehicular Construction machinery Activities	Vehicular maintenance Standard machinery Good construction practices and suitable enclosures/barriers Avoid high noise generating activities, vehicular movement and operation of machinery during nighttime
Water	Water discharge from construction activities	Good construction practices will be adopted to minimize water wasting and pollution.
Socio-economy	Expectations/aspirations of local people	Assessing local skills availability & the skills required for construction related activities & giving preference to local persons for job
Ecology	Loss/degradation of local floral species	Avoid flowering season for site activities Control of noise & vehicular movement in pre-defined areas Avoid night time working

BIOLOGICAL ENVIRONMENT

Green belt development is one of the most effective environmental pollution control measure. Trees play vital role in the environment in preventing the horizontal dispersion of the pollutants to the surrounding areas. They are very effective in trapping the pollution causing agents viz. dust and gaseous pollutants. They are also considered to be excellent indicators of excessive ground level concentrations. The green belt is being proposed for the following objectives.

- Mitigation of fugitive dust emissions
- Noise pollution control
- Prevention of soil erosion
- Balancing eco environment
- Aesthetics

In view of this, the list of species to be planted in the green belt area is illustrated below. Mixed plantation shall be done keeping optimum spacing between the saplings.

Action plan for proposed trees in tree plantation area

1. Eucalyptus globules
2. Pongamia Pinnata
3. Ficus benghalensis
4. Syzygium cumini
5. Azadirachta indica

SOCIO-ECONOMIC ENVIRONMENT

The proposed resin manufacturing plant will provide an opportunity for the local people to get employment directly or indirectly and helps in the supplement of the socio-economic status of the area. The project proponent proposes for skill development training programme to the unemployed youth and betterment of neighboring social conditions through environmental awareness and welfare programs.

PROJECT SCHEDULE AND COST ESTIMATE

Existing Project Cost Details:

S.No.	Description	Cost
1	Land	15,000.00 USD
2	Building	85,000.00 USD
3	Plant & Machinery	350,000.00 USD
	Total	**450,000.00 USD**

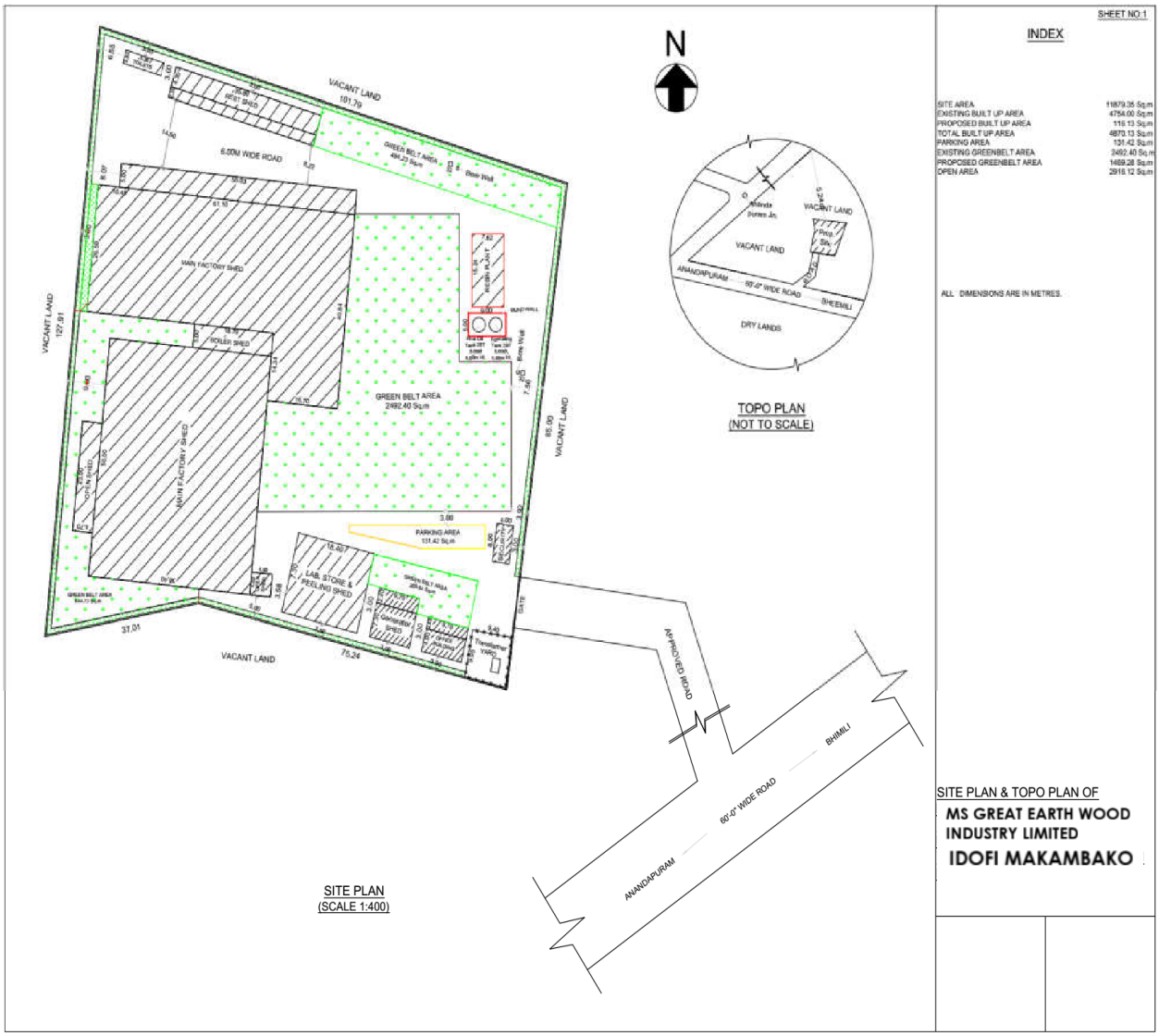
COST ESTIMATE FOR ENVIRONMENTAL MANAGEMENT PLAN

The management of M/s. Great Earth Wood Industry Co. Limited is quite conscious of its responsibility for maintaining clean and a healthy environment. The management is also keen make efficient measures towards suppression of pollution sources. It is estimated that the capital cost for implementing the Environment Management Plan is 10,000.00 USD and Recurring cost per annum is 10,000.00 USD. The cost estimate is presented in Table

Environmental Management Budget

S.No.	Description	Capital Cost USD	Recurring Cost per annum Lakhs
1.	Air pollution Control	200	100
2.	Water pollution Control	--	--
3.	Environmental Monitoring and Management	--	100
4.	Occupation Health	600	300
5.	Greenbelt	250	175
6.	Rain Water Harvesting	--	50
7.	Solid & Hazardous Waste	80	40
Total		**1,130**	**750**

CORPORATE ENVIRONMENTAL RESPONSIBILITY



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Risk Analysis & Disaster Management Plan

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RISK ASSESSMENT

The principal objective of the risk assessment study is to identify and quantify the major hazards and the risk associated with various operations of the project, which may lead to emergency consequences (disasters) affecting the public safety and health. Based on this information, an emergency preparedness plan is to be prepared to mitigate the consequences. The approach involves hazards identification, hazards assessment and evaluation, developing Disaster Management Plan (DMP)

Objective of Risk Assessment

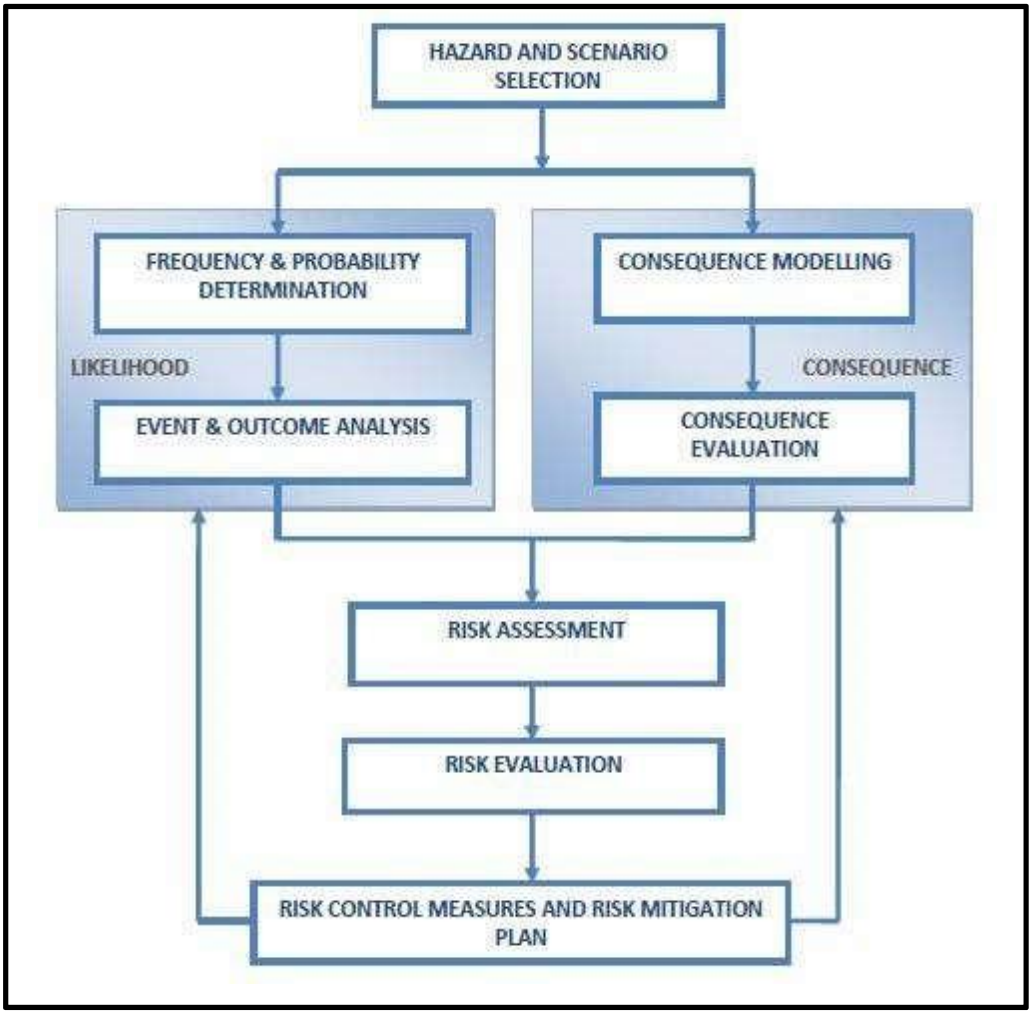
The main objective Risk Assessment is to determine the potential risks of major accidents having damage potential to life and property and provide a scientific basis for decision makers to be satisfied about the safety levels of the facilities to be set up. This is achieved by the following:

- Identification of hazards that could be realized from the unit operations and other activities.
- Identify the potential failure scenarios that could occur within the facility.
- Analyze the possible likelihood and frequency of such risk scenarios by reviewing historical accident related data.
- To assess, the potential risks associated with identified hazards to which the project and its personal and community outside may be subjected. Consequences analysis of various hazards is carried out to determine the vulnerable zones for each probable accident scenario.
- Evaluate the process hazards emanating from the identified potential accident scenarios.
- Analyze the damage effects to the surroundings due to such accidents.
- Conclusion and Recommendation to mitigate measures to reduce the hazard / risks.
- To provide guidelines for the preparation of On-site emergency plan.

Risk Assessment Methodology

Risk analysis consists of hazard identification studies to provide effective means to identify different types of hazard during the operation of the facility. This is followed by an assessment of the impacts of these hazards. Hazard is present in any system, plant or unit that handles or stores flammable materials. The mere existence of hazards, however, does not automatically imply the existence of risk. Screening & ranking methodologies based on Preliminary Hazard Analysis (PHA) techniques have to be adopted for risk to be evaluated.

Risk Analysis techniques provide advanced quantitative means to supplement other hazard identification, analysis, assessment, control and management methods to identify the potential for such incidents and to evaluate control strategies. The methodology adopted for the study has been depicted in the Flow chart given below



Hazard Identification

A major hazard is defined as an event, which may have the potential to cause one or more fatalities and also the potential to affect the integrity of the facility as a whole. The aim of this step is to create a complete tabulation of identified hazards. Identification of hazards in the project campaign is of primary significance in the analysis, quantification and cost effective control of accidents involving chemicals and process. Hence, all the components of a system/process need to be thoroughly examined to assess their potential for initiating or propagating an unplanned event/sequence of events, which can be termed as an accident.

Early detection of hazards and visualization of disastrous situation helps to impart safety in a systematic way. The plants can continue to operate for many years and can be modified several times in its life span, so due care must be given to avoid any compromise on the safety concept included in the original plant design and operating conditions. HAZOP is structured methodology, which allows its user to employ imaginative thinking in the identification of hazards and operational problems. It involves a systematic, methodical examination of design document that describe the facility. A multidisciplinary team to identify hazards or operability problems that could result in an accident performs the study. Deviations from the design value of key parameters are studied, using guide words to direct the process of evaluation. This technique presumes that the design values of flows, temperatures and other process variable are inherently safe and operable.

Environmental Risk Assessment is a scientific analysis for identification of credible risk and there after estimating the safe distances from any hazardous installations/processes in the eventuality of an accident. Estimation of near-accurate safe distances is absolutely necessary to protect the public, property and environment. Risk Assessment' also known as 'Hazard Analysis' and 'Vulnerability Assessment' is a procedure for identifying hazards and determining their possible effects on a community and environment. Risk or hazard by itself is not an event - it is the potential for an event.

This section on Risk Assessment aims to provide a systematic analysis of the major risks that may arise as a result of resins manufacturing by M/s. Great Earth Wood Industry Co. Limited. The Risk Assessment process outlines rational evaluations of the identified

risks based on their significance and provides the outline for appropriate preventive and risk mitigation measures. Results of the Risk Assessment provides valuable inputs into the overall project planning and the decision making process for effectively addressing the identified risks. This will ensure that the project risks stay below As Low As Reasonably Practicable (ALARP) levels at all times during project implementation.

EMERGENCY RESPONSIBILITIES

The responsibilities of the key personnel are appointed below:

Site Controller

On receiving information about emergency he would rush to Emergency Control Center (ECC) and take charge of ECC and the situation. His responsibilities would be as indicated below:

Assesses the magnitude of the situation on the advice of Incident Controller and decides;

- Whether the affected area needs to be evacuated;
- Whether personnel who are at assembly points need to be evacuated;

Declares Emergency and orders for operation of emergency siren;
Organizes announcement by public address system about location of emergency;
Assesses which areas are likely to be affected, or need to be evacuated or are to be alerted;
Maintains a continuous review of possible development and assesses the situation in consultation with Incident Controller and other Key Personnel as to whether shutting down the plant or any section of the plant is required and if evacuation of persons is required;
Directs personnel for rescue, rehabilitation, transport, fire, brigade, medical and other designated mutual support systems locally available, for meeting emergencies;
Controls evacuation of affected areas, if the situation is likely to go out of control or effects are likely to go beyond the premises of the factory, informs the District Emergency Authority, Police, Hospital and seeks their intervention and help;
Informs Inspector of Factories, Deputy Chief Inspector of Factories, RPCB and other statutory authorities;
Gives a public statement if necessary;
Keeps record of chronological events and prepares an investigation report and preserves evidence; and

On completion of On Site Emergency and restoration of normalcy, declares all clear and orders for all clear warning.

Incident Controller

- Assembles the incident control team;
- Directs operations within the affected areas with the priorities for safety to personnel minimize damage to the plant, property and environment and minimize the loss of materials;
- Directs the shutting down and evacuation of plant and areas likely to be adversely affected by the emergency;
- Ensures that key personnel help is sought;
- Provides advice and information to the Fire and Security Officer and the Local Fire Services as and when they arrive;
- Ensures that all non-essential workers/staff of the affected areas are evacuated to the appropriate assembly points, and the areas are searched for casualties;
- Has regard to the need for preservation of evidence so as to facilitate any inquiry into the causes and circumstances, which caused or escalated the emergency;
- Co-ordinates with emergency services at the site;
- Provides tools and safety equipment to the team members;
- Keeps in touch with the team and advices them regarding the method of control to be used; and
- Keeps the Site Controller of Emergency informed of the progress being made

Emergency Coordinator – Rescue, Fire Fighting

On knowing about emergency, rushes to ECC;

- Helps the Incident Controller in containment of the emergency;
- Ensure fire pumps are in operating condition and instructs pump house operator to ready for any emergency with standby arrangement;
- Guides the firefighting crew i.e. firemen, trained plant personnel and security staff;
- Organizes shifting the firefighting facilities to the emergency site, if required;
- Takes guidance of the Incident Controller for firefighting as well as assesses the requirements of outside help;
- Arranges to control the traffic at the gate and the incident area;

Emergency Coordinator – Medical, Mutual Aid, Rehabilitation, Transport and Communication

- In the event of failure of electric supply and thereby internal telephone, sets up communication point and establishes contact with the ECC;
- Organizes medical treatment to the injured and if necessary will shift the injured to nearby hospitals;
- Mobilizes extra medical help from outside, if necessary;
- Keeps a list of qualified first aid providers for the plant and seeks their assistance;
- Maintains first aid and medical emergency requirements;
- Makes sure that all safety equipment is made available to the emergency team;
- Assists Site Controller with necessary data to coordinate the emergency activities;
- Assists Site Controller in updating emergency plan, organizing mock drills, verification of inventory of emergency facilities and furnishing report to Site Controller;
- Maintains liaison with Civil Administration;
- Ensures availability of canteen facilities and maintenance of rehabilitation center.
- Liaises with Site Controller/Incident Controller;
- Ensures transportation facility;
- Ensures availability of necessary cash for rescue/rehabilitation and emergency expenditure;
- Controls rehabilitation of affected areas on discontinuation of emergency; and
- Makes available diesel/petrol for transport vehicles engaged in emergency operation.

Emergency Coordinator – Essential Services

Assists Site Controller and Incident Controller;
Maintains essential services like Diesel Generator, Water, Fire Water, Compressed Air/Instrument Air, power supply for lighting;
Plans alternate facilities in the event of power failure, to maintain essential services such as lighting, etc.
Organizes separate electrical connections for all utilities and emergency services so that in the event of emergency or fires, essential services and utilities are not affected;
Gives necessary instructions regarding emergency electrical supply, isolation of certain sections etc. to shift in-charge and electricians; and
Ensures availability of adequate quantities of protective equipment and other emergency materials, spares etc.

Emergency Facilities

Assembly Point

In affected & vulnerable plants, all nonessential workers (who are not assigned any emergency duty) will be evacuated from the area & they shall report to specified Assembly Points. Assembly Points shall be marked at a safe place well away from area of risk and least affected by the down wind direction.

To ensure that workers do not have to approach the affected area to reach the Assembly Point, proper location and number shall be marked at Assembly Points. Each Assembly Point shall be manned by a nominated person to record the names and dept. At each Assembly Point, duties of Assembly Point In-charge shall be displayed in brief. Before reaching an Assembly Point or subsequently, if it is required to pass through an affected area or due to presence of toxic substances, suitable PPE's including respirators, helmet etc., shall be issued & made available with workers.

Emergency Control Center (ECC)

It is a location where all key personnel like Chief Coordinator, Emergency controller, maintenance coordinator can assemble and monitor aspects related to emergency and take decisions related to emergency. The office room is designated as ECC. In case if this area is affected, zone security room is designated as alternative ECC.

Telephone and other facilities required with necessary documents shall be displayed in ECC for ready reference. Designated trained personnel shall operate ECC. In case of Major Emergency, the Site Main Controller will operate from ECC.

Fire Control Arrangements

Role of Manager (Fire and Safety)/Shift In-Charge (Fire & Safety)

Incident Controller shall direct the firefighting and Emergency operation. His duties include:

Keep the constant touch with the SMC/In-charge - EHS.

Direct the crew members to the scene of emergency and arrange replenishment of Manpower/equipment/extinguishing media etc.

Role of EHS Representative:

On being notified about the location of fire/ gas leakage, he shall immediately proceeds to the help.

Decides his line of action in consultation with Incident controller and takes appropriate measures to handle the emergency.

Shall assess the severity of the incident & shall immediately report to emergency controller about the gravity of the situation.

He shall also assess the extra requirement required if any, from the neighboring industry.

Medical Arrangement

The roles of Medical officers are as follows:
He will report immediately to the SMC/IC.
He will render necessary treatment, at Occupational Health Center.
He will arrange for Hospitalization and Treatment at outside hospitals, if required.
He will mobilize in getting the services of External medical agencies, other Para – medical services etc. and transportation services etc.
He will arrange for extra medical assistance/antidotes, from out, if required.
He will arrange for first-aid trained volunteers for necessary help. He will liaise with the Government Health Authorities for treatment of the affected persons nearby.

Communication System

Communication System is a Crucial Factor while handling emergency. Company has quick & effective Communication System through which, any situation, which can lead to emergency, can be informed or known to;
All persons working inside the plant.
Key Personnel outside during normal working hours & during off-duty hours.
Outside emergency services, Statutory and Local Authorities &
Neighboring facilities and public leaving in vicinity.
Each and every section, Plant & Department of the Factory will be connected by internal telephones with SMC, Supervisor or IC"s. External Phone at Office and Residence and

Mobile shall also be made available with Key Personnel and top executive of the factory. The Communication System shall begin with raising the alarm declaring the emergency, Telephone messages and Procedure to communicate the emergency to other persons & General Public.

Raising the Alarm

As soon as incident takes place inside the factory and is noticed by someone, the first step shall be to raise the nearest manual emergency bell to alert the nearby people. Next, he/she shall inform the security persons to raise the emergency siren located at the factory gate. The security personnel sound the siren

Off-Site Emergency Plan

If an accident takes place in a plant and its effects are felt outside its premises, the situation thus created is called an "off-site" emergency. It no longer remains the concern of the factory management alone but also becomes a concern for the general public living outside or passing by the premises of the factory or storage site involved. To meet such situations, off-site emergency plans are to be prepared as stipulated and put into operation.

It is mandatory under Rule 16 of the Hazardous Chemical Rules for District authorities to prepare an off-site emergency plan in respect of clusters of hazardous chemical industries or at locations where accidents are likely to have an off-site adverse effect.

The off-site emergency plan should detail how emergency related to major accidents on the site will be dealt with. For preparing the plan, the concerned district authorities should consult the industries and other persons who would be concerned with its execution should such an emergency arises

Responsibility for Planning an Off-Site Emergency

The planning for emergency response requires cooperation among the responders to know the persons responsible for various activities. This understanding is facilitated through personal interaction and close working in devising and updating a plan. Therefore, the pre-requisite for preparing a plan is the formation of a planning team. The possible composition of the planning team is given below:

Planning Team-Members

- TRA
- TFS
- Fire Brigade Services
- NEMC
- OSHA
- NSSF
- Auditors

Assessment of Emergency Plan

Arrangements for:

Collecting information on the causes of the emergency;
Reviewing the efficiency and effectiveness of all aspects of the emergency plan.

Role of the Emergency coordinating Officer

The various emergency services would be coordinated by an emergency coordinating officer (ECO), who will be designated by the district collector. The ECO would liaison closely with the site main controller. Again depending on local arrangements, for very severe incidents with major or prolonged off-site consequences, the external control would be passed to a senior local authority administrator or even an administrator appointed by the central or state government. The ECO will be equipped with address and phone numbers of important agencies.

Role of the Local Authority

The duty to prepare the off-site plan lies with the local authorities. The emergency planning officer (EPO) appointed should carry out his duty in preparing for a whole range of different emergencies within the local authority area. The EPO should liaison with the plant, to obtain the information to provide the basis for the plan. This liaison should ensure that the plan is continually kept up to date.

It will be the responsibility of the EPO to ensure that all those organizations which will be involved off site in handling the emergency, know of their role and are able to accept it by having for example, sufficient staff and appropriate equipment to cover their particular responsibilities. Rehearsals for off-site plans should be organized by the EPO.

Role of Police

Formal duties of the police during an emergency include protecting life and property and controlling traffic movements. Their functions should include controlling bystanders, evacuating the public, identifying the dead and dealing with casualties, and informing relatives of death or injury.

Role of Fire Authorities

The control of a fire should be normally the responsibility of the senior fire brigade officer who would take over the handling of the fire from the site incident controller on arrival at the site. The senior fire brigade officer should also have a similar responsibility for other events, such as explosions. Fire authorities in the region should be apprised about the location of all stores of flammable materials, water and foam supply points, and firefighting equipment. They should be involved in on-site emergency rehearsals both as participants and, on occasion, as observers of exercises involving only site personnel.

Role of Health Authorities

Health authorities, including doctors, surgeons, hospitals, ambulances, and so on, should have a vital part to play following a major accident, and they should form an integral part of the emergency plan.

For major fires, injuries should be the result of the effects of thermal radiation to a varying degree, and the knowledge and experience to handle this in all but extreme cases may be generally available in most hospitals. Major off-site incidents are likely to require medical equipment and facilities additional to those available locally, and a medical "mutual aid" scheme should exist to enable the assistance of neighboring authorities to be obtained in the event of an emergency.

Occupational Health & Safety Programme

M/s. Great Earth Wood Industry Co. Ltd. has prepared the Occupational Health Surveillance Programme which shall be followed right from the project construction & erection phase and the same shall be updated for the upcoming new facility, if required. The details of the same are described in the following sections.

Ambulance Van & First Aid Box

An Emergency Vehicle shall be made available round the clock to be used as an Ambulance during emergency.
First Aid Boxes will be made available at the different location in the plant. Training shall be given to employees for First Aid.

Plan for Periodic Medical Checkup

- Periodic Medical Examination shall be conducted as per the following schedule;
- Workers employed will be examined by a Qualified Medical Practitioner/ Factory Medical.

Safety Trainings & Mock Drills

Safety trainings (on Safe Material Handling, First Aid, & all Safety Aspects) shall be provided every 15 days by the Safety Officers with the assistance of faculty members called from other Professional Safety Institutions and Universities. In addition to regular employees, limited contractor labors will also be given safety training. To create safety awareness, safety films shall be shown to workers and leaflets shall be distributed.

Mock Drills

- To evaluate the effectiveness of emergency preparedness and to spread the awareness among employees mock drill will be carried out at the interval of every six months.
- After completion of the mock drill, summary report shall be made and corrections will be done if any weakness has been observed.

DECLARATION

The Business Plan has been prepared by Safety and Security Expert Mr. James Mapesa Bundala in collaboration with other registered Experts,

The Ngoro Conservancy, The information in this Business Plan is correct based on professional Judgement, therefore the proponent is advised to undertake the project as per proposed mitigation measure mentioned in this environmental protection plan.

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Sostenes J. Nkano

Environmental Consultant