Risk Assessment

Risk Assessment

1.1 Hazard Identification & Risk Assessment

This Risk and Hazard analysis report is prepared to identify the risks, hazards and suggest mitigation measures to reduce the possibility of any accident minor or major to the minimum.

Objective of the Risk and Hazard analysis is to

1) Identify hazards and nature of hazard in the process, storage and handling of hazardous chemicals.
2) Carry out Qualitative risk analysis for the process and suggest mitigation measures.
3) Carry out Quantitative risk analysis of the storage of hazardous chemicals and estimate the threat zones for Most Credible and Worst case scenarios.
4) Suggest mitigation measures to reduce the risk/probability of the accident to the minimum.
5) Incorporate these measures for ensuring safe operations and safe layout and for effective preparation of On-site and Off-site emergency plans.
6) Suggest Guidelines for on-site and off - site emergency plan.

Methodology:

Identify hazards based on

- Processes description received
- Identify Hazardous Chemicals handled and stored
- Inventory of Hazardous chemicals
- Proposed storage facilities for hazardous chemicals
- Plant layout
- Safety measures to be adopted by the company

Hazard Assessment:

- By Qualitative Risk Assessment
- By Quantitative Risk Assessment by Hazard index calculations and estimate threat zones by using ALOHA.

Recommendations:

- Recommend mitigation measures based upon the above
- Recommending guidelines for the preparation of On-site Emergency plan

Hazard Identification:

Identification of general types of Hazards in Sugar& Distillery:

The potential hazardous areas and the likely accidents with the concerned area have been enlisted below in **Table 1.1**

Table 1.1: Possible Hazardous Locations onsite

Sr. No.	Hazardous Area	Hazard Identified	Mitigation measure	Mitigation measure in place	Comments/ Additional measure
1	Boiler Area	Explosion	IBR rules for design, maintenance and operation of boilers by certified boiler attendants is mandatory	These measures are in place as the boiler is in operation for the existing capacity.	Will be adopted for the additional boiler capacity
2	All over the plant	Lightening	To design and install adequate number of best available lightening arrestors.	6 Lightening arrestors at critical locations like bagasse yard, biogas plant, and distillery section are installed.	For additional areas required / for increased area of operations these will be installed
3	Electrocution	Loose fitting	Regular maintenance, internal safety audit, and external safety audit at regular intervals.	These are in place for the operation of the existing capacity	It will be adopted for proposed expansion project
4	Electrical rooms	Fire and electrocution	Regular maintenance, internal safety audit, and external safety audit at regular intervals.	These are in place for the operation of the existing capacity	It will be adopted for proposed expansion project
5	Transformer area	Fire and electrocution	Regular maintenance, internal safety audit, and external safety audit at regular intervals. Regular checking and replacement of	These are in place for the operation of the existing capacity	It will be adopted for proposed expansion project

			cooling oil.		
6	Cable tunnel	Fire and electrocution	Regular maintenance, internal safety audit, and external safety audit at regular intervals.	These are in place for the operation of the existing capacity	It will be adopted for proposed expansion project
7	Storage yard	Fire	Constant supervision to extinguish small fires caused by heat by spraying water. Fire hydrant lines to be laid around the bagasse storage area.	Fire hydrant shall be provided	Fire hydrant system for proposed expansion is proposed
8	Bagasse storage area	Fire	Fire hydrant around bagasse storage area.	Fire hydrant around the bagasse storage is in place	Other Detailed measures have been suggested in the report, in the later part.
9	Alcohol production area	Fire and Alcohol vapours release	HAZOP study is recommended for the production as well as Alcohol Storage area and adequate safety instrumentation with alarms and interlocks to be incorporated to make the design and plant operation intrinsically safe.	----	----
10	Distillery (ethanol storage tank)	Fire	Detailed measures have been suggested in the report, in the later part and QRA results and based on failure frequency risk has been calculated. Fire hydrant will be laid around with foam fighting	Most of the measures are in place	Detailed measures are suggested in the report.

			arrangements.		

Proposed Additional Mitigation Measures to avoid accidents:

(A) Preventive Measures for Electricity Hazard:

- All electrical equipment is to be provided with proper earthing. Earthed electrode are periodically tested and maintained.
- Emergency lighting is to be available at all critical locations.
- Easy accessibility of firefighting facilities such as fire water pumps and fire alarm stations is considered.
- All electrical equipment to be free from carbon dust, oil deposits and grease.
- Use of approved insulated tools, rubber mats, shockproof gloves and boots, tester, fuse tongs, discharge rod, safety belt, hand lamp, wooden or insulated ladder and not to wear metal ring and chain by electricians /operators / workers .
- Central fire and emergency announcement system is recommended. Temperature sensitive alarm and protective relays to make alert and disconnect equipment before overheating is to be considered
- Danger from excess current due to overload or short circuit is to be prevented by providing fuses, circuit breakers and thermal protection

Additional Measures suggested:

Accidental Release Measures, Safety Measures for Storage & Handling of Alcohol

Keeping away from heat, sparks and open flame, care will be taken for avoidance of spillage, skin and eye contact, well ventilation, Use of approved respirator if concentration of alcohol in air is above acceptable level.

For Storage and handling following precautions will be taken:

- Keeping away from oxidizers, heat and flames.
- Cool, dry& ventilated storage and closed containers.
- Grounding of the container and transferring equipment to eliminate static electric sparks.
- Avoid increasing linear velocity in loading and unloading of Alcohol in the piping beyond 5m/sec.

Fire Fighting Measures:

- Properly designed fire hydrant system with alarm and hooter, hose boxes, dry powder extinguishers etc., based on applicable IS standards are in place for the existing plant.

- These will be expanded for the additional storage tanks and additional areas due to expansion.

Establishing a Fire Fighting Group:

A small spark of fire may result into loss of lives, machines and the damage by fire may result in high economic losses. This type of losses can be avoided by preventing and controlling the fire instantly for which fire fighting group will be established.

The firefighting group would house and keep in readiness, the following types of equipment and arrangements.

- CO_2 extinguishers
- Dry powder chemical extinguishers
- Foam extinguishers
- 80 mm. spray hoses
- Fire brigade

Major Areas of concern are as under:

A. Sugar manufacturing section:

I. Bagasse storage: Fire hazard

II. Storage and handling of Sulphur: Exposure to dust, dust explosion,

III. Production and handling of SO_2

IV. Molasses Storage tanks: Leakage of molasses due to tank failure

B. Distillery area:

I. Storage and handling of Alcohol: Leakage and fire.

C. Cogeneration plant: Noise, steam leakage and boiler explosion, mal-operation of the turbines.

Sugar manufacturing section of the plant:

I. Bagasse Storage: Fire hazard

- The bagasse is produced after crushing of sugar cane. In dried form it is used as fuel for boiler.
- After the expansion, Actual crushing capacity of Sugar Plant will be 11000 TCD on 24 h and Production of Bagasse at present is 90300MT/M, it will be 111300 MT/M after expansion

- Maximum 50,000 MT of bagasse will be stored instead of present maximum storage of 20,000 MT
- For storage of this and for the storage of additional quantities if procured, the company has reserved and has earmarked areas for the storage of bagasse inside the factory campus of size 125 X140 m(17500 m^2).

Hazard: Small spark or ignition will cause fire and will spread rapidly leading to injury and loss of life and damage to the property.

Mitigation Measures:

Following mitigation measures to eliminate the fire hazard are in place and some additional measures are suggested as below:

- It should be ensured while routing high tension voltage lines to avoid storage of bagasse storage below & near high voltage (H.T.) transmission lines.
- Avoid routing of electric supply cables &cable trenches near to bagasse storage and if unavoidable locate these as far away from stored bagasse or bagasse heaps.
- Always keep other raw materials & useful material far away from storage of bagasse area.
- Installation of Fire Hydrant (self-auto-mode firefighting) system around the area of bagasse yard. Fire hydrant has been laid around the bagasse storage area. Fire hydrant system will be designed as per relevant IS code and as per the applicable relevant code.
- Creating awareness among workers about sudden bagasse fire and emergency action plan will definitely avoid risks of heavy fire. In this way save a valuable fuel & life of human being working near bagasse can be saved.
- Posting of proper supervision staff with necessary communication facility.
- Works like welding; gas cutting should not be carried out near bagasse storage. Or only after issue of proper work permit and making necessary fire protection arrangements.
- Daily record of bagasse storage data must be maintained and proper review of storage conditions must be taken by higher authority.
- Training of all the involved staff in firefighting in normal & emergency operating system be conducted
- Proper planning & installation of fire hydrant system around the bagasse storage yard would reduce the dependency exclusively on fire tender for firefighting.

Hazard identification and Mitigation measures:

Storage and handling of Sulphur:

Exposure to dust, dust explosion, Sulphur is stored in a closed shed. In a warehouses presently 300 MT Sulphur is stored, with an area of 14m x 7m and maximum stack height is 1.6 m. The same storage facility will be used after expansion. It is transferred in bags by a crane to the SO_2 production unit as per the requirement.

Following are the hazards in storage and handling of Sulphur.

Hazards

- Dust Explosion
- Fire

Dust Explosion:

As Sulphur is stored and handled in granular form, there is always some dust formation, which can lead to dust explosion. A dust explosion occurs when a fine dust in suspension in air is ignited, resulting in a very rapid burning and the release of large quantities of gaseous products. This in turn creates a subsequent pressure rise of explosive force capable of damaging plant and buildings and injuring people. It is generally considered that a dust explosion can only be initiated by dust particles less than 500 microns diameter.

Conditions for a Dust Explosion

Following conditions are necessary before a dust explosion can take place.

- The dust must be combustible.
- The dust cloud must be of explosive concentration, i.e. between the lower and upper explosion limits for the dusts.

Sulphur is a flammable substance in both the solid and liquid states. The dust is characterized by a very low ignition point of 190°C compared to other combustible dusts and dust clouds are readily ignited by weak frictional sparks. Dusts containing 25% or more elemental Sulphur may be almost as explosive as pure sulphur.

- There must be sufficient oxygen in the atmosphere to support and sustain combustion.
- A source of ignition must be present.
- The dust must be fine enough to support an explosion.

Mitigation Measures:

Explosion Prevention:

Dust explosions can be prevented by ensuring that the following conditions are met:

- Formation and Suspensions of Sulphur dust in air are avoided.
- To prevent dust formation during the storage and handling of Sulphur, it is required to take necessary precautions to avoid spillage and crushing of granular Sulphur during bulk loading and unloading in the storage area.
- Storage shed should be constructed with a minimum number of horizontal surfaces to avoid dust accumulation.
- Bulk accumulations of fine Sulphur may also be removed using soft push brooms, having natural bristles and non-sparking scoops or shovels before vacuum cleaning equipment is used.
- The use of compressed air to remove dust from any surface, vigorous sweeping or any other method of cleaning which may raise a dust cloud is prohibited.
- All sources of ignition are excluded.
- Presence of moisture helps in preventing dust explosion.

Fire in Sulphur storage:

There is a low risk of fire in Sulphur storage as ignition temperature is low 190 °C. Solid and liquid Sulphur will burn to produce Sulphur dioxide gas, which is extremely irritating and toxic and hence, the effects of the fire hazard itself are slight.

Mitigation Measures:

- Smoking and the use of matches shall be prohibited in all areas, where sulphur dust is likely to be present. Prominent NO SMOKING signs shall be placed around such areas.
- Naked flames or lights and the use of gas cutting or welding equipment are prohibited during the normal operation of the plant. Repairs involving the use of flames, heat, or hand or power tools in areas, where sulphur may be present shall be made only after getting hot work permit from the authorities.
- Where this is not possible the sulphur shall be wetted down.

Safety and Fire Fighting Tips:

- Always use Self Contained Breathing Apparatus (SCBA). Sulphur fires produce hazardous sulphur dioxide gas. Sulphur dioxide gas is heavier than air and will accumulate in the vapour spaces of the rail car.

- Automatic sprinkler systems which comply with relevant Indian Standards and provide a fine spray or mist are recommended as the most satisfactory extinguishing system for bulk stores. Fire hoses and extinguishers must be fitted with fine spray nozzles to ensure that Sulphur dust clouds are not raised, as these can explode on contact with the fire.
- Small Sulphur fires are easily extinguished by adding more sulphur on top of the burning Sulphur. This depletes the oxygen and smothers the fire.
- For larger Sulphur fires use a light water fog or CO_2 to extinguishers. Do not use heavy water streams as this may create Sulphur dust which could potentially explode.

Hazard Identification: Sulphur di-oxide (SO_2) production and handling:

The plant has standard Sulphur dioxide (SO2) production unit. The existing production capacity is adequate to cater to the additional requirement of Sulphur dioxide (SO_2) for increased production. The unit produces required amount of Sulphur dioxide(SO_2) at the required rate by charging sulphur feed to the unit, it is melted (Temp. 110-120$^{o^{\circ}}$C) and charged to the burner chamber, where in the air at controlled rate is fed to burner to produce Sulphur dioxide(SO_2).Gas at high temp of 300 to 350°C,which is cooled to 70-75°C and sent to the user unit through 150 mm piping at 1.5 to 1.7 atm pressure. This unit designed for in- situ production and use of Sulphur dioxide(SO_2). There is practically no inventory of gas in the Sulphur burner unit and the inventory of the gas is in the pipeline from the unit to the sulphiter only.

Major hazard is leakage; being toxic, it can lead to serious injuries and health concerns.

Mitigation Measures suggested and measures which are in place:

- SOP for the unit operation is available.
- Emergency Shutdown procedure is available.
- Operators are trained.
- Emergency Shutdown procedure, in local language should be displayed.
- SO_2 leak detectors shall be installed in the plant for early warning

Hazard quantification:

Following are the toxic properties of SO_2

NFPA rating N (H)=3, N(F)=0 and N(R)=0, TLV= 2 ppm

Toxicity Index:

Toxicity Number: The toxicity number (Th) is derived from the NFPA health factor Nh. Nh is an integer number ranging from 0 to 4.

Nh	0	1	2	3	4
Th	0	50	125	250	350

Penalty Factor:

The Penalty Factor (Ts) is the second toxicity parameter used to determine the TI. The Ts value is derived from the 'Threshold Limit Values (TLV)'.

The TLV-values are drawn up by the American Conference of Governmental Industrial Hygienists. TLV represents a time weighted average (TWA) air concentration to which workers can be exposed during a normal working week of 6 days at 8 h per day, without ill effects. The penalty factor is determined from the table below:

TLV	Penalty factor Ts
<5	125
5-50	75
>50	5

Toxicity Index

TI= Th+Ts/100 X (1+Gh +Gs)

Gh = General Process Hazard = 2.75

Gs = Special Process Hazard = 2.55

TI= 250+125/100 X (1+ 2.75+ 2.55) = 3.75X 6.3, which is equal to 23.625

The resulting TI values are ranked into three categories:

1-5 Light

6-9 Moderate

10-up High

Hence Toxicity index is in High range.

Sulphur dioxide is produced by oxidation of molten Sulphur in situ in a standard readymade unit as described above and is used in Sulfitation of Sugar cane juice. There is no storage of Sulphur dioxide, as it is produced at the consumption rate and when required.

The maximum inventory in the plant is the quantity of Sulphur dioxide is in the pipe line of 200 mm Diameter and approximately 20 m long at a pressure of 1.7 $kg/cm^2(g)$ at near ambient temperature. This unit is situated at 10 m elevation platform open on all three sides.

7.3 QRA:

QRA was carried out, using ALOHA software, for estimating threat zones in case of 2 Most Credible scenarios of Sulphur dioxide gas leakage.

Most Credible Case Scenario

1. In first case, leakage is assumed to be from a 2 mm hole in the pipe line due to corrosion.

Under following conditions:

Atmospheric Data: (Manual Input of Data)

Wind: 5 m /second from WS at 10 m

Ground Roughness: open country Cloud Cover: 0 tenths

Air Temperature: 35° C Stability Class: D

No Inversion Height Relative Humidity: 5%

Source Strength:

Non-flammable gas is escaping from pipe

Pipe Diameter: 20 centimeters

Pipe Length: 50 m

Unbroken end of the pipe is closed off

Pipe Roughness: smooth Hole Area: 0. 0314 sq. cm

Pipe Press: 2.7 atmospheres Pipe Temperature: 60° C
Pipe Temperature: 35° C

Release Duration: ALOHA limited the duration to 1 hour
Max Average Sustained Release Rate: 103 g /min

(averaged over a minute or more)
Total Amount Released: 4.27 kg

Threat Zone:

Model Run: Heavy Gas

Red : 11 m --- (100 ppm = IDLH)

Note: Threat zone was not drawn because effects of near-field patchiness make dispersion predictions less reliable for short distances.

Orange: 76 m --- (3 ppm = ERPG-2)

Yellow: 254 m --- (0.3 ppm = ERPG-1)

For worst case scenario for similar conditions with 5 mm hole the results are:

Pipe Roughness: smooth Pipe dia: 20 cm Hole Area: 0.19625 sq. cm

Pipe Press: 2.7 atmospheres Pipe Temperature: 35° C
Release Duration: ALOHA limited the duration to 1 hour

Max Average Sustained Release Rate: 617 g/min (averaged over a minute or more)
Total Amount Released: 6.96 kg

Threat Zone:

Model Run: Heavy Gas

Red : 27 m --- (100 ppm = IDLH)

Note: Threat zone was not drawn because effects of near-field patchiness make dispersion predictions less reliable for short distances.

Orange: 155 m --- (3 ppm = ERPG-2)

Yellow: 515 m --- (0.3 ppm = ERPG-1)

Effects of SO_2 on health: Continuous exposure at TLV of 2 ppm may irritate eyes, nose and throat, coughing with chocking and many cause bronco constriction.

Concentration of 50 to 100 ppm is considered as dangerous. TLV = 2 ppm and IDLH =100 ppm

Mitigation Measures suggested based on QRA:

- Before the plant startup and every six months, pressure test and thickness test of all the equipment's and piping carrying Sulphur di oxide must be carried out to avoid leakage.
- There must be alarm system, in case, SO_2 leakage is suspected and detected by smell, to warn all workers of the leakage.
- SO_2 leak detectors may be installed.
- All operators must be aware of Emergency Shutdown procedure and action to be taken to warn authorities to sound alarm.
- Emergency Shutdown procedure and action to be taken should be displayed in the SO_2 production area in the local language.
- It should form an important part of mock drill to be carried out as per on-site emergency plan.
- In case of leakage as envisaged in MCA of flange joint leakage, area around SO_2 production unit and part of the main plant must be vacated immediately.
- Even in small leakage, IDLH concentration is within 10 to 12 m range and hence all leakages must be attended after wearing PPEs and SCBA.

- In case of major leakage of 5 mm as envisaged in the worst case scenario, area around 150 m to 500 m will be heavily affected and full onsite emergency plan for the entire plant will have to put in action and if necessary population around 1 to 1.5 km will have to be warned.

Co-generation plant:

The company has present co-generation plant with capacity of 38 MW and plans to add another 11 MW to have total generation of 49 MW. Cogeneration will be done through steam turbines of double extraction condensing route (DEC) by 40 and 70 TPH Boiler with steam generation at 72 Kg/sq. cm pressure at 540^0C steam temperature and using steam turbines for T.G. sets.

The steam produced is used for power generation through turbine and the extracted steam is used for internal consumption for Sugar plant and Distillery operation

The boiler is as per IBR design standards, maintained and approved by IBR authority's rules and regulations.

The boiler and Co-generation unit incorporates all the necessary instrumentation, alarms and interlocks and is operated through DSC system to ensure the safe operation.

Hazard identification:

Heavy high pressure steam leakage, resulting in noise pollution, and in the worst case explosion involving boiler.

Mitigation measures in place:

- As mentioned above all the precautions and mitigation measures as per the statutory rule are in place and are strictly observed.
- Important interlocks such as boiler water control, fans tripping on backfire, steam pressure, noise have been provided for boiler. In turbine section, high speed trip, bearing vibration and temperature in addition to the standard alarms and controls are recommended.

Distillery Plant:

Presently the company has 60 KLPD capacity plant for Alcohol production and is planning to install new plant with a capacity of 90 KLPD and thus, total capacity will be 150 KLPD alcohol production. Present plant is a standard plant for the production of Alcohol, PC controlled with necessary instrumentation, alarms and interlocks. Process and other details for the proposed plant are given in earlier part of the report.

Production capacity will be increased by setting up an additional plant in the existing plant site. The location has been marked.

Hazard Identification:

There are two areas of concern:

- Molasses storage: Heavy leakage of Molasses, total breakage of tank, leading to loss of life and pollution.
- Alcohol Storage: Leakage leading to fire.

Molasses storage:

Molasses production from the present 11040 MT/M will be 14040 MT/M after expansion, two molasses storage tanks of capacity 10000 MT and 6500 MT each will be added for expanded capacity.

Mitigation Measures:

It is necessary to take following mitigation measures to prevent bursting of tanks and heavy leakage and loss of life.

Storage of molasses:

- Molasses should be stored in good quality and leak proof mild steel tanks.
- Adequate safety factor should be incorporated into the design of wall thickness considering deterioration that will occur due to corrosion over a period of time.
- Regular internal and external inspection should be scheduled for checking wall thickness of the tanks.
- Dyke/ Bund walls should be constructed around the tank or tanks.
- It must be ensured while finalizing the dyke dimensions and that thickness that clear volume inside the dyke walls is equal or more than 1.2 x volume of tank storage capacity.
- Continuous mixing of molasses through external pump circulation should be done.
- If there is increase in temperature beyond 30°C external cooling of tanks shall be provided by heat exchanger in the circulation line.
- Frequent Temperature monitoring, manually or by recorder is strongly advised.

  If there is leakage:

  - Leakage should be washed out and diluted and should be recycled as far as possible or must be properly treated in Effluent treatment plant.

- Replacing of leaky gaskets, joints, should be done strictly by following work permit system.
- Leakage of pipelines, welding repairs should be attended / carried out outside the plant. The necessary hot work permit should be issued after taking necessary precautions and firefighting measures for onsite hot work, by the concerned authority before any hot work is undertaken.
- Leakage through pump gland shall be reduced to the minimum by installing mechanical seals.
- To attend all major leakage in tanks the following procedure should be followed:
  - Transfer the material to other tank.
  - Prepare the tank for welding repairs by making sure that it is positively isolated with blinds from other vessels and ensuring that it is free of the chemicals and gases by purging air and carrying out air analysis before any hot work is undertaken and this should be done by skilled workers. For this purpose safety permit should be given.
- During the shutdown, Molasses tank are emptied for cleaning sludge and maintenance. General practice is to manually remove the sludge/tank bottoms and drain this in the open without treatment. If such practice is being followed, It is strongly recommended to discontinue this practice and use pump suitable for pumping viscous sludge by diluting it and let out after proper effluent treatment.

Production of Alcohol:

Major hazard identified in the production unit is release of alcohol vapors and fire. It is recommended to eliminate the risk and hazard at the design stage of the expansion itself by carrying out detailed systematic HAZOP study of the entire process and make the process and operation intrinsically safe.

Major area of concern from Risk and hazard is Alcohol storage:

NFPA rating for Alcohol is NH (Health Factor) NF (Fire Factor) NR (Reactivity)

NF= 3, NH = 2 and NR=0, indicating fire as the major hazard in handling and storage of Alcohol

Following storage **(Table 1.2)** has been for various grades of alcohol in the existing plant in the unit 1 and 2:

Table 1.2: Details of Storage for Grades of Alcohol

Sr. No.	Number	Storage	Diameter (m)	Height (m)	*Capacity of Each Tank (cum)	Total Capacity (cum)
1.	1	ENA	10.77	10.00	900	--
2.	1	ENA	8.85	10.00	600	--
3.	3	ENA	9.67	8.76	575	2075
4.	1	RS	8.75	10.00	600	--
5.	2	RS	8.50	9.67	575	1175
6.	2	Impure	5.85	7.50	200	--
7.	2	Impure	6.10	6.60	187	387
8.	1	Ethanol	10.70	10.00	900	--
9.	1	Ethanol	8.77	9.68	577	--
10.	1	Ethanol	11.476	9.67	1000	2477
11.	3	SDS	11.476	9.67	1000	1000
12.	4	Ethanol addl.	11.476	9.67	1000	1000

Note: * Capacity rounded off

New storage tanks for ethanol of 1000 cum, each of 11.476 m diameter and 9.68m of height are proposed to be installed for the expanded capacity.

Qualitative Risk analysis:

For the storage of3600 m^3 of alcohol, Fire and Explosion index has been calculated to be 72 based on the Material Factor MF= 16 and storage conditions (Degree of Hazard is rated based on of Fire and explosion index as follows).The degree of hazard is well given in **Table 1.3.**

Table 1.3: Degree of Hazard

Degree of Hazard and F&EI Index	
F&EI Index Range	Degree of Hazard
1-60	Light
61-96	Moderate
97-127	Intermediate
128- 158	Heavy
More Than 159	Severe

F&EI index is in the range of moderate degree of hazard:

Mitigation Measures:

- Based on standard recommendations for moderate hazard, it is recommended that Alcohol storage tanks should be placed in open in dyke walls and must have spill collection and control (recycle) arrangement to pump into another tank.
- As indicated the storage will be placed in open with dyke walls.

- Clear distance between tanks will be provided as per the requirement of Petroleum Rules.
- Location of pumps, location of tank farm in the factory should be as per the requirements of Petroleum Rules.
- Necessary approval from Chief Controller of Explosives will be obtained for the alcohol storage and factory lay out.
- Proper firefighting system, inside the plant and around the storage tanks will be designed as per IS or international code and Fire NOC will be obtained.
- Fire fighting around Alcohol storage will be as per OIS 117 standard with sprinkler system and foam based firefighting arrangement.

Quantitative Risk Analysis:

F&EI index can also be used for estimating the damage that would probably result from the accident/fire. It is converted to radius of exposure by multiplying it by 0.84 to feet. Thus radius of exposure in this case will be 0.84x72= 60 feet or 18 m.

Quantitative risk analysis for the Most Credible Scenario and Worst Case Scenario:

Following conditions are assumed for the Most Credible scenario:

One of the 4 Alcohol storage tanks of 1000 m^3 capacity, Tank is 80% full and there is leakage through hole /rupture of 20 mm at a distance 0.5 m from the bottom and the alcohol leakage forms a pool within the dyke wall catches fire and there is a pool fire.

For the worst case scenario:

One of the 4 Alcohol storage tanks of 600 m^3 capacity, Tank is 85% full and there is leakage through hole/rupture of 50 mm at a distance 0.5 meters from the bottom and the alcohol leakage forms a pool within the dyke wall catches fire and there is a pool fire.

Effects of Pool Fire:

Pool fire may result when bulk storage tanks will leak/burst and the material released is ignited. As these tanks are provided with dyke walls to contain the leak and avoid spreading of flammable material, the pool fire will be confined to the dyke area only.

However, for the calculation it is assumed that it is unknown as the dyke wall dimensions are not known and will change after installation of tanks as per the Petroleum Rules 2002.

Results are as follows:

For worst case scenario with 50mm Hole

Atmospheric Data: (Manual Input of Data)

Wind: 5 m/second from SW at 3 m

Ground Roughness: open country Cloud Cover: 0 tenths

Air Temperature: 35° C Stability Class: C

No Inversion Height Relative Humidity: 5%

Source Strength:

Leak from hole of 50 mm in vertical cylindrical tank

Flammable chemical is burning, as it escapes from tank

Tank Diameter: 11.467 m Tank Length: 9.68 m

Tank Volume: 1000 cum

Tank contains liquid Internal Temperature: 35° C

Chemical Mass in Tank: 685 tons Tank is 80% full

Circular Opening Diameter: 5 centimeters

Opening is 1 m from tank bottom

Max Flame Length: 7 m

Burn Duration: ALOHA limited the duration to 1 hour

Max Burn Rate: 90.2 kg/min

Total Amount Burned: 5,216 kg

Note: The chemical escaped as a liquid and formed a burning puddle.

The puddle spread to a diameter of 8.3 m.

Threat Zone:

Threat Modeled: Thermal radiation from pool fire:

Red : 13 m --- (10.0 kW/ (sqm) = potentially lethal within 60 sec)

Orange: 16 m --- (5.0 kW/ (sqm) = 2nddegree burns within 60 sec)

Yellow: 21 m --- (2.0 kW/(sqm) = pain within 60 sec)

For MCA with 20 mm hole

Max Flame Length: 4 m

Burn Duration: ALOHA limited the duration to 1 hour

Max Burn Rate: 14.4 kg/min

Total Amount Burned: 835 kg

Note: The chemical escaped as a liquid and formed a burning puddle.

The puddle spread to a diameter of 3.3 m.

Threat Zone:

Threat Modeled: Thermal radiation from pool fire

Red : less than 10 m(10.9 yards) --- (10.0 kW/sq. m = potentially lethal within 60 sec)

Orange: less than 10 m (10.9 yards) --- (5.0 kW/sq. m = 2nddegree burns within 60 sec)

Yellow: less than 10 m(10.9 yards) --- (2.0 kW/sq. m = pain within 60 sec)

Conclusion: Serious threat zone remains with the confines of the dyke wall and firefighting piping when laid 10 meters away from the dyke wall, fire can be extinguished from the safe distance, there is no threat to the population outside the plant.

The criterion chosen for calculating thermal radiation effects for the above values is based on the following information.

Thermal radiation due to pool fire may cause various degrees of burns of human bodies. Exposure at different incident levels of thermal radiation on human with exposed skinis elaborated in **Table 1.5**

Table 1.5: Radiant Heat and Effect on human

Radiant Heat (kW/m^2)	Effect on human with exposed skin	
37.5 KW/m^2	100% lethality in 1 min;	1% lethality in 10 seconds
25.0 KW/m^2	100% lethality in 1 min	significant injury in 10 seconds
12.7 KW/m^2	1% lethality in 1 min	first degree burns in 10 seconds
9.5 KW/m^2	Pain threshold reached after 8 seconds	second-degree burns after 20 seconds
4.0 to 5.0 KW/m^2	Sufficient to cause pain to personnel after 20 seconds and blistering of skin	--
1.6 KW/m^2	Causes no discomfort for long exposure	--

It is observed that, the exposed persons normally find shelter or protection from the heat radiation (e.g. against a wall) within 10 seconds. However, exposure time of 30 seconds is normally assumed for pessimistic calculation, which applies if people do not run away immediately or when no protection is available.

Recommendations based on QRA:

- There needs to be sprinkler system installed on the tanks to cool the tanks in the case of pool fire. Tanks close to the leaking tank will be very close to flame length of 4 m, and will also be heated and radiation zone of 37.5 kW/sq. m
- Fire hydrant lines should laid minimum 15 m away from the tanks for fighting persons to stay at a safe distance away from heat radiations. This has been incorporated in the firefighting design proposed
- As per plant layout, the other buildings and other units are at safe location from the Alcohol storage tank farm
- In case of pool fire under the worst case scenario, there will be no threat outside the factory premises.
- Based on the **Table 1.5** given above, it is recommended to follow the interspacing distances as given in the Petroleum Rules 2002 (Extract of Table -3 from petroleum rule 2002 is given in **Annexure {I}**). This will be incorporated in the proposed tank farm layout.
- Chief controller of Explosives license and clearance will be obtained as per the requirement of Petroleum rules 2002.

Firefighting system design around alcohol storage:

Fire hydrant system, with necessary alarm systems, piping, with required number of hydrant points, hose boxes, pump, auxiliary pump to operate, auxiliary power generator/backup will be designed as per relevant IS standards.

The static firefighting pumps shall conform to the requirements given in IS 12469: 1988. The capacity of pumps should be worked out based on requirements of output and pressure for the system 171 m^3/h @ 7 kg/m^2.Provision shall be made for standby pumps fed from different source of power at the rate of 50 percent of aggregate number of pumps, subject to minimum of one and maximum of two. Where pumps are of different capacities as per DBR, Main Electric

Pump, Stand by Pump Electric or DG, Sprinkler Pump, if Further applicable and Jokey Pump are required.

Firefighting hydrant system in the entire plant will be as per IS909: 1975 Standard with Hose Reels

Special firefighting arrangement around RS and ethanol, ENA tank farm will have

- Medium Velocity Water Spray system Configured with Deluge Valve System and Automatic Smoke Detection System with Multisensory Detectors with Manual Call Point and Hooter.
- Automatic Sprinkler System Or Internal Hydrant & Hose Reel with Foam Ratio Controller. NFPA 13 & 15 + Foam Monitor Nozzle. NFPA 13 & 15.
- Foam sprinkler system, configured with AFFF foam tank NFPA 16.

1.4 On-site Emergency Plan:

The company has on-site emergency plan (part of Risk assessment done earlier) prepared and in lace for the existing facilities.

The same can be modified with inclusion of Quantitative Risk analysis results given above and Mitigation measures and other suggested modifications.

Safety Measures during regular and shut-down:

It must be remembered that shutdown plant are also and sometimes more prone to accidents. Hence, it is suggested that all workers, regular and contract workers should be issued proper PPE, like helmet, safety shoes etc. as necessary.

All work, hot work, working at height etc. during working and shutdown period should be carried out with proper work permit and under proper supervision.

1.5 Occupational Health Aspects and medical provision in the factory

Effects of Alcohol on health:

It reacts vigorously with oxidizing materials. TLV for 8 h is 1000 ppm (ACGIH). Minimum identifiable concentration has been reported as 350 ppm.

Exposure to concentrations of 5000 - 10000 ppm results in irritation of eyes and mucous membranes of the upper respiratory tract.

Effects of exposure to higher concentration of Alcohol in the atmosphere are given in the following **Table 1.6**

Table 1.6: Effect of Ethyl Alcohol

mg/l	ppm	Effect on human
10-20	5300 – 10,640	Some transient coughing and smarting of eyes and nose, not tolerable
30	15,960	Continuous lacrimation and marked coughing; Could be tolerated with discomfort
40	21,280	Just tolerable for short period
> 40	>21,280	Intolerable

- To prevent injury to workers, standard PPEs will be provided. In addition, sufficient
- Number of Self-contained breathing apparatus will be provided to be used in case of major alcohol leakage to avoid exposure to higher levels of Alcohol
- All precautionary methods will be adopted by the company to reduce the risk of exposure of employees to occupational safety and health hazards

Medical check-up: Pre & post medical check-ups will be done of all the employees. Employees will be regularly examined and the medical records will be maintained for each employee. Pulmonary function test and periodical medical checkup shall be done once in every year.

The following tests will be conducted for each worker:

- Lung Function Test
- Radiology - X-ray
- Pulmonary Function Test
- Audiometric Test
- General clinical examination with emphasis on respiratory system
- Pre-employment examinations
- Periodical medical examinations at the time of employment and after completion of employment.

Occupational Health Center (OHC):

The organization is carrying out regular health checkup of workers. A medical fitness certificate issued by Medical Officer Primary Health Center Pimpalner, Solapur is enclosed as **Annexure {II}.** It may be noted that no abnormalities are noticed during health checkup.

The company will have OHC and other medical facilities at the site as per the Factories Act and based on number of employees.

A few guide lines are given below:

Under rule 73 W, All factories carrying out hazardous processes must have OHC with required services and facilities:

A) For factories employing up to 50 workers:
   i) Medical officer on retainer ship basis.
   ii) Minimum 5 workers trained in first aid, at least one shall be available during all working hours.
   iii) Fully equipped first aid box (What it should contain is also specified later)

B) For factories employee 51 to 200 workers
   i) OHC with min. floor space of 15 sq. meters.
   ii) Part time medical officer.
   iii) One qualified and trained dresser-cum- compounder throughout all working hours.
   iv)Equipped first aid box

C) For factories employing more than 200 workers,
   i) Full time medical officer up to 500 workers and one more full time medical officer for every additional 1000 workers or part thereof
   ii) OHC with 2 rooms.
   iii) one compounder and one ward boy 24 by 7
   iv) OHC to be equipped all emergencies

With what OHC should be equipped with is given in details in schedule.

Requirement of Ambulance van for any factory carrying on hazardous process shall be provided and maintained is defined under 73-X.

For factories with less than 200 workers, management must have an arrangement for getting ambulance van at short notice, it also details out what facilities ambulance Van should have.

Other important requirements are:

- Company must have, MSDS for all hazardous chemicals at site
- Pre-employment medical checkup and six monthly medical check-up for all employees, including contract workers and record must be available
- Since the operation involve storage and handling of toxic chemicals, affecting liver, kidneys, lounges, medical test must include the specific kits to check functioning of these vital organs

- The company carries out medical checkup for workers as per the requirement; the health checkup parameters can be modified in consultation with the qualified medical doctor.

Standard Medical facilities as required by Factory Rule are expected to have been provided in the OHC for the existing plant, some important are illustrated below:

1. Well-equipped First Aid Boxes will be provided in each Section of the factory.
2. Snake bite Lancet
3. In case of need, factory will be having dispensary to give effective medical facility to workers. In dispensary, sufficient stock of medicines shall be available to provide to workers in case of any major emergent situation.
4. A vehicle will be always available to shift the sick/injured person to District Hospital.
5. Ambulance will be made available 24x7 in the factory to deal and take the injured workers to the district hospital.

1.6 EHS policy:

The company has the EHS policy and it is known to all employees.

Disaster Management

Disaster Management Plan (DMP) is to provide guidelines for on-site emergencies and Emergency Preparedness Plan (EPP) for off-site emergency. The Existing DMP Plan is attached as **Annexure {III}.**

7.7 Social Impact Assessment. R&R Action Plan

The study on social impact is already discussed in Chapter 3 under section no. 3.3.12. R&R plan is not applicable to this project as the expansion will be on existing premises only.

Annexure {I}: Guidelines for storage of Class A and Class B solvents storage

Guidelines for storage of Class A and Class B solvents stored in above ground when bulk storage exceeds 5000 KL or where any tank diameter of any storage tank exceeds 9 meters. Extracted from Table 3.

Schedule II

1. Distance between 2 Class A storage tanks = or > 0.5D Diameter of large tank or d= Diameter of small tank or 15 meters
2. Distance between tank and filling Shed for Class A or Class B =15 meters.
3. Distance between tank and tank loading and unloading area for Class A or Class B =15 meters
4. Distance between tank and flame proof electric motors = 15 meters
5. Distance between tank and office building workshop etc =15 meters
6. Distance between tank and boundary fencing around the installation =20 meters

Annexure {II}}: Worker health check-up Report

Medical Fitness Certificate

This is to certify that I have examined according to list of male workers R/o Gangamangam for fitness to work at the center as per berth on date. 23/11/14

all are physically fit

hence certified

Vithalrao Shinde S.S.K.Ltd., Gangamainagar, Pandharpur,Tal. Madha Dist.Solapur.
Co-Gen Staff for Sugar Manufacture Projects

Sr.No.	Code No.	Name of employee	Designation	Date Of Birth	Uniforms			Remarks
					Size	Given	Required Size	
		Administration						
1	[illegible]	[illegible]	Managing Director	[illegible]	X	X	X	
		Engineering						
2	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
3	[illegible]	[illegible]	Asst. Engineer-VI	[illegible]	X	X	X	
4	[illegible]	[illegible]	Dy. Chief Engineer	[illegible]	X	X	X	
5	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
6	[illegible]	[illegible]	Dy. Chief Engineer	[illegible]	X	X	X	
7	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
8	[illegible]	[illegible]	Automobile Engineer	[illegible]	X	X	X	
9	[illegible]	[illegible]	Asst. Engineer-VI	[illegible]	X	X	X	
10	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
11	[illegible]	[illegible]	Asst. Engineer-VI	[illegible]	X	X	X	
12	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
13	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
14	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
15	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
16	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
17	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
18	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
19	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
20	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
21	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
22	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
23	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
24	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
25	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
26	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
27	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
28	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
29	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
30	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
31	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
32	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
33	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
34	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
35	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
36	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
37	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
38	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
39	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
40	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
41	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
42	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	

Sr. No.	Folio No.	Name of Shareholders	Designation	Date of Birth	Shareholding			Remarks
					Share	Share certificate	Share warrant	
43	72	[illegible]	Shareholder	[illegible]	X	X	X	
44	73	[illegible]	Shareholder	[illegible]	X	X	X	
45	76	[illegible]	Shareholder	[illegible]	X	X	X	
		Manufacturing			X	X	X	
46	[illegible]	[illegible]	[illegible]	[illegible]	X	X	X	
47	110	[illegible]	[illegible]	[illegible]	X	X	X	
48	911	[illegible]	[illegible]	[illegible]	X	X	X	
49	914	[illegible]	[illegible]	[illegible]	X	X	X	
50	915	[illegible]	[illegible]	[illegible]	X	X	X	
51	922	[illegible]	[illegible]	[illegible]	X	X	X	
52	923	[illegible]	[illegible]	[illegible]	X	X	X	
53	924	[illegible]	[illegible]	[illegible]	X	X	X	
54	926	[illegible]	[illegible]	[illegible]	X	X	X	
55	930	[illegible]	[illegible]	[illegible]	X	X	X	
56	931	[illegible]	[illegible]	[illegible]	X	X	X	
57	934	[illegible]	[illegible]	[illegible]	X	X	X	
58	971	[illegible]	[illegible]	[illegible]	X	X	X	
59	974	[illegible]	[illegible]	[illegible]	X	X	X	
60	979	[illegible]	[illegible]	[illegible]	X	X	X	
61	981	[illegible]	[illegible]	[illegible]	X	X	X	
62	986	[illegible]	[illegible]	[illegible]	X	X	X	
63	992	[illegible]	[illegible]	[illegible]	X	X	X	
64	993	[illegible]	[illegible]	[illegible]	X	X	X	
65	96	[illegible]	[illegible]	[illegible]	X	X	X	
66	121	[illegible]	[illegible]	[illegible]	X	X	X	
67	122	[illegible]	[illegible]	[illegible]	X	X	X	
68	123	[illegible]	[illegible]	[illegible]	X	X	X	
69	975	[illegible]	[illegible]	[illegible]	X	X	X	
70	975	[illegible]	[illegible]	[illegible]	X	X	X	
71	976	[illegible]	[illegible]	[illegible]	X	X	X	
72	981	[illegible]	[illegible]	[illegible]	X	X	X	
73	983	[illegible]	[illegible]	[illegible]	X	X	X	
74	912	[illegible]	[illegible]	[illegible]	X	X	X	
75	916	[illegible]	[illegible]	[illegible]	X	X	X	
76	1004	[illegible]	[illegible]	[illegible]	X	X	X	
77	575	[illegible]	[illegible]	[illegible]	X	X	X	
78	575	[illegible]	[illegible]	[illegible]	X	X	X	
79	580	[illegible]	[illegible]	[illegible]	X	X	X	
80	711	[illegible]	[illegible]	[illegible]	X	X	X	
81	730	[illegible]	[illegible]	[illegible]	X	X	X	
82	139	[illegible]	[illegible]	[illegible]	X	X	X	
83	142	[illegible]	[illegible]	[illegible]	X	X	X	
84	142	[illegible]	[illegible]	[illegible]	X	X	X	
85	541	[illegible]	[illegible]	[illegible]	X	X	X	
86	617	[illegible]	[illegible]	[illegible]	X	X	X	
87	616	[illegible]	[illegible]	[illegible]	X	X	X	

Sr.No	Empno	Name of employee	Designation	Date Offrtd	Dikanaar			Remarks
					Sita	Cheta ghem	ramas uraca bla	
88	134	JARE RAMCHANDRA DATTATRYA	Pan- Incharge	01-06-1963	x	x	x	
89	786	DESHMUKH DATTATRYA BHAGWAN	Pan- Incharge	21-01-1965	x	x	x	
90	135	Jadhav Rajendra Madhavrao	Pan- Incharge	01-06-1970	x	x	x	
91	106	JADHAV RAJENDRA BABASAHEB	Pan- Incharge	15-06-1969	x	x	x	
92	107	Sonawane Sunil Bhaurao	Panman	11-06-1972	x	x	x	
93	108	Mahalingade Bhaurao Manohar	Panman	01-06-1963	x	x	x	
94	124	Gujral Hanumanth Laxman	Pan- Incharge	01-06-1971	x	x	x	
95	973	SHINSAT SANDRAN SHANKAR	Pan- Incharge	07-06-1971	x	x	x	
96	840	Jawale Dhana Arjun	Asst. Panman	01-06-1971	x	x	x	
97	948	Jagtap Lalu Sadhnath	Asst. Panman	01-06-1972	x	x	x	
98	948	Pulli Shahajirao Belkhire	Asst. Panman	01-06-1976	x	x	x	
99	971	Ghodake Govind Sadashiv	Asst. Panman	01-06-1983	x	x	x	
100	984	Inje Shalaram Jothiram	Asst. Panman	01-06-1976	x	x	x	
101	988	Zambre Mahadev Laxman	Asst. Panman	02-06-1980	x	x	x	
102	989	More Santosh Popat	Asst. Panman	01-06-1980	x	x	x	
103	998	Hagadhar Tatyarao Wanshar	Asst. Panman	01-06-1982	x	x	x	
104	921	Gaikwad Sanjay Navnath	Asst. Panman	01-06-1975	x	x	x	
105	938	Gaikwad Manik Dattatraya	Asst. Panman	12-06-1976	x	x	x	
106	815	Bhoge Bajarao Madhukar	Asst. Panman	28-06-1981	x	x	x	
107	839	Bachute Sudarshan Prabhakar	Asst. Panman	01-07-1983	x	x	x	
108	823	Kawane Hanumant Pandurang	Asst. Panman	08-08-1976	x	x	x	
109	1017	SHINDE NAVNATH BAPURAO	Asst. Panman	01-06-1986	x	x	x	
110	935	Shembde Sakhi Ambadas	C DEMOBILIZED-C	13-06-1970	x	x	x	
111	814	Bagal Prabhakar Dnyandev	C DEMOBILIZED-C	01-06-1972	x	x	x	
112	824	Mete Changdev Ganpat	UNSKILLED B	01-06-1972	x	x	x	
113	939	Phad Rajendra Raghunath	UNSKILLED-C	16-06-1977	x	x	x	
114	830	Mulani Rafik Bashir	UNSKILLED-C	08-06-1977	x	x	x	
115	140	Vagh Bhaoso Khushna	Centrifugal Mat	11-06-1974	x	x	x	
116	113	JEDHE TARAJI THAKAJI	Centrifugal Mat	01-01-1984	x	x	x	
117	136	Waghe Arun Maruti	Centrifugal Mat	01-01-1982	x	x	x	
118	141	Ghadge Vishnu Ramchandra	Centrifugal Mat	01-06-1971	x	x	x	
119	137	Ramani Dhondiba Nanaji	Centrifugal Mat	19-06-1976	x	x	x	
120	987	DARADE ASHOK PRAKASH	Centrifugal Mat	02-04-1980	x	x	x	
121	931	DARADE SADASHIV LAXMAN	Centrifugal Mat	01-06-1980	x	x	x	
122	138	Dhanan Govind Rajnde	Centrifugal Operator	10-01-1977	x	x	x	
123	139	Dhanan Subhash Dagadu	Centrifugal Operator	11-11-1974	x	x	x	
124	539	Dhage Bhagat Dagadu	Centrifugal Operator	01-06-1979	x	x	x	
125	540	Deshmukh Vishwas Pulchand	Centrifugal Operator	01-06-1979	x	x	x	
126	564	Halwade Bhau Dattatraya	Centrifugal Operator	01-06-1979	x	x	x	
127	580	Bhangale Ujaba Gajanan	Centrifugal Operator	18-04-1981	x	x	x	
128	581	More Babu Subhash	Centrifugal Operator	06-06-1981	x	x	x	
129	519	Lonkhe Ramchandra Madhukar	Centrifugal Operator	01-06-1975	x	x	x	
130	563	Shinde Laxman Balkrishna	Centrifugal - Operator	01-06-1975	x	x	x	
131	559	Lonkhe Onkar Bhagwan	Centrifugal -Operator	01-06-1975	x	x	x	
132	565	Lonkhe Arvind Manik	Centrifugal -Operator	16-07-1975	x	x	x	
133	574	Lonkhe Mohan Yashwant	Centrifugal -Operator	01-06-1969	x	x	x	
134	247	Thorat Chandrakant Shrinivas	Centrifugal -Operator	23-01-1973	x	x	x	

Sr. No	Emp. No	Name of employee	Designation	Date Of Birth	Dasara			Remarks
					Saris	Cloth given	Cash given Rs.	
134	347	Magar Rajendra Bala K	CLEARK-3	01-09-1968	x	x	x	
135	424	Nalawade Anil Ajab	CLEARK-4	01-05-1970	x	x	x	
137	503	Jagtap Rajendra Tukaram	CLEARK-4	10-06-1975	x	x	x	
138	593	Kale Pandurang Tatyaram	CLEARK-4	01-05-1974	x	x	x	
139	920	WADAV JANARDHAN RAMAWADH	Dancer Belt Filter	05-05-1001	x	x	x	
140	211	UNDHAV BALASAHEB DYANDEV	SEMI SKILLED	01-08-1966	x	x	x	
141	943	PATHAK PRAVIN PRABHAKAR	Sugar Godown Keeper	05-10-1976	x	x	x	
142	988	KHATAKE VIKAS ABDHAN	CLEARK-3	01-06-1980	x	x	x	
		Manufacturing Seasonal-1						
143	940	YEOLE KISHOR UTTAM	Lab Chemist C Grade	29-01-1981	x	x	x	
144	1019	SALUNKE PRABHAVAT BHARAT	Lab Chemist C Grade	01-05-1986	x	x	x	
145	1020	BOCHARE PRITAM BHARAT	Lab Chemist C Grade	01-11-1987	x	x	x	
146	714	Gawali Surendra Sukdev	Diesel	28-08-1980	x	x	x	
147	769	Phuge Sunil Ramhari	Diesel	01-08-1982	x	x	x	
148	762	Khalane Mahadev Sunil	Diesel	24-01-1985	x	x	x	
149	870	Bagal Sandip Shivaji	Asst. Pannman	30-05-1987	x	x	x	
150	889	Patkar Shakaji Shivaji	Asst. Pannman	01-06-1984	x	x	x	
151	802	Nagtilak Prabhakar Chandram	UNSKILLED-C	01-06-1973	x	x	x	
152	836	Phuge Jalindar Raghnath	Centrifugal Operator	28-12-1979	x	x	x	
153	737	Phodhare Pratapsinha Raghunath	Centrifugal -Operator	01-05-1984	x	x	x	
154	738	SALUNKE AMOL KAMLAKAR	Centrifugal -Operator	01-02-1987	x	x	x	
155	739	Shinde Somanath Ashokrao	Centrifugal -Operator	01-06-1986	x	x	x	
156	741	Ajwane Deepak Vithal	Centrifugal -Operator	11-07-1984	x	x	x	
157	742	Pate Shivaji Vishwanath	Centrifugal -Operator	01-06-1000	x	x	x	
158	750	Dhaigir Somanath Rameshchandra	Centrifugal -Operator	01-03-1987	x	x	x	
159	806	DHIDLE BHASKAR RAJARAM	CLEARK-3	01-06-1987	x	x	x	

Managing Director
Vithalrao Shinde S.S.K.Ltd.

Annexure {III} Disaster Management Plan

On- Site Emergency Control Plan

It has been noticed that company prepared Emergency Control plan for the situation of fire, explosion and accidents involving human beings/property, also natural calamities like earthquakes, floods, etc. But the Emergency Control plan needs to be modified. It has been observed that Fire Hydrant System is provided. And also precautionary measures are taken by providing fire-fighting equipments like first aid fire appliances.

1. Definition of Emergence :-

It is one, which has the potential to cause serious injury or loss of lives, damages to property and serious disruption inside and outside the industry or to the environment. The emergency will normally manifest itself in three basis forms-fire, earthquake & serious accidents.

2. Objectives of Emergency plan :-

Following are the objectives of emergency control plan

a. To locate the emergency and if possible eliminate the same.
b. To minimize the effects of accidents on people, property and environment.
c. The command, coordination & response organization structure along with efficient trained personnel.
d. The availability of resources for handling emergencies.
e. Appropriate emergency response action.
f. Regular review and updating of emergency plan.
g. Proper training of the concerned personnel.

Concept of Operation

The emergency Control Plan and its associated response have been established to provide direction to personnel in managing an Emergency Situation to ensure the health, safety or employees/general public and contain the environment. This plan establishes the concept of operation for,

- An Assessment of the emergency situation.
- Timely and Effective mitigation of the emergency condition.
- Management of emergency response activities.
- Notification to Plant Personnel and Off-site personnel & organizations.
- Recovery from the Emergency Conditions.
- Post – Emergency action.

3. Potential Emergency Situations :-

Emergency situation are a discrete phenomenon and not continuous occurrence. Otherwise it will lose its "emergency" credentials. These situations have different shades and colors of their intensity to cause damage and hence they need to be identified the form in which they manifest. Considering the location and the activities carried out on site; four different types of emergency situations are envisaged for drawing up this plan.

1. Fire/Explosion:
2. Accident involving human beings and/ or property;
3. Natural calamities / disaster such as cyclone & earthquakes,
4. Preparedness Requirement.

- **Fire / Explosion :-**

There is a possibility of fire due to hazard imbedded in process, storage of hazardous material & storage of bagasse.

Sr. No.	Activity	Fire
1.	Storage of hazardous material.	Fire hazard due to unsafe storage practice / condition.
2.	Bagasse storage.	Fire hazard due to unsafe work practice / condition.
3.	Hazardous process.	Fire/ explosion hazard due to unsafe practice / condition or unsafe action.
4.	Escaped dust production area.	Occupational hazard/ Fire due to unsafe work practice / condition.
5.	Storage of combustible material like paper, wood etc.	Fire hazard due to unsafe storage practice / condition.

- **Accident :-**

Accident is unwanted, unexpected occurrence arising out off or in the course of employment that way cause bodily injury, property damage and which may interrupt smooth flow of production.

The different activities carried out and falling within the scope of this plan involve complex process and hence some of them have potential for causing accident, for example working on heights, operation of electrical one or more personnel depending on their nature.

Anticipate situations that have potential for accident and which call for preparedness response are listed in the table below.

Sr. No.	Nature of work	Type of Accidents
1.	Mechanical & electrical maintenance work inside plant and also working on heights i.e. on roof replacement of sheet, replacement of roof lights etc.	Person falling from height. Material falling over human being. Accident due to rotating machine. Electrical shock. Damage to the Property. Caught in between type accidents. Project work related to machine erection.

- **Natural Calamities / Disasters such as Earthquakes :-**

Considering the location as past history the most probable anticipated Natural calamity is earthquake. Such disaster involves damage to properties and loss of lives. The potential emergency situation considered is shown in table below:

Sr. No.	Nature of work	Type of Accidents
1.	Earthquake	Damage to properties. Loss of lives. Structure collapse causing death / injury to human beings. Minor and major injuries.
2.	Thunder Lightning	Damage to properties. Injury or death due to electrical shocks.
3.	Cyclone	Damage to properties. Loss of lives Structure collapse causing death / injury to human beings.

Preparedness to face different emergency situations:-

Fire:-

Sr. No.	Activity	Fire	Preparedness
1.	Storage of hazardous Material	Fire hazard due to unsafe storage condition / practice	• Maintenance department conducts test and preventive Maintenance of all critical equipment. • External agency conducts survey and servicing quarterly for the adequacy and state of firefighting equipment i.e fire extinguishers. • The fire tender and ambulance van have

			approach road in case of emergency. • Sufficient water is available. • A separate team is constructed for fire fighting only. Necessary training is provided to team through security officer & outside experts. • Separate team for first aid and rescue are also constructed. Responsibilities are explained to concerned team members. • All security people are trained in fire fighting. • All electrical appliances are earthed properly.

Responsibilities of technical team

- Utility Operator to provide assistance for use of water tanks & water pipeline / hydrant system.
- Maintenance Engineer & fitter shall go to emergency spot & give necessary support as per the Incident controller's instructions.
- Electrical Engineer / Electrician: if required, cut off electrical supply of that area on the instructions of Incident / Main Controller and provide portable lights / extension lights.
- Instrumentation Engineer / Technician: act as per instructions by incident / Main controller
- Boiler attendant: no to leave boiler- house till he receives further instructions from incident Main controller and act accordingly.

Responsibilities of Fire Fighting Team

- After reaching the spot, to act as per the instructions of the Incident Controller, the following jobs are assigned to Firefighter during emergency.

1.Fire fighting.

2.Area Cordoning.

3.Guiding the ambulance.

4.Assisting /coordinating fire brigade.

5.Stopping wok permit activity.

6.Containment of spillage etc.

7.Confirmation of resources, water storage required for fire fighting.

8.Participating in mock drill and correcting the lacunas operation.

- After handling the emergency, to be engaged in salvage operation if required, otherwise in normal case to go back to the plant and resume the work.

Responsibilities of First Aid Team

- After receiving the information, the doctor and medical assistant to remain in ambulance room only.
- First Aiders to go to the site. If required provide first aid treatment remove the casualties from the place, shift them to ambulance room for required treatment.
- Provide assistance to Doctor / Medical assistant.
- Confirmation of required medicines at the time of emergency

Responsibilities of rescue team

- Identify the Wind direction. Evacuate people from emergency location.
- Guide them towards the assembly points. Carry out head count operation.
- Give feed back to Main Controller.
- In case of off- site implications, they will carry megaphone and evacuate neighboring village with help police.
- Rescue operation.
- Traffic control.

Personal Protective Equipments:
Here is the list of personal protective equipments,

1) Safety Goggles;
2) Helmets;
3) Hand gloves;
4) Safety shoes;
5) Face shields;
6) Nose mask;
7) Ear plugs;
8) Safety belts;
9) Crawling ladders;
10) Canister respirations mask of ammonia gas;

Assembly point: Main Gate.

Communication Method: Phone / Mobile.
Communication Center: Identified
Ambulance & Hospital: Available.

Training:

Training is given to all employees for procedure in reporting emergency, knowledge of alertness, location of Fire Fighting Equipments and it use.

Testing and Evaluating of Emergency Control plan:

Testing and evaluating is an integral part of Emergency preparedness.

Objectives:-

1. Teat knowledge and skill of participating personnel.
2. Provide an opportunity to practice skills under realistic condition.
3. Educate the plant personnel and other concerned.
4. Test the communication network and co-operative response skill.
5. Establish criteria for corrective action.

Emergency Drill

The success of this plan is depending upon planned and unplanned mock drills.

Mock drills will be carried out regularly and a register will be maintained.

Mock drill helps to familiarize workers, employees for their roles.

Procedure for Emergency drills.

- Inform all the employees about the Emergency drills (for planned drill and no information to employees, workmen if it is a surprise drill) and the signal to be given.
- Mock drill shall be conducted every month.
- Emergency Drills will be monitored by the Observer (who will be one of the senior officers) not involved in the exercise.
- Emergency Alarm.
- Site controller will take the charge in case of absence / non-availability of the chief controller.
- After emergency is over All Clear Alarm will be raised.

Emergency Team

On hearing the emergency, the Emergency Team leader establishes communications with Chief Controller / site Controller and start handling the emergency directly.

These teams directly handle the emergency under the instructions from Chief Controller / Site Controller.

Declaration of Emergency

The declarer of emergency (works main controller) will be immediately come to the place and assess the situation and act in an appropriate way. In case of emergency the effects of which are not going to be outside the Factory Premises; he may try to control it himself. If the emergency may affect areas outside the factory then he will get in touch with Fire Brigade, Police, Factory Inspector (Dy. Director, Dept. of industrial Safety and Health, Kolhapur), and Hospital who will guide and help at the time of emergency.

As and when an emergency condition occurs, the initial indication is made by security in charge and alarm insecurity office, or from operators in various sections or areas who observe a problem and inform their supervisors. The Supervisors immediately notify the Unit Head/HOD. Simultaneously, he directs for the immediate actions of plant personnel for mitigating the conditions and assesses the conditions and classifies it as appropriate. Upon classifying the situation as an On-site /off- site Emergency, HOD assumes the responsibility of the Incident Controller and activates the Emergency Control Plan. If emergency condition occurs after general shift hours, shift In Charge assumes the role of Incident Controller.

Upon classifications as an On-Site Emergency, The Site Controller authorizes the communication coordination to complete notifications to the appropriate Off-Site agencies to call in addition support personnel as directed the site controller the Emergency Control Plan; while the HOD resumes his function as Incident controller of the Emergency Control Plan.

Upon classifications as an Off-Site Emergency, The site controller provider for the immediate notification to the appropriate Off-Site Governmental Authorities, provides recommendation for public protective actions, if necessary, and activates the full Emergency control Organization. This Organization operating out of Main control center, functioning as Emergency Operation center provides Overall Assessment Damage Control, Notifications and communications, and Employee and Public Protective. Upon termination of emergency, the Site controller establishes recovery organization to manage those activities necessary to return operations to normal.

1.Works Main Controller

WMC (Works Main Controller) shall rush to Emergency Control Center (Main Office) no sooner he receives information on emergency. His duties are outlined below:

a. Before proceeding to Main Office he should visit the emergency spot to understand the type and seriousness of the occurrence.
b. Call key personnel to Assess the situation and review of possible development.
c. Direct shutting down the plant and evaluation of the premises.
d. Call outside emergency services i.e. Fire Brigade, Police and inform nearby industries and residential areas, if necessary.
e. Ensure that casualties are receiving adequate medical attention and arrange for additional help and advice to the relatives.
f. Liaise with Chief Fire Officer, Police Department, and Factory Inspectorate etc.
g. Accounting of personnel and control traffic movement.
h. Issues authorized statements to the news media and inform head Office if required.
i. Preservation of evidence for enquiries by statutory authorities.
j. Control rehabilitation of affected areas.

2.Works Incident Controller.

On intimation of emergency he will rush to the scene of occurrence and take overall charge and shall report to the works main controller.

k. Assess the scale of emergency and act accordingly.
l. Direct all operations within the affected area / plant to minimize damage to the plant and property, environment and loss of material and for the safety of the personnel.
m. Direct rescue and Fire Fighting Operations until the arrival of outside Fire Bridge.
n. Instruct the non – essential workers to assemble as ASSEMBLY POINT.
o. Report evidence and assist outside services.

3.Asst. To Works Main Controller Liaison & Communication.

On hearing of an emergency he will rush to the Emergency control Center. If works Incident Controller is not available he will act as work Incidence Controller and his duties will as mentioned above. If work incidence controller is available, his duties will be as below.

p. Visit Emergency Spot to assess the scale of Emergency.
q. He will help works incident controller for controlling the emergency and also report to work main controller.
r. Receive casualties and help them and inform relatives.
s. Control traffic inside the factory and arrange transport ambulance etc.

t. Under the guidance he will handle police, Press Enquiries, roll call, visit assembly Point, get latest information and inform to work Main Controller.

u. Arrange First Aide through first – aid team to the causalities.

v. Collection of records and conducting enquires and submit the report to Dept. of industrial Safety & Health.

w. Making Insurance Claims.

x. Implementation of recommendations by Factory Inspector (DISH Office).

y. Rehabilitation of affected persons.

z. Help works main controller for reporting to head office.

4.<u>Communication</u>

On hearing of emergency he should proceed to emergency control center (Main office) and maintain communication with incident controller.

aa. He will communicate to Fire Brigade, Police and hospital as per the instruction of works main controller.

bb. If telephone fails he will arrange for runners to communicate various office and spot effectively.

cc. He will take instruction from works main controller and pass on the same to the concerned.

5.<u>Security Dept.</u>

At the time of emergency as per the instruction of works Main Controller / Incident Controller security person will "BLOW ALARM CONTINUOUSLY FOR FIVE MINUTES" So that all concerned people will come to know about emergency.

dd. As soon as he ring the bell he will rush towards the emergency spot for actual fire fighting.

ee. All security dept is responsible for actual fire fighting with the help of other operators.

ff. If the emergency is beyond their control they will report immediately to works incident controller for outside help.

gg. All security people will help fire Brigade for controlling the fire and work as per their instruction.

hh. At the time of emergency one security person should proceed to the fire pump house and ensure the pump operations.

After the emergency is over security person will "BLOW ALARM THREE TIMES AT THE INTERVAL OF TWO MINUTES". To in form concerned people that emergency is over.

6.Members

All members will rush to emergency spot and help as per the instructions of work incidence controller and Asst. to work main controller.

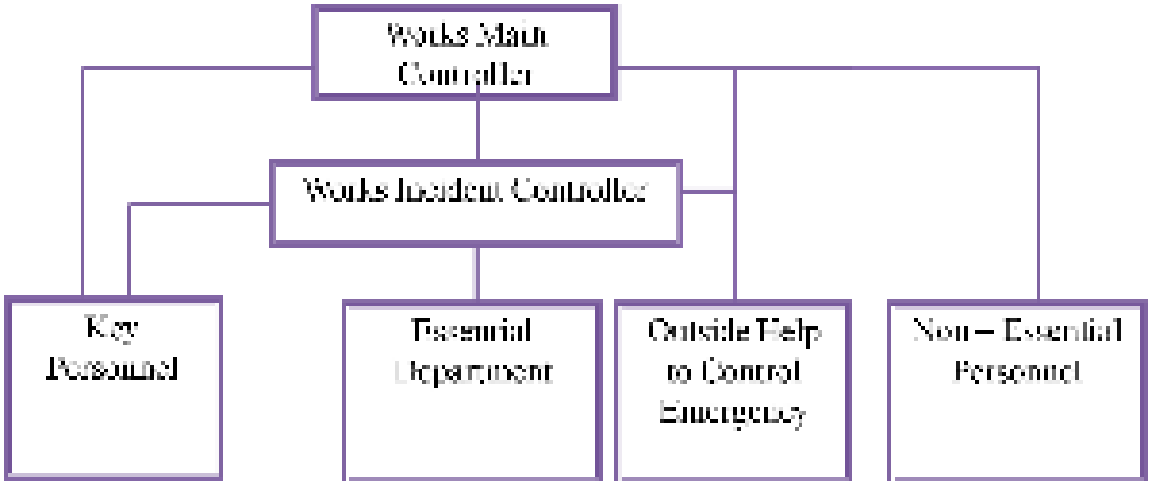
7. All Operators / Other Employees.

ii. On hearing the emergency bell (continuously ringing for five minutes) all employees who have been asked to move ASSEMBLY POINT should move quickly towards the assembly point without panic.

jj. The employees who have been trained in fire fighting should start fire fighting operations as per the instruction of security people and the employees who are trained for first – aid should start giving first aid to required person under the guidance of assts. To works main controller.

kk. After the emergency is over the bell will ring three times at the interval of two as per the instructions of their head of dept or in charge.

Control Structure



Vitthalro Shinde Sahakari Sakhar Karkhana Ltd

Gangamainagar- Pimpalner Tal. - Madha Dist. - Solapur

Emergency Reference and Action Plan

Assembly point co-ordinator	Communication team	Rescue team	Fire team	First Aiders	Search team	Fire pump operator
Mr. Mutekar J.B.	Mr. Gaikwad A.A.	Mr. Sapate. M.E.	Mr. Shelk. S.S.	Mr.Khupse S.T.	Mr.Shinde B.D.	Mr.Aware V.G.
Mr. Mahadik M.D.	Mr. Kaiche S.D.	Mr. Sutar H.P.	Mr. Dhaygude G.M.	Mr.Kadam B.K.	Mr. Salunke V.G.	Mr. Thosar A.B.
Mr.Kolekar B.R.	Mr. Bade V.U.	Mr.Anbhule T.H.	Mr.Mulani M.J.	Mr. Bhosale B.M.	Mr. Khatake P.B.	Mr.Kute N.M.
Mr. Dange V.R	Mr. Randive N.N	Mr.Yele A.S.	Mr.Survase A.H.	Mr.Shaikh R.J.	Mr. More B.B.	Mr. Mane S.S.
Mr.Shinde U.S.	Mr.Jagtap A.K.	Mr.Dhotre R.K.	Mr.Anbhule P.T.	Mr.Ghodake L.D.	Mr.Khandale R.S.	Mr. More V.S.
Mr.Kadam N.G.	Mr.Shinde S.R.	Mr.Gaikwad A.V.	Mr.Pawar G.B.	Mr.Pawar S.L.	Mr.Chavna G.S.	Mr.Kedar R.F.
Mr.Thorat H.B.	Mr.Pathak P.P.	Mr.Sarkate G.N.	Mr.Yele D.A.	Mr.Miskin T.M.	Mr.Patil B.S.	Mr.Jadhav M.S.
Mr.Shinde G.N	Mr. Gavhane S.V.	Mr. Godase M.E.	Mr.Thorat H.B.	Mr.Vhanmane.S.K	Mr.Wagh B.H.	Mr.Bedage D.M
	Mr. Sonawale J.M.	Mr.Miskin A.J	Mr. Adhegaonkar S.A.		Mr. Yele.L.B	Mr.Raut H.S
	Mr. Mujawar A.G	Mr.Adhegaonkar G.A.	Mr.KhatakeV.S.			Mr.Kamble S.D.
		Mr.Miskin T.S.	Mr.Kadam H.P.			
		Mr.Londhe R.N.	Mr.Nandurke R.B.			
		Mr.Dhavale A.T.	Mr.Londhe T. R.			
		Mr.Londhe B.B.				

Important Contact Number

Name	Designation	Contact Number
Mr. C.S. Bhogade	Works Manager	9850489055
Mr.Mane A.A.	Safety Officer	9970500775
Mr.Mutekar J.B.	Safety Officer	9011218355

Important Telephone Number

Name	Location	Telephone number
Nearest Electrical board	Tembhurni	02183- 231366
	Pimpalner	02183- 264133
Blood bank	Barshi	02184- 222399
	Akluj	02185- 222101
	Solapur (Damani)	0217- 2722106
Nearest Fire station	Kurduwadi	02183- 223272
Nearest Police station	Kurduwadi	02183- 23333
	Tembhurni	02183- 231333
Nearest Hospital	Gangamai Clinic Karkhana site	9850022801
Day night medical stores	Gangamai Clinic Karkhana site	9850022801

Health and Safety Policy

CERMET

HEALTH AND SAFETY POLICY

This health and safety policy is prepared as per sec. 7A (3), 41 B (2), 112 of factories Act 1948 and rule No. 73 – L of Maharashtra Factories Rule 1963. The health and safety policy is applicable to Sakhar Karkhana, Co – generation and Distilleries.

We at Vithalrao Shinde Sahakari Sakhar Karkhana Ltd, committed to provide all necessary safety resources, training & PPE to our employees. We will provide risk – free work environment in our organization. "Safety of our people is most important for us".

Zero accident and pollution free environment is our goal and we will continuously strive to achieve the same. We have organizational set up to implement safety policy throughout the organization. Our line management is responsible to implement safety activities on shop floor. We will arrange to provide necessary training on safety subjects and implement latest techniques available in market. We will conduct internal safety inspection / audit to identify our status. We will consider individuals performance regarding safety at the time of promotion /increment. We abide by all rules & regulation framed by Govt. time to time.

This policy is compulsory for our employee, contractor, sub contractor and visitors.

Declared on – 6th June 2015

Review on – 6th June 2017

(V. Managing Director
Vithalrao Shinde S.S.K.Ltd.

Occupational Health Center

We are availing the facilities of occupational health center in the factory premises.

1. VSSSK has appointed three males nurses, who are posted at occupational health center 24x7. The male nurses are trained in first-aid, besides this VSSSK has tie-up Dr. Khatake Hospital which is within a radius of 1 km.
2. The company owned ambulance remains available around the clock, in addition one vehicle is kept as an emergency vehicle for 24 hr at our site. The doctor can be contacted on mobile in the event of medical emergency. The occupational health center is equipped with medical oxygen cylinder-2 nos, stretcher and 1 bed.
3. Every year complete bodies check up of all employees is carried out.

Sulphur storage

1. Maximum quantity of sulphur stored or in shed.

In ours factory sulphur storage in permanent godown. Its stored capacity is about 300 MT. From sulphur godown to sulphur burner one crane fitted for travel the sulphur upto sulphur burner.

2. Area provided for storing sulphur

Godown size length- 14 meter, width- 7 meter and its sulphur bag (50 kgs capacity) Appx. Stack height- 1.6 meter Godown capacity- 300 MT

3. Location of area marked for storage of suplhur in the factory.

Attached drawing as annexure I.

4. Please specify precautions taken in handling and in storage of sulphur

i. In sulphur storage godown, near provided by fire fighting.
ii. All worker use of personal protective equipment i.e. nose mask, handling used by hand gloves, gum boot and close fitting safety goggles.
iii. Provided by sand filling bucket aside the suplhur burner and sulphur storage godown.
iv. Provided by water cooling piping aside sulphur burner and godown.
v. Provided by First Aid box.

5. Details for generation and handling of sulphur. (used for sulphitation of sugar cane juice)

Sulphur bags unloading from vehicle to sulphur storage godown by workers using nose mask, hand gloves, gum boot and also sulphur filling mazdoor in melter sulphur burner.

SO_2 Generation

1) Before starting sulphur burner first upon start steam (5 to 6 kg/cm^2 press) which is generated by boiler or vapcon system (i.e self generated) to melter which is jacked vessel.
2) After that sulphur 1st filling in melter.
3) After that when sulphur melte in melter his molten sulphur (120°C) taken in melt receiver which is located below the melter.
4) Above molten sulphur taken in sulphur furnace which is located below the melte receiver vessel. After that compressed air i.e oxygen (O_2) to molten sulphur & SO_2 formation started.

The sulphur burner furnace temp Maintained at above 300 to 350°C this temp is maintained by using secondary air valve. To maintain scrubber outlet gas tem. Is 70°C to 75°C used by cooling water.

Then after generation of SO_2 gas, the continuous sulphitation of juice & syrup demand continuous supply of SO_2 gas. It is necessary to stress its importance for optimum juice sulphitation with ultimate control of pH, which forms the basis of process efficiency Attached drawing nos. 1, 2, 3 & 4.

6. Process description, Process flow diagram generation & storage pressure for SO_2

1) Before starting sulphur burner first upon start steam (5 to 6 kg/cm^2 press) which is generated by boiler or vapcon system (i.e self generated) to melter which is jacked vessel.
2) After that sulphur 1st filling in melter.
3) After that when sulphur melte in melter his molten sulphur (120°C) taken in melt receiver which is located below the melter.
4) Above molten sulphur taken in sulphur furnace which is located below the melted receiver vessel. After that compressed air i.e oxygen (O_2) to molten sulphur & SO_2 formation started.

The sulphur burner furnace temp maintained at above 300 to 350^{0}C this temp is maintained by using secondary air valve. To maintain scrubber outlet gas tem. Is 70^{0}C to 75^{0}C used by cooling water.

Then after generation of SO_2 gas, the continuous sulphitation of juice & syrup demand continuous supply of SO_2 gas. It is necessary to stress it's importance for optimum juice sulphitation with ultimate control of pH, which forms the basis of process efficiency.

Attached drawing - flow diagram: - sulphur burner, sulphiter syrup tower. Drawing no. 1, 2, 3 & 4.

7. Location of SO_2 Generation, in plant layout & in the factory layout, please provided drawing showing clear distance.

Attached – factory lay out new/old plant

Site information required SO_2

Details of absorption /scrubber system installed with sulphur or zero discharge of SO_2

In to the atmosphere. Attached – both diagram

The SO_2 gas is used only juice sulphitation syrup sulphitation process. It is necessary to stress its importance for optimum juice sulphitation with ultimate control of pH which form the basis of process efficiency.

Sulphitation tank absorption tower:-

1) Absoption tower is a cylindrical tank situated on the top of main sulphitation tank. The small amount of sulphur dioxide after reaction escape from the main sulphitation tank. And this gas is enters to absorption tower from bottom to top and juice/syrup enters in absorption tower from top to bottom. (i.e. juice travels downward direction and gas upward direction) so that all small amount of gas which escape from sulphiter will be absorbed.

2) For complete absorption, baffles are provided inside the tank. A vent provided on the top of the covered tower. Juice after absorbing gas, leaves from the bottom of the tower and enters the main sulphitation vessel from the bottom in venting only vapour is go the atmosphere zero discharge SO_2 gas to the atmosphere attached drawing no,-5.

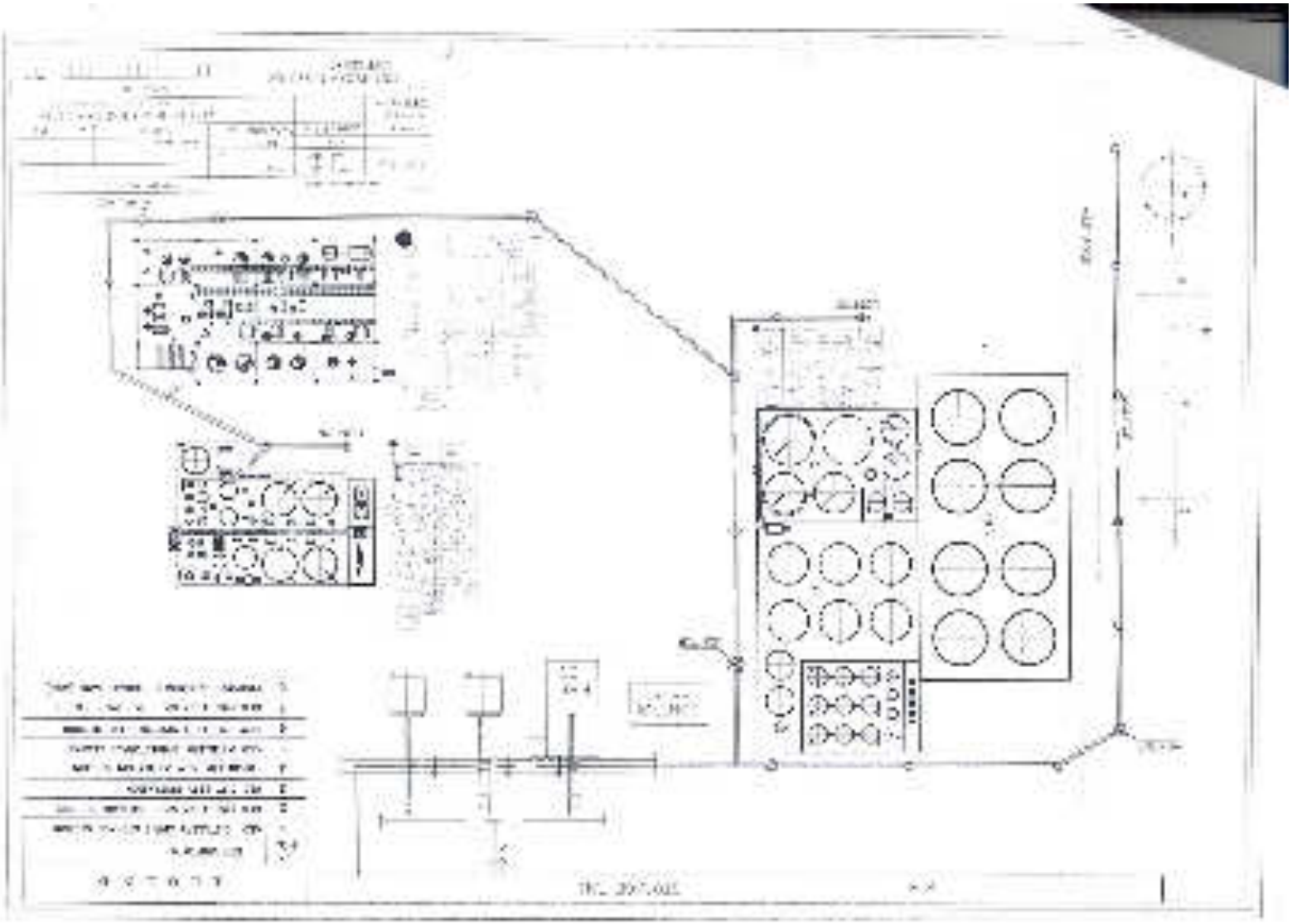
Fire Hydrant System: (Distillery)

An underground fire hydrant system has been installed in the plant rings around all blocks to achieve maximum coverage water.

Following are the details of the system.

1) Water reservoir - 700 M^3 + 500 M^3
2) Design code TACS fire protection manual.
3) Total No. of fire hydrant including landing valves - 24 Nos.
4) Automatic operation jockey pump of 10.8 M^3/hrs, head - 92, head capacity with pressure switches.
5) Standby arrangement Diesel generator with AMF control panel.
6) Nos. of hose boxes External - 18 Nos.
7) Nos. of hose - 36
8) Electric driven main pump 85 Mtr. Head and 171 M^3/hrs discharge.
9) Diesel operated pump 85 Mtr. Head and 171 M^3/hrs discharge.

Fire Hydrant System

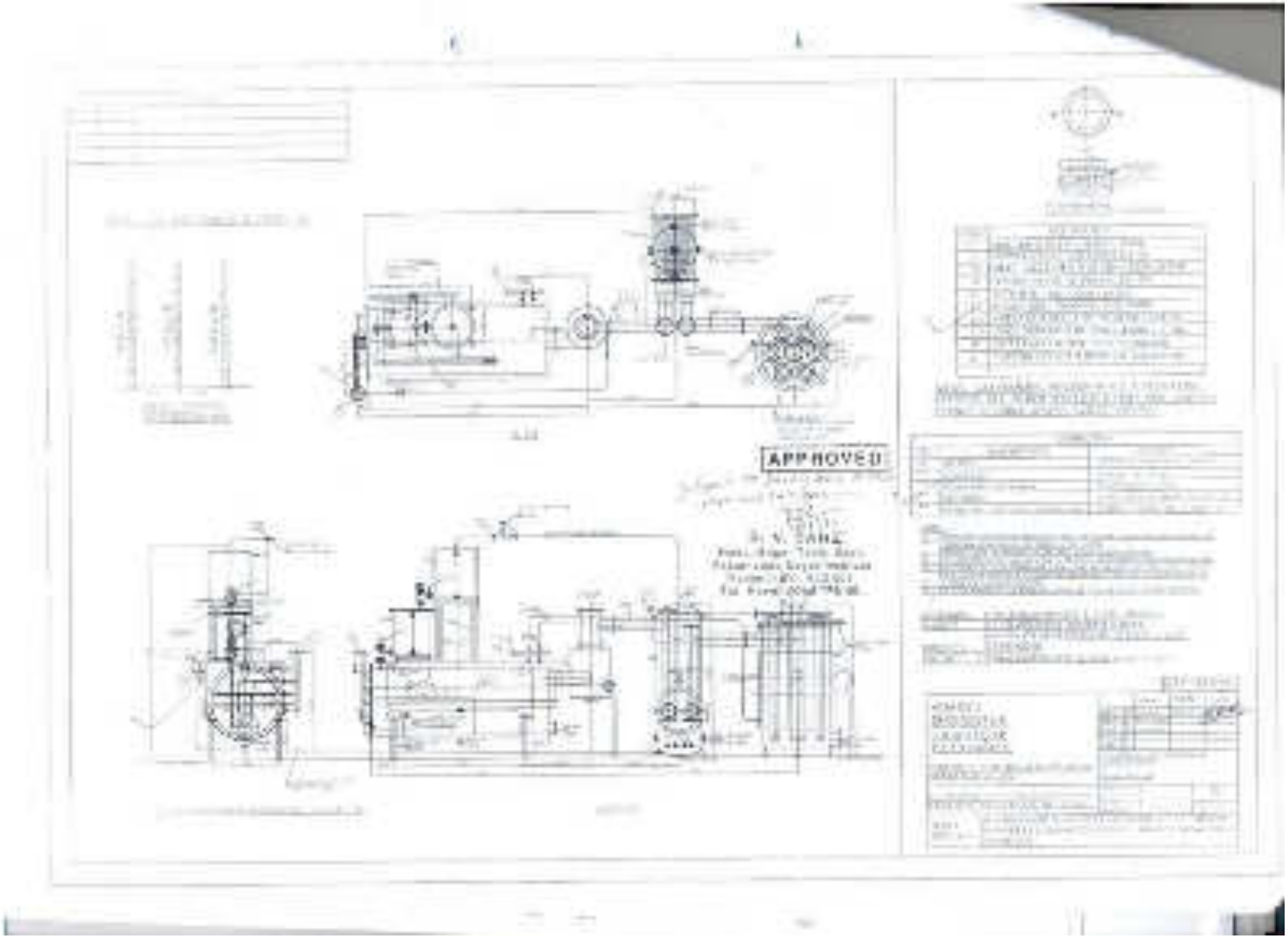


Vitthalrao Shinde Sahakari Sakhar Sakhana Ltd.,Gangamainager, Pimpalner

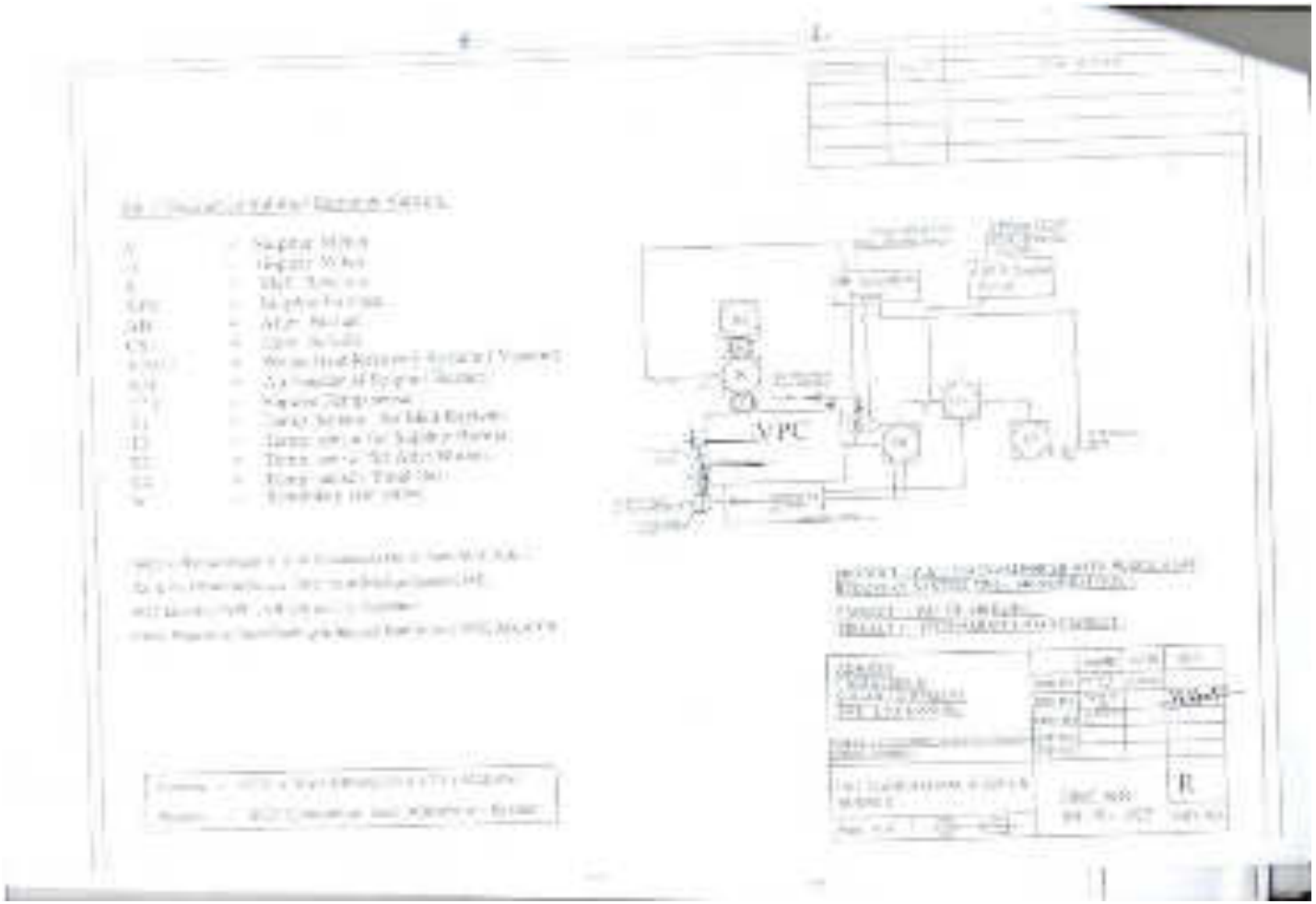
Existing R.S/ENA/I.S/T.A/ETHANOL Storage Tank Details

Sr. No.	Spirit Tank Name	Storage Capacity Litrs	Height Dip - CM	Diameter
Unit No-I				
1.	Rectified Spirit tank No-1	608205.0	1000.0	8.75 M
2.	ENA Tank No-1	900537.0	1000.0	10.7 M
3.	ENA Tank No- 2	608583.0	1000.0	8.75 M
4.	Ethanol Tank No- 1	901746.0	1000.0	10.7 M
5.	Impure Tank No-1	201636.0	750.0	5.85 M
6.	Impure Tank No-2	202218.0	750.0	5.85 M
Unit No-II				
7.	Rectified Spirit Tank No-1	575347.0	966.8	876.3 CM
8.	Rectified Spirit Tank No-2	575360.0	967.1	876.3 CM
9.	ENA Tank No- 1	575824.0	967.8	877.2 CM
10.	ENA Tank No- 2	575656.0	967.3	877.2 CM
11.	ENA Tank No- 3	576515.0	967.5	877.2 CM
12.	Impure Tank No-1	187200.0	663.8	610.2 CM
13.	Impure Tank No-2	187765.0	662.6	610.0 CM
14.	Ethanol Tank No- 1	577327.0	968.2	877.2 CM
15.	Ethanol Tank No- 2	1000015.0	967.9	11.476 CM
16.	SDS Tank No- 1	1000008.0	967.8	11.477 CM
17.	SDS Tank No- 2	1000006.0	967.8	11.477 CM
18.	SDS Tank No- 3	1000013.0	967.9	11.476 CM
New Proposed Storage Tank Details				
1.	New storage Tank NO- 1	1000008.0	967.8	11.477 M
2.	New storage Tank NO- 2	1000006.0	967.8	11.477 M
3.	New storage Tank NO- 3	1000013.0	967.9	11.476 M
4.	New storage Tank NO- 4	1000015.0	967.9	11.476 M

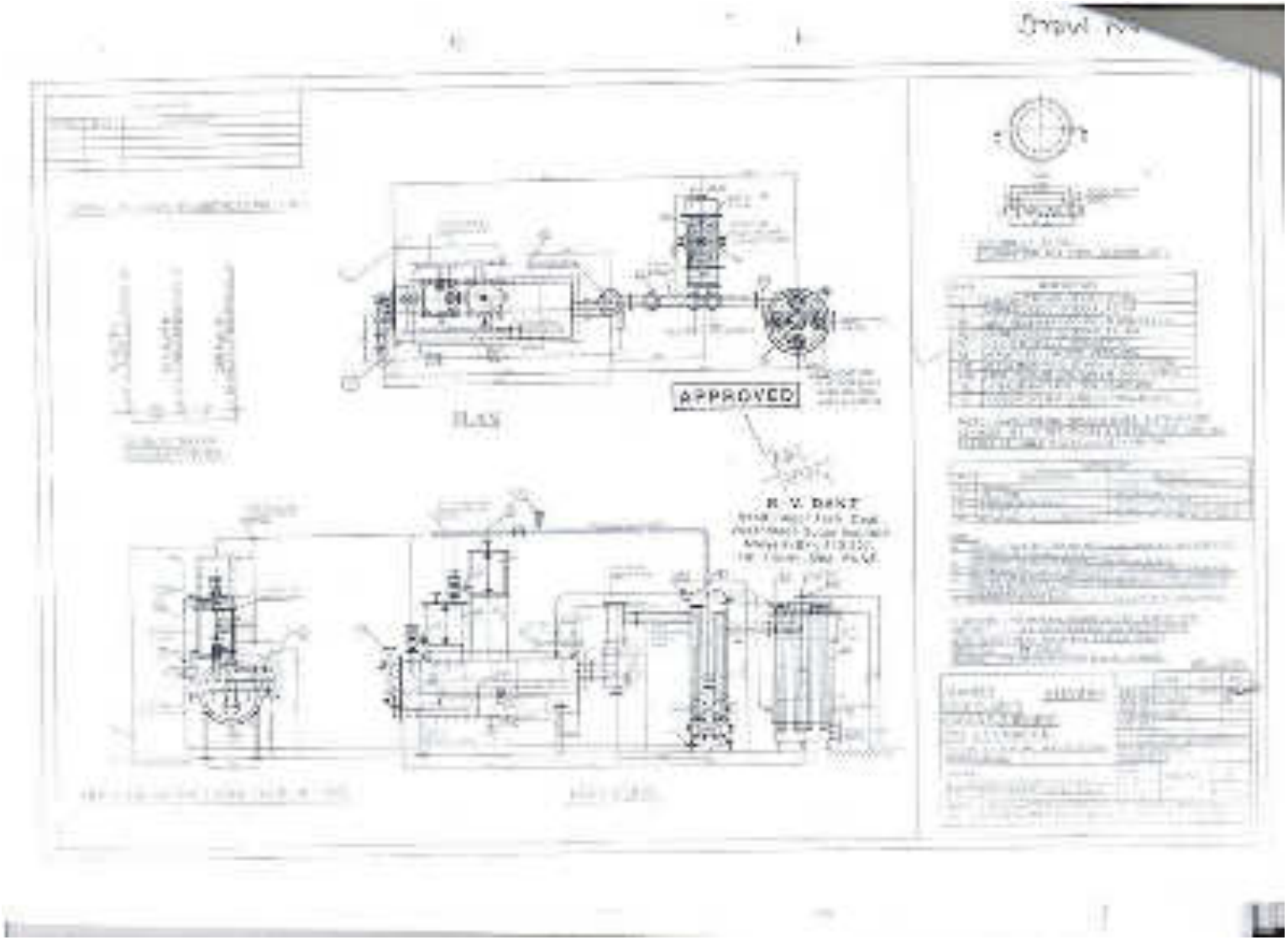
Drawing 1



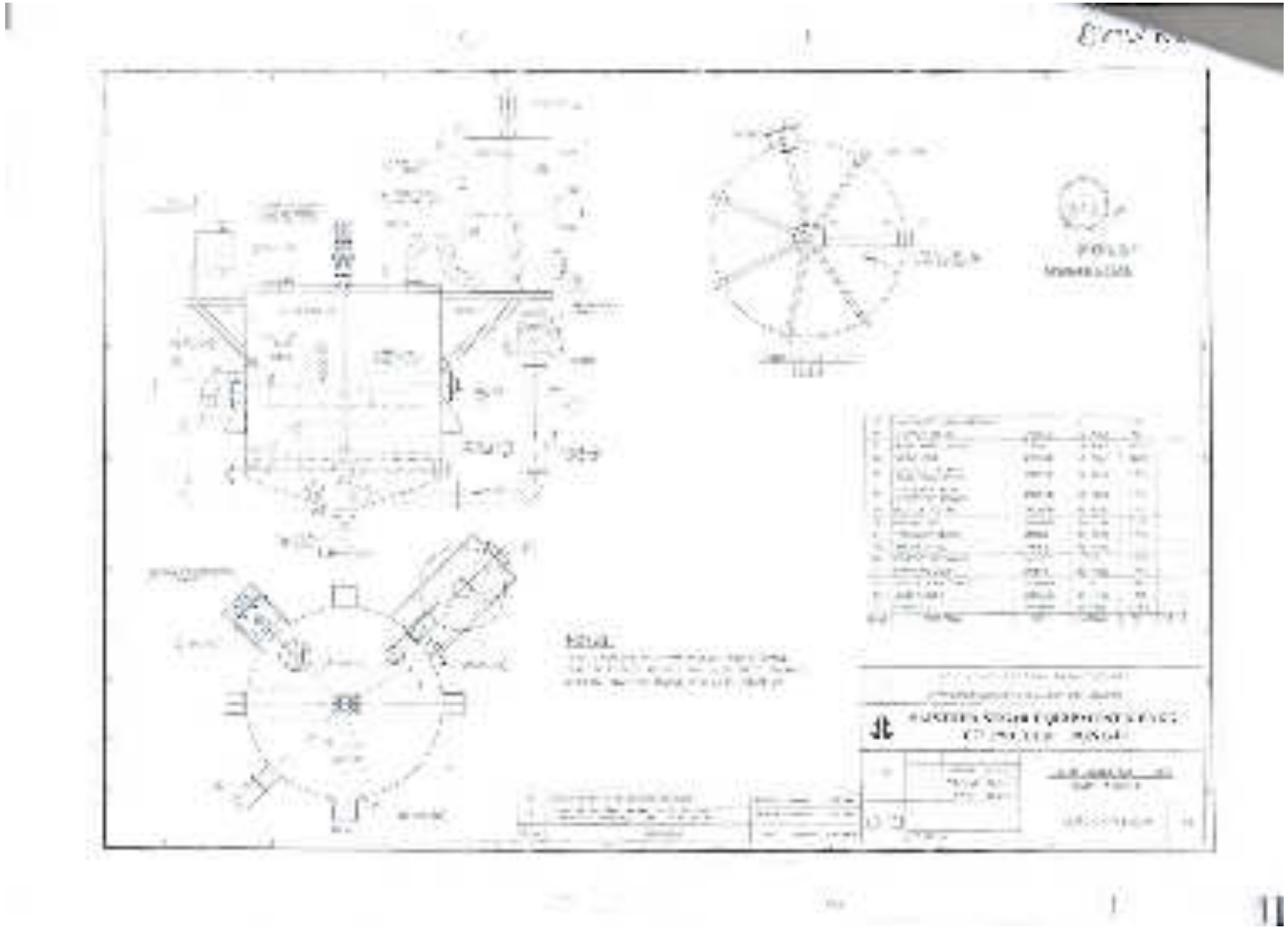
Drawing 2



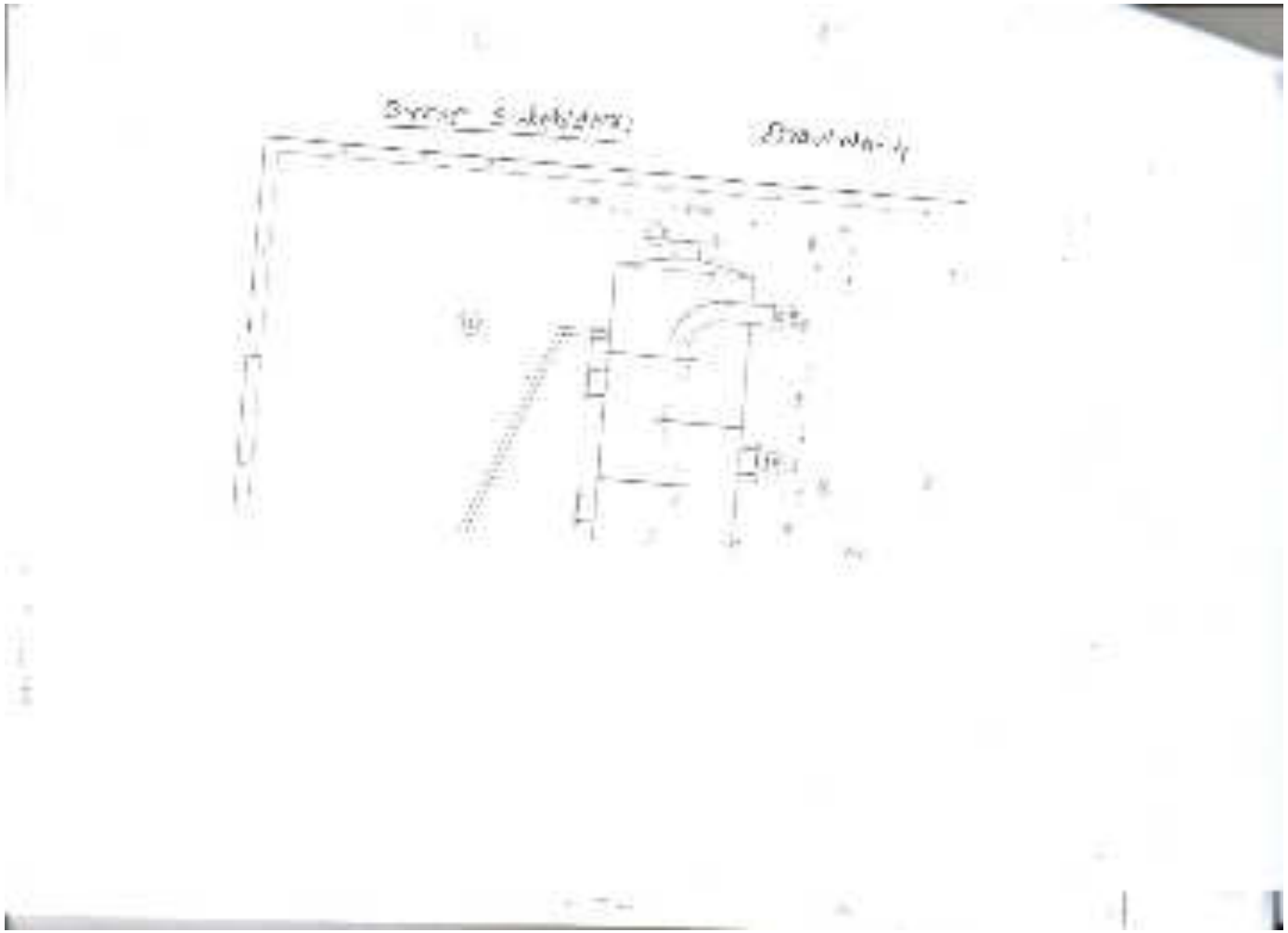
Drawing 3



Drawing 4



Drawing 5: Syrup Sulphiter



Drawing 6: Absorption Tower of Juice Sulphiter