

Chapter – 7

Additional Studies

7.1 Public Consultation/Hearing



Public hearing was applicable for the proposed facility as per the provisions of Notification no. S.O. 1533 (E) dated 14/09/2006 and its subsequent amendments, Ministry of Environment, Forest & Climate Change, Government of India, New Delhi. Public hearing is conducted for M/s. ArcelorMittal Nippon Steel India Limited, for Modification in existing Plant by Installing Auxiliary Facilities without Increasing Plant Capacity located at 27 km, Notified Hazira Industrial Area, Surat - Hazira road, Ta. Choryasi, Dist.: Surat, Gujarat covered under project category “A” of above referred notifications on 21.09.21.

The Public Hearing held on 21/09/2021 at 11:00 hrs. at ArcelorMittal Nippon Steel India Limited, Plant B Security Gate, Hazira Bypass Road, Hazira-394270, Ta. Choryasi, Dist. Surat under the chairmanship of Sh. Y. B. Jhala (GAS), Additional District Magistrate and Residential Additional Collector, Surat. Almost 550 persons attended the public hearing.

Details of the Public Hearing Proceedings are appended herewith the Final EIA/EMP Report:


- Public Hearing Proceedings-Public Hearing Proceedings along with attendance sheet have been enclosed as Annexure – 26 along with this EIA/EMP Report
- Public Hearing Notice published in Newspapers “Indian Express”, “Gujarat Mitra”, dated 17th August, 2021.
- AMNS received 22 no of written letters before PH and 9 no. of submissions during public hearing, whose reply were enclosed along with pH proceedings as annexure D.
- Photographs of Public Hearing




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Action Plan for the issues raised during Public Hearing


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1	Dharmendra Bhikhubhai patel (Sarpanch) Village: Hazira	<ul style="list-style-type: none"> • He submitted that I have some proposals and suggestions as Hazira Sarpanch for the public hearing of ArcelorMittal Nippon Steel India Limited organized by today's Gujarat Pollution Control Board which I present in the Council. We all welcome the public hearing for the environment that will be held today and there will be all kinds of support from our side. We agree that with the arrival of this company, there will be development of whole Gujarat including our village. As sarpanch of the Hazira village, I have had several meetings with the top official of this company. The attitude of most of the officials of this local company has been very cooperative. Through my constructive suggestions and presentations some unemployed students have been interviewed by the company and all have been assured to be trained and they will be provided permanent service by the company as per the rules. Secondly, some local engineers of Hazira were hired in contract by the previous company Essar Steel India and they have also been confirmed by the company to be made permanent and placed on the payroll of the company. Thus, the demand of me and the people of Hazira community were accepted by AMNS India Company. It is a great pleasure for me and the villagers as well. Thus, it has been fully ensured that all environmental policy rules, including local employment, are followed as well as maintain edifying what is called Corporate Social Responsibility (CSR) of the entire area, including Hazira. Thus, AMNS company has started very well. We personally welcome them and I personally believe that the entire Hazira village and the surrounding area will be developed along with the development of the company. People in the local Hazira area should get small and big contract businesses. Tenders should be received. We are hoping for all such things. We are confident that AMNS is providing business & employment to people of local Hazira area rather than providing business employment to an outsider. The long term interest of the company will also be maintained. Moreover, I am happy to say that there are many companies and big industries in our area, but AMNS, which was earlier Essar Steel India, has now become AMNS and this company is one of the highest recruiting companies in Gujarat. There are many other companies that have not hired any boy from Hazira. I am completing my speech by telling this. I request all of you to give our Ex Minister an opportunity to speak. 	<ul style="list-style-type: none"> • The Regional Officer said that let the project managers respond to your presentation which is as per the system of notification. Then as per your last presentation about the verbal submission by Ex Minister then in this connection it is to tell you that large numbers of locals are present here and therefore if Ex minister will submit their submissions in written then the same will be taken into consideration. This forum is for submission of locals. Therefore, it is more important that they will get opportunity for their submission • The Representative of the Project thanked him and said that he would give a positive response by discussing the representations received in this regard
2	Patel Jaimin Chandrakantbhai	<ul style="list-style-type: none"> • He submitted that I am a young man from Hazira village today with some questions before you. Many companies have entered on the lands of Hazira village 	<ul style="list-style-type: none"> • The Regional Officer stated that, Jaimin bhai, your detailed presentation will be included in the work note in

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	Village: Hazira	<p>and the villagers have also given their lands to the companies in the spirit of trusting the companies that they will get better livelihood and their business and employment will run. When the land is acquired and the two brothers are having their share and go to the government to collect the money kept in the treasury for the acquired land, then they are told to bring the Letter pad but no one provides the letter pad and requests them to pay to the person who is owed such money. Because it is the money of its own right</p> <ul style="list-style-type: none"> • There was Essar Steel India Limited in of our area and it was handed over to AMNS India Limited Hazira. But till date, the youth of the village, brothers and sisters, have not got permanent employment and those who had got are very few. As per rule, it is necessary that 80% locals should get employment but it was not given till now. So it is my humble request to provide employment to locals as per their education and knowledge. Brothers and sisters of Hazira town are doing service since last 20 years but they have not provided permanent job. But outsiders are coming to our town and they will get permanent service directly. This will create a need for 15290 people according to the company after the company's reposition. This is a humble request to employ as many of our local people as possible out of 15290. It has been many years since the company was formed but the opportunity for vehicle contracts is not available to the local people. And all contracts are given to the migrants and I want to tell their names also. USS Movers 	<p>today's public hearing and the Manager will reply to you. And your other point is that the public hearing should be held at Gram Panchayat Hazira, yes you are right. But it was clearly mentioned in the notification that it should be held within the proximity of the site. Three hearings were conducted in this area within a span of last two years. All these hearings which are Sandhi Cement, Essar Bulk Terminal and Adani port and have been held at the same place where the project is coming and each one has wide project and number or presenters were present in good quantity. So according to that notification, at site means the project has been planned at this place.</p> <ul style="list-style-type: none"> • The representative of the project thanked and informed that the AMNS company has started last year 2020. The company, which was earlier Essar Steel, was going into losses for some reason and was closing down. Under such circumstances, AMNS has taken up the project through a joint venture and has paid about Rs 50,000 Crore to the banks. Deposits of the banks have been secured by paying them. Our ideology is that people's problems will be solved by coordinating with everyone. • Regarding local employment, the company has about 3000 permanent employees and 80 per cent of it means 2400, which is not even the local employment capacity of Surat district. Local employment can be termed as the state of Gujarat. Government's rules are for Gujarat and efforts are being made by the company to ensure the same. We will work as you expect in terms of employment.

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		<p>and Jain trailers are the outside contractors and they are providing their vehicles on hire to the company and locals cannot get opportunity for the same</p> <p>There is a Mangrove Island to the south of the village. The island was seven decades old. Pollution causes huge damage to fish and aquatic animals and the locals of the village eat this fish and disturb their health. The arrival of companies in Hazira area has snatched away the livelihood of fishermen. While villagers approach company officials and ask for jobs or business. Then the officer's answer is to talk to the sarpanch. Is Sarpanch is managing the company? And when the job notification is issued, the company stipulates the conditions that the candidate must have taken education from standard one to five in Hazira town, are the officers in the company have studied in hazira from standard one to five?</p> <ul style="list-style-type: none"> • Despite of having so many companies around the village, there is not a single public hospital in our village. This is an AMNS company which will grow in the future and there will be a time when Hazira village will be known as AMNS village. • Toxic chemicals, toxic gases, chemical-rich water are released into the sea from the plant. After modification if the proportion of the same will be increased then pollution will be increased and due to these pollution residents of Hazira town will face the problems and disease of ear, nose, throat or disease like TB. Due to modification certain people of the town will have to suffer. Huge pits of garbage are piled up where there was plantation of trees and the same can be seen easily. Trees and land are severely damaged where stored and the locals who were getting employment by collecting this waste have become unemployment due to lack of education. In the programme related to environment name of our town was kept in last, it was organized first at Briquette House, second at SVC, third: near Suprabhat, fourth: CRM office, fifth : AMNS township, and sixth number is of Hazira, does it mean that there is Hazira town is having less impact of pollution? And other places such as Briquette house and AMNS office are having more impact of pollution. If company feels that there is less pollution in Hazira then they can visit to our town for examination about the level and impact of pollution and they can collect the samples and as the Sir has informed that there is no pollution in land. And if the pollution is found in the land then you have to show 	<ul style="list-style-type: none"> • Steps will be taken by the company for the hospital and the industries here will be organized with the help of the members of the association as well as the village elders as well as the Sarpanch. • On environment reforms, the GPCB said that instruction was given to the previous company the management also wanted to control environmental devices or controls. But we will complete the work as the previous company does not have financial positions or financial resources. We need some time for the same. This company came into existence since last one and half year. We are considering and taking definite decisions that all devices will be installed that will prevent pollution and said that we will put up a large screen which is higher than the height of the temple so that environmental particles do not come to the temple of Sikotar Mata. As shown in the presentation, equipment will be installed so that the particles are caught and disposed of before they go into the air. We will complete this work with environment clearance. This will improve the amount of particulate matter that is presently 80%.

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		<p>the place from where the samples were collected and provided the evidences of the samples to the local persons of our town so that they can see the same.</p> <ul style="list-style-type: none"> • The public hearing arranged at present is beside the plant. But there are many places in Hazira town even though why the public hearing is arranged beside the company? People of our town cannot reach in this public hearing easily so arrange the public hearing beside the Panchyat or at the surrounding area of town so that people of our town can reach easily. • Your company has developed various conveyor belts, pipe lines railway lines for its connectivity beside your steel plant which is situated on the only government road provided for the town and steel plant has also tried to take this road from the people of town even though you have an alternate option. The company asks for its safety to use the road on the east side on which the large LPG tanks, large furnaces of steel plants which are dangerous for the village. Hot iron is transported on the village road. The company calls for an alternative route to the west, but if there are very sensitive installations like shell, ONGC Terminal, Adani Petroleum, they find this dangerous, while the villagers living nearby are at an even greater risk and there is no way for the villagers to escape. For this, if the villagers get a way to escape in times of hardship and disaster and if the roads are allowed to remain both as an alternative route, people can use it for traffic and their movement. Locals are struggling a lot to save the road. Therefore it is the request of all of us that do not divert the road 	<ul style="list-style-type: none"> • The representative of the project said that the local people cannot come to the public hearing but you can see that a very good number of people have come. • The problem of transport is really complex. We will definitely resolve it and implement it by doing something concrete. • The regional officer said, Jaimin bhai, in approval of your submission I only want to state that I have received one written submission from Chandrakantbhai Balubhai Patel and it is the same submission which was orally described and presented by you” and you have read the same submission over here orally which means that you have raised all points verbally which was submitted by him in written. Therefore, a written response will be sent by the project administrators and will be included in today's public hearing work.
03	Deepakkumar Dhansukhbhai Patel Village : Damka	<ul style="list-style-type: none"> • He has stated that this plant has informed to the government in its previous hearing that this unit is Zero liquid discharge unit which means that not a single spot of polluted water will be released in the Tapi river or sea but sir has clearly mentioned clearly in his EIA report that Industrial dirty water through their RCC 	<ul style="list-style-type: none"> • The representative of the project thanked him and said that the things you are saying are the condition of the environment clearance received in 2016. He said that since Essar was a company in 2016, and therefore in 2016

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		<p>drain sewage is released daily 17250 cubic meter since last five to six years whereas on the other hand it was told to the government that they are not releasing a single drop of water which means that Sir is misleading the Government. I am asking its reply with evidences and submit the proofs if you have because we are openly violating the Water Act CCA Order EC condition C-12 Notification 2011-2019. The problems of water pollution are very serious and I want to show and explain through Map that how the cancer through water is developing? In this map it was mentioned in page – 2 of EIA report and page 32 of Tapi Chemical and Biological Environment monitoring report of Hazira plant that station is very close to five to six jetty. And old disposal point of steel plant is existed over there. The toxic chemicals that are present in acidic and polluted water are very high in the report. Because in our Hazira area, my grandparents called sea fish as sea feast and today I also eat these sea feast in our Hazira area and everyone in my area eats. Now my point is, sir, that in this polluted water, according to the certificates issued to the company by the Ministry of Forest, Environment, Climate Transport, Integrated Regional Office, Gandhinagar, EIA Report Appendix 24, the government is clear that zero effluent discharge is not a drop. That, this company has not complied. Due to non-implementation of this there are more than 80 cancer patients in my immediate surrounding area who are eating these fishes. And I am not telling this but this is mentioned in Government RTI report. In fact, there is a relatively very serious situation. I need detailed on-record evidence of this.</p> <ul style="list-style-type: none"> The company has mentioned in the EIA report that more than 15000 are to be employed but it was nowhere mentioned that how many boys were employed in 10 KM of Hazira kantha area then how can we trust? I had submitted my points and I am not satisfied. 	<p>environment clearance was taken by ESSAR, its use was to be expanded and the permission given and approved as part of that expansion was the condition of discharge of zero liquid. But after 2016 company do not have financial resources therefore expansion was not done by them therefore this condition is not applicable as the expansion plan was not executed.</p> <p>Project manager Shri Jose has also mentioned that the EC which was received in the year 2016, it was clearly mentioned but expansion of project was not executed therefore implementation was not done But, as per the earlier approval, the water is sent out after purification as per the permission for discharge in Tapi. The project we are planning will release 20,000 m. cubes of water. For that we are going to set up a reverse osmosis plant. We will reuse the water purified at the reverse osmosis plant and then dry the discharge that is there and dispose of the waste.</p> <ul style="list-style-type: none"> The Regional Officer said that the submission should be made on a point and the representatives of the project had earlier clarified that water is released as per the approvals and conditions received in the earlier approvals and the production capacity of the previous plant. Therefore, it is a humble request not to discuss it. The representative of the project said that as per the executive report, a total of 1700 persons have been shown under the project and the total employment of the entire plant after implementation of the project is to be 15290. Out of total 1700 employees there is 1000 direct and 700 indirect employees. Out of total 2800 places, 180 to 190 engineers of Hazira Kantha area are regular and there are another 200-300 persons through the various agencies of the company. Thus, as of today, the total number of

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			people in Hazira and surrounding areas is about 870 against the total number of people in the company.
4	Patel Chetankumar Manubhai Village : Gundardi	<ul style="list-style-type: none"> • He has informed in his submission that they way company is telling that we will provide employment to everyone. Sir, I am BE mechanical 2014 Pass out and company has not declared any recruitment advertisement for mechanical engineer. Seven years have been passed and I am unemployed. What should I do now? • In monsoon huge water was logged in our house and there is no solution of this problem then where should we go? Another problem is that company has made the surface level too high and therefore chemical and polluted water was coming into our house and there is no solution for the same and we have to face the same problem every year. • Another problem is Piling Machine: when column and beam was installed for coating plant then piling machine were operated and due to that houses of many villagers were broken and there were cracks in the walls of many houses. There is no solution for the same 	<ul style="list-style-type: none"> • The representative of the project thanked that the company could not reach the production capacity of the company. The Sarpanch of the surrounding village has been visited. In which everyone's question is about employment and work business. Within employment, we have a clear attitude that the villagers /engineers who are capable or who deserve up to a certain level will be considered. Company will inform the Sarpanch of respective town as and when the recruitment will be opened so that you will get opportunity and we will set certain criteria so that people of surrounding area will get support. • Representative of the project has informed that we will visit at your house together and will resolve the problem after discussion • Representative of the project has informed that we will discuss the problem and resolve the same after discussion.
5	Chhotubhai Rambhai patel : President of Hazira kantha and Sarpanch of Bhatlai town	<ul style="list-style-type: none"> • He has informed in his submission that in this public hearing arranged by AMNS and my special question is related to employment and business. The person who had submitted here is having his own land situated beside the plant at Gundardi town. This place was acquired by the company and they are having problem of their residence therefore make the payment of money of their land and it is my instruction to resolve this problem at an earliest 	<ul style="list-style-type: none"> • Representative of the project has thanked and said, "Your point has been noted and for business employment, we will create a mechanism and structure that no one is discriminated against."
6	Dhansukhbhai Kantibhai Patel, Village – Kavas & Ex-president of Hazira kantha	<ul style="list-style-type: none"> • He submitted, "Sir, Today, on the day of world peace, I request you to join hands to really follow what you have said today. At least three public hearings have been held in the chairmanship of respected sir. In this area this is only one problem every time and always, we welcome the industries and expansion. Kindly suggest one alternative road for transportation of production of every industry. As per my 	<ul style="list-style-type: none"> • Regional officer has clarified that proposals for alternative transportation was submitted in past and I want to clearly inform that this is a forum of public hearing and this forum is not to get the permission of environment clearance from honourable additional district judge. This

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		<p>knowledge, many international companies of the world are doing production of Crores of rupees but they all have only one road for production and i.e. Surat Hazira Road. Sir just have a look at the condition from Mora Tekra to ONGC and I believe that biggest pollution is that place only. Sir, kindly suggest one alternate road so that we save ourselves. Other than this I had sent my suggestion to Shri Gadkari Sir to sent it to the Honourable Modi Sir through NAMO App that you are such a problem resolver that you can create desert in Rajasthan. So provide us one road for surrounding area of 10 km of Hazira town so that we can easily use the same for our daily basic routine, education and health. Every student of this town is going to Surat for education and they are having only this road. When 40-50 feet long truck of Essar is passing through this road then the mothers and sisters of town are literally feeling unsecured while travelling on this road. But no industry has thought about this, kindly provide us an alternate road. This Hazira is not known as Hazira town but it is known as Hazira industrial zone. Sir we will welcome each and every industry.</p> <ul style="list-style-type: none"> • Sir, we are discussing about environment, employment and alternate road, in this connection it is my suggestion to incur 1% of CSR will be consumed in this village then there will be golden Sun in Hazira town and in fact if Rs. 16 crores will be incurred then there will be golden roads in Hazira town. In case of employment I can suggest certain solutions, kindly take note of the same. Sir I had submitted letter to The Collector, Shri Nitin Bhai Patel, Ex deputy chief minister as a president of Hazira Kantha area that you can prepare the solution for employment. There are approximately 25-30 engineers in Hazira area, provide training for two years directly and get them ready and generate the skill and by this way the boys should be that much knowledgeable that they will be capable to face the interview in any corner of the world <p>For CSR activity company should do activities along with the Sarpanch of respective town</p>	<p>forum is organized to get the suggestion and submission and its proper minutes is prepared and it will be forwarded to the Government even though you have submitted the same matter this time and therefore matter of transportation will be included in the minutes book. Subsequently, the CSR has been submitted 0.2 per cent and the Direct Training Institute, Training Institute, Employment Office has been responded to by the manager of the project for the exchange employment related issue. I would request the project operators to respond to your suggestion and CSR, local spending.</p> <ul style="list-style-type: none"> • The representative of the project thanked that the project would be planned with the Government of Gujarat on the issue of transport and coordination would be structured with other industries. • For CSR, representative of the project has informed that Rs. 16 Crore will be incurred within a span of 5 years considering the suggestion of elders of the town and Sarpanch of the town. It includes mainly education, health, instruments for sports and training.
7	Jenish Patel, Youth for Hazira area trust, Bhatlai	<ul style="list-style-type: none"> • He has informed through his submission that there are many toxic gas in the blast furnace gas which will be used in your company and one of those gases are Carbon Monoxide therefore the officers of the company should inform general public that how the Carbon Monoxide is harmful to the general public. This Hazira town is situated between this Toxic Gas. I will technically explain you risk assessment 	<ul style="list-style-type: none"> • The representative of the project thanked and informed that the company has been working for so many years but the gas has not been leaked. The amount of this gas is an academic subject so let's keep it limited there. Officer has informed Vishnu Bhai that if Carbon Monoxide gas is

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		<p>consequences which were provided by you in the environment impact analysis of risk assessment. You have given Rank -3 for the probability of likelihood risk to consequences for Carbon Monoxide and Result -5 will be considered as extreme dangerous. And when we are using such dangerous gases then surrounding people should have information about the same or we are waiting for a tragedy like Bhopal Gas where Methyl isocyanides gas was leaked and many people were died. And therefore we have to be prepared that such incident will not occur at our place.</p> <ul style="list-style-type: none"> Officer of the AMNS has stated that almost 180 person of the town have got employment in the company. AMNS is ISO Certified company and its slogan is “Do whatever you have committed and inform whatever is done by you” but this standard does not match with this company and you have told that there will be Campus for employment then student of surrounding college can apply from their site. But at local level we do not have qualified persons like degree or diploma, commerce graduates of science graduate. Here candidate of every category are available then why you cannot arrange campus for them in Hazira? and why you are insisting to move to Campus. If you want to arrange Campus in Hazira then just inform us date and send officer of your company, I am declaring on behalf of my institution that we are ready to take the responsibility of gathering candidates, their registration and all other arrangements. <p>Under CSR activity company should think about addition of deadly disease such as Cancer TB in medical treatment and medical camps should also be organize accordingly</p>	<p>gathered with a limit of 50 PPM then there will not be any problem to any human being till 8 hours but if the problem is more than that time then there will be problem therefore we have prepared one emergency plan for the same and we have also installed Gas Meter and alarm.</p> <ul style="list-style-type: none"> Officer of the company has informed that there are less than 3000 regular employees in the company and out of that 180 engineers are of Kantha area and more than 700 employees of Kantha area are working with company, you come to the company we can show the records of the same
8	Umesh Patel New Delhi Registration, Akhil Bhartiya Koli Samaj Joint Secretary, Gujarat Akhil Bhartiya Koli Samaj, egional Secretary, Resident of Dumas Village, Choryasi Kantha Vistar	<ul style="list-style-type: none"> He submitted that it is my request to the collector that Essar company was established before many years and its beside Hazira town. Hazira town of Gujarat is known as Sikotar Mata Temple. When we do not have roads and then people are coming for prayer in bullock cart and the strength of temple mataji is such that huge sea is beside it and entire Surat was sunk but hazira was not sunk and no companies were affected. Today there is some plant in Essar company in which the particles of steel were blown the same were also seen at Hazira town and temple of Sikotar mataji. Respected Sir, if you got for prayer to the temple without shoes then look at your legs you can see the particles of steel and people are preparing their food in such pollution and drinking water. Elders and children are living in such polluted environment. And due to that almost 25-30 were expired 	<ul style="list-style-type: none"> The representative of the project stated that representations have been made in this regard and definite steps are being taken for particles matter.

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		<p>as per report of news papers but actually 150-200 were died due to cancer till today. Therefore, kindly transfer this plant to some another place so that pollution will be reduced and our livelihood will become normal. Elders and children can have healthy environment. I had given my submission to Essar company multiple but they have not taken any initiative for the same. my only submission is to think about this plant and this plant should be shifted to Dahej or any other place so that the health of our society will be maintained properly.</p> <ul style="list-style-type: none"> • This problem was not sorted out since many years and we are accepting the reply provided by you and we are congratulating you that this is the first company who has initiated such conversation with us and consoled us that your problem will be resolved. I am submitting my humble request to resolve this problem at an earliest because as on today also huge money was spent in hospital. Now a human being should spend his energy in maintaining his family or in fighting with such problem therefore kindly provide the solution at an earliest. • AMNS has informed that their funding is Rs. 16 Crore and as informed by Sir, it is really good that you will give first priority to sports, hospital and education. But it is good that this things will be started as early as possible because many companies came in this Hazira road and approximately 70-80 towns are situated within the radius of 10 km and population will be approximately 5 Lacs to 6 Lacs and most of them are working in these companies but no one has thought about the establishment of hospital which will run for 24 hours so that the families of Hazira road and workers of companies should not have to go to Surat for treatment and no one will lose their life while travelling. Moreover I am congratulating the youth of Bhatlai town for their submission for Cricket ground and I am always ready to co operate them. So if you will provide funding for sports to youth then those youth will automatically develop ground for sports and if there will be shortage in the funding then we the people of town will collect the fund for ground and we will develop the ground of cricket. We are welcoming this plant because due to arrival of this plant many young persons will get employment. We have bigger society of approximately 15 Lac to 20 Lacs members and we do not have employment and there is huge financial crisis and recession due to unemployment and it is very tough to maintain a family. And we should welcome the plant because they have accepted many conditions which were forwarded by us and I hope that company will fulfil its commitments. If company will do any activity 	<ul style="list-style-type: none"> • Project representative has informed that Co-ordination and planning should be arranged with another company. • We will build a structure for cricket grounds and sports where the villagers can use the company funding directly. On education, we will take good suggestions for the school to run the same, get good teachers, take good care of the teachers.

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		which will harmful for us then being a Joint secretary of Akhil Bhartiya Koli Samaj I am giving my commitment that I will initiate agitation against the company with the five Lacs members of Koli samaj. At present we are welcoming the company because there is unemployment and situation is worst Company should build hospital of 10-15 bed and think to provide employment to 400 to 500 unemployed youth.	
9	Atulbhai Patel, Ichhapore Gram Panchayat	<ul style="list-style-type: none"> • He has informed that Ganpat bhai Narsinh bhai patel is resident of old town and there are many such farmers whose owned lands were illegally encroached and these facts were submitted to higher authorities of the company but officers of company are not providing any clear reply and solution of this problem so we are expecting explanations from the representative of the company. It is my humble request to the collector that he is having many complaints of this type and many application were submitted to you for illegal encroachment which were illegally possessed by the company and if any farmer is visiting the company for any submission the they were told that this lands are of us and it is situated on the road of the company so if you want to move through this road, you can go but you will not be provided any road to go to your land and that road and land are beside the bypass road of Adani and they have illegally constructed wall then how the farmers can go to their farm. • We have many speakers today and we have discussed about roads and hospitals. There are many notified companies and arrangement can be done from the notified grant. You all company have big officer so that you can establish the hospital from Notified Grant. 	<ul style="list-style-type: none"> • Representative of the project has informed that we will look after the case of land of Ganpatbhai • Representative of the project has informed that Covid hospital was arranged as per the order of the Government. Hospital of 250 bed with the oxygen facility on each bed was formed within 72 hours and also informed that we will do the work of hospital with your co-operation.
10	Dilipbhai Patel, Village : Kavas	<ul style="list-style-type: none"> • He has stated in his submission that those employees should be given permanent job whose land was encroached. It is to inform to those land loser whose land was acquired by Essar steel company that they were recruited by Essar steel Limited and they are doing services on Adecco basis since last 6 years but no one can understand their mental state and they are still doing services on Adecco basis and they are degree and diploma holder even though they were not recruited on permanent basis. Land losers are exploited and they are not provided facilities which were given to the permanent employees. Due to the pollution of plant of the company, people of Hazira town became victim disease like Cancer and they cannot take house in the city due to poor financial condition. They are mainly 	<ul style="list-style-type: none"> • Representative of the project has informed that a mediation agreement was done with all the land owners with whom the settlement was made. The award was made within the land acquisition and after the award was challenged, the court process was called for mediation and mediation was also awarded. One question was also arose in the mediation that they do not have any son or daughter who can work then they have taken compensation. Job against the land and compensation against the job. Adecco is our agency and in this agency persons are doing job on temporary basis since many

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Sr. No.	Name and Address of the person	Points Represented and / or written Submission	Response given by the Representative of the project
		doing labour work and fishing. Their conditions are worst due to loss of land. Sir we need concrete solution.	years and we are regularizing the same and you will get the reply within short time.
11	Hirenbhai Patel, Village: Suvali	<ul style="list-style-type: none"> • He has stated in his submission that I want to talk for this adecco. When I was joined, I was given letter for one year and it was told that we will take you on the payroll of Essar after a span of one year. We have submitted memorandum to the collector with the signature and stamp of Sarpanch multiple times and we have also submitted the same at Hazira Kantha vistar mandli and they are informing that things will be implemented today or tomorrow. Therefore kindly provide us the final letter about the completion of the work as early as possible. We are very tired not and we were not kept on permanent employment even after employment of ten years. 	<ul style="list-style-type: none"> • The representative of the Project said that your submission has been noted and work will be done for the same.
12	Himanshubhai Patel Village: Junagam	<ul style="list-style-type: none"> • He has informed in his submission that the Contractor named Adecco had recruited 62 person in its first batch and they were given commitment and almost 10 years have been passed but they were exploited continuously. I was also an employee and I had also worked with the engineer of adecco. Employee of the company is having salary of one Lacs and against that initial salary in Adecco is Rs. 6000 to Rs. 15000/-. Now how much exploitation is still pending? And you are also not informing that when they will be given permanent service. • There are many questions which were already discussed such as pollution, traffic etc. But many villages are situated on the bank of seashore such as Junagam, Hazira town and people of these town are maintaining their family by doing fishing. Therefore if due to act of the company of the employment or fishing is affected then their family should be remunerated. Kindly produce the plan for the same, if any. As the honourable Collector is present here therefore I am submitting this complaint related to company. There is temple of Ganpati near the bypass road of Hazira and one road is coming towards our Junagam and condition of this road is worst and my own sister met with an accident at that place and the pit of the road are too deep due to water logging and nobody can see the same therefore many incidents of accident were registered. There are many big companies but no one is ready for repairing and maintenance of that road. Yesterday youth of our town had closed that road then police have arrested them and those youth have to write apology letter. Therefore it is my humble request to the Collector sir to draw attention of companies on this matter so that the problem of persons who are using this road for their employment to the company will be minimized and no one has 	<ul style="list-style-type: none"> • The representative of the Project said that your submission has been noted and work will be done for the same. • Representative of the project has informed that we do not have any projection for the person who are connected with the business of fishing and we have already submitted our reply in case of acquirement of land.

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Sr. No.	Name and Address of the person	Points Represented and / or written Submission	Response given by the Representative of the project
		to lose his life due to accident in future. Therefore this is my request to come up with solution.	
14	Babubhai Ahir Deputy Sarpanch, Village : Suvali	<ul style="list-style-type: none"> • He has stated in his submission that everybody including Dhansukhbhai of Kavas has informed about the establishment of Hospital but I came to know that there may be delay due to lack of land space but survey for hospital was conducted at Survey number 498 new number 242 of Suvali town and jungles of babool trees were cleaned but government is doing this process at very slao level therefore the same cannot be seen and we cannot come to any resolution but in fact this hospital has become necessity now. Therefore it is my humble request to Co-ordinate with The Collector and initiate the process of construction of hospital. There is nothing like lack of land space, it is available 	<ul style="list-style-type: none"> • Representative of the project has replies that we have considered your submissions
15	Deepakbhai Dhansukhbhai Patel Village : Damka	<ul style="list-style-type: none"> • He has stated in his submission that many companies have conducted environment public hearing and I had demanded the information through RTI and Sir I am getting the information which was written on paper but your department is not providing the video recording therefore I am not agree with the answer of those persons and I have protest against them. If any injustice occurred in my area then I will be in need of this video recording evidence then how will you provide the same to us? 	<ul style="list-style-type: none"> • The regional officer said that if you want video graph in RTI for every public hearing, it is definitely available in our office. We don't discuss anything for the time being that in which office you ask for, but I assure you that whatever public hearing video CD you ask through RTI, will definitely be available by this office.
16	Arjunbhai Patel Village - Hazira	<ul style="list-style-type: none"> • He has stated in his submission that his complaint is in accordance with the complaint of Lalubhai Nathubhai patel. My land is allied with Essar and there is land of Essar company in all the four side of my land and my this land has become totally unproductive, now what should I do? and where should I Go? • He has added that his land was sunk in the flow of Tapi river and I had requested to Shri Dhavalbhai, Collector and he has consoled that we will look in this matter. At present general public is using this place for Ganpati Visarjan and Essar company has constructed railing at that place. Thus they have constructed railing in my owned place in an unauthorized way, now what should I do? When we are going there but police persons and PI are not permitting us to stand over there, why? Why we are not permitted to stand in our own place? Whether this PSI will allow me to stand in his own place? My question is only that I want to stand in my own land. 	<ul style="list-style-type: none"> • The representative of the Project said, Arjunbhai, we will look into the details of the land that has gone into the sinking. We'll contact you.
17	Divyakantbhai Patel Village : Hazira	<ul style="list-style-type: none"> • He has stated in his submission that company has committed and trusted that there will not be pollution then I want to go in deep in this matter that company should install Pollution Parameter display near Panchayat so that people of town can know whether there is Carbon dioxide or sulphur dioxide alongwith its proportion 	<ul style="list-style-type: none"> • Representative of the project has replies that we have considered your submissions

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		<p>so that trust can be built. Further in case of employment, I want to state that the employees who are doing job since last five years and still they are not on permanent scale then they should be converted into permanent employee and if they cannot be converted as permanent employee because of their qualification then their salary should be doubled so that they can maintain their family properly.</p> <ul style="list-style-type: none"> • Another question is that previous Essar company has not constructed road of Hazira town for 15-20 years and it was told that there was MOU agreement between Essar and NH and Under which those people were to use this road for maintenance but it has been constructed only from Nandaniketan to the police station and that MOU is still in continuation or is it cancelled? Another question is that huge water i.e. approximately four to five feet is logged between Chunagate and petrol pump and even bike cannot travel through that road therefore in this connection I want to know that, this road has become too deep from the surface of both the sides of the road and therefore water cannot be drained therefore I want to inform to the company to increase the height of the road so that problem of water logging in monsoon can be resolved immediately. 	<ul style="list-style-type: none"> • Representative of the project has informed that we will think for arrangement of drainage of storm water so that rain water will directly be transferred to sea.
18	Alpeshbhai Village : Hazira	<ul style="list-style-type: none"> • He has informed in his submission that the discussion of this hospital may goes on but kindly provide the help to the existing cancer patient because expenses of treatment such as chemotherapy, Radiation is huge and it is not affordable to them 	<ul style="list-style-type: none"> • Representative of the project stated that we have discussed about sports, we have discussed about education and accordingly we are also noting your this point about CRR and we will definitely consider the same.
19	Priya Patel Village : Ichhapore	<ul style="list-style-type: none"> • She has informed in her submission that Yashashvi Academy is a government contractor and they have appointed as trainee for two years and it was told that you will be converted in permanent and extension was given for one year and thereafter on one day they have told that do not come from tomorrow because if we will convert one person as a permanent employee then we have to convert all other employee as permanent, now what is the solution for this? 	<ul style="list-style-type: none"> • The representative of the project said, Priyaben, this is a question related to employment. Send me your details we will verify your representation
20	Jayeshbhai P Patel Ex Deputy Sarpanch Village : Kavas	<ul style="list-style-type: none"> • He has informed in submission that this company has acquired land for this project. So kindly provide the details of land acquired by the company. 	<ul style="list-style-type: none"> • Representative of the Project said that no land has been acquired under the project.
21	Bankimbhai Patel Village : Rajgari	<ul style="list-style-type: none"> • He has stated in his submission that the pasture land was used by the company and due to that many cows can be seen on the roads of the town due to lack of posture land. Then in this connection it is to state that company is about to use Rs. 16 Crore for CSR activities then kindly make an arrangement for protection of cow at the posture land situated at surrounding area so that cows will not wander in Hazira town 	<ul style="list-style-type: none"> • The representative of the project said that CSR worth Rs 16 crore should be used to avoid grass problem. We will add a department of animal husbandry to it and if there is a need for grass in nearby villages, we can give some amount from CSR fund or we can give grass and we will start work in that direction.

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22	Viralbhai Patel Village : Hazira	<ul style="list-style-type: none"> • He has informed in his submission that, Sir our land was procured by the company before 10 years. And we are doing calls to Mr Vinit Khemka but he is not receiving our calls so when we will get our pending payment? 	<ul style="list-style-type: none"> • The regional officer said that your submissions have now been recorded. The land was acquired 10 years ago and you have not received money for the same. This forum cannot respond to you and you will get reply from competent authority officer after submission of your written representation • The representative of the project said that we will check details of your survey number - 347/1, 346/2+4, 346/6.
23	Rameshchandra J Patel Village : Shivrajpur, Junagam	<ul style="list-style-type: none"> • He has informed in his submission that I am a farmer and I am giving my services as a secretary in temple of Hazira kantha Area. Hazira Temple was built in 1991 to seek justice against the industries in Hazira Bet which are doing injustice to the locals and many submission were made in this context. The question of employment for youth of Hazira town was discussed with each company. Then it is my humble request that every company should include the members of our 13 towns and each company should recruit at least 5 boys from each town then the problem will be resolved. But the same was not done accordingly. Company is recruiting 10-12 boys for training and then 10-12 years will be passed. Management of Essar company is better than other companies but they are doing injustice with Hazira but they are not recruiting local candidate on contract basis also. • Many people have made submission for hospital then I came to know yesterday that Government has allocated 10000 square meter land to disaster management at Suvali, near Cairn energy. But that hospital will be constructed by notified area. But notified area has told that we need at least 50000 square meter and if 5000 square meter will be provide by government then Government will initiate that work. I had got such news. This file is pending at government level so I am drawing attention to concerned persons that submit this matter to the government for acquirement of 50000 sq. Mtr land and work for hospital should be started immediately. Hazira town has become separate from Suvali. And this Suvali is the town where parsis have taken shelter. The town Junagam was declared as Shivrajpur in the year 2000. And in this Junagam is the place where there was port and this port is developing as on today also. And after completion of this port work, new town was formed in this Suvali which is known as Junagam and new town was declared as Shivrajpur. This is only for the information. Hazira was 	<ul style="list-style-type: none"> • The Regional Officer stated that all your issues will be included in the minutes and the matter will also be brought to the notice of the Government in the form of a note of this public hearing.

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		<p>separated from Suvali in the year 1952 and number 6 of hazira came into existence but its records, maps and revenue were not separated and it is still in continuation in Hazira. Survey number of suvali is also in continuation and there are many mistakes as the records were not modified. And this should be rectified and we have submitted many submissions at all levels but the speed of the work at mamlatdar level is too slow so the speed of this work should be increased and Shivram town was separated from Suvali town and records were modified and due to that when there was draught in the year 1948 then government has visited our town and allocated 2-2 acre land to each farmer with the motto of additional agriculture production and they have provided land with permanent possession against value and 20% land was allocated after 1955 and as per rule therefore they came on the record of 7-12 and they became talati. But as it was not rectified and therefore the original hector number is 400 then area of the same will be doubled after addition of two years and therefore we have done many submissions but we have not received any result for the same. Another point that Number 434 is present in Hazira and its big number and its approved by the Government as on today and its maximum land is with three farmers i.e Ganpatbhai, jamubhai and Janakbhai and remaining land is in the possession of Essar. Therefore the private land other than government land and the land which are provided by government on permanent basis and those land which are on the name of the farmer and not transferred on the name of the company and if further managerial process was not initiated than it is my request to regularize the land on the name of Essar and payment of the should be made in the treasury of government. As it was not rectified and modified in 434 and therefore area became double on records and due to that huge contradiction was created. And for shipyard, in the year 1974 government has decided to develop shipyard in Hazira and hazira was not developed thereafter. And as on today also Port of hazira is known as Essar port but shipyard was not prepared. In the year 1974 6.69 number came into Hazira and on the other end of land, 915 was reserved for shipyard and due to that Essar has acquired the same and Maritime board has released that land. Whereas land of 525 farmers is still pending and they are visiting at office to submit the application. Then sir the land which is not used till today and farmers has submitted affidavit but not procedure was initiated on the same which is completely wrong. I had submitted application to maritime Board with the signature of Sarpanch of Hazira on 03/09/2019 and visited at the office of Maritime board for 10-15 times but resolution was not found till today. These</p>	

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Sr. No.	Name and Address of the person	Points Represented and / or written Submission	Response given by the Representative of the project
		industries are coming within hazira kantha area and we are welcoming them but our locals should not be ignored and the same should not be happened in case of employment.	
24	Astik patel Village : Kavas	<ul style="list-style-type: none"> • He has informed that It is a matter of happiness that the representatives, leaders, youth, mothers and sisters of all the villages from Hazira area all came here and expressed their anguish in a very good atmosphere. From this, it seems that the villagers were plagued by various questions and felt that today is an opportunity to present whatever question sits may be heard by the Sir and perhaps presentation will be followed. • He congratulated all the people of his Hazira area on behalf of the President of the Taluka Panchayat for making his presentation very well. He said that sir, we welcome your plant and it was also informed by the Sir about the Covid -19 hospital by AMNS. The hospital was started and no one has analysed or talked about it, but sir, I congratulate you. My mother was also Covid patient and she was admitted to your hospital and she was having 65% Covid symptoms and got good treatment and I would like to thank you for making my mother healthy and normal today. But covid hospital which was started by your company was closed due to effect of Taute storm. At that time 2 persons from my village, one aged mother and a young man from Kawas were also admitted to Harsh Sandhvi Hospital and another hospital for treatment. And out of that my mother was expired. All I want to say in the near future is, sir, whatever you do we are with you. Our youth are educated and harassed. Every parent dreams that my son should get employment in Essar, Reliance, Kribhako, L&T. Kindly listen all these pains and now every company has to properly prioritize our youngsters whatever is employment oriented matter, others get employment and our people will stay out. It is a big thing for us so kindly understand our pain. Every employee and officer from the company is certainly of a new generation and a new management, 100% implementation will be done if you think at 100%. We expect you to move forward with what we have thought soon, thank you. 	<ul style="list-style-type: none"> • The representative of the project responded by saying that your representations have been taken into consideration.
25	Satish Patel Village : Kavas	<ul style="list-style-type: none"> • He has informed that almost all the leaders have done very impressive submission. My only submission is that AMNS has recruited 27 persons before two months and out of those employees, no one was from local area so I want assurance from your company to recruit at least 2-5 boys with immediate effect. 	<ul style="list-style-type: none"> • Representative of project has replied that we are working on this and today is 21st September and you will get some good news before 31st October.
26	Kalpeshbhai Patel Village: Junagam,	<ul style="list-style-type: none"> • He has informed in his submission that here we have discussed on employment, transportation, roads and environment topic. This is a humble request to the 	<ul style="list-style-type: none"> • Representative of the project has thanked and informed that reply to your question was already provided during

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Sr. No.	Name and Address of the person	Points Represented and / or written Submission	Response given by the Representative of the project
	(Member : Suvali Taluka panchayat)	collector sir to look into the problems and question of farmers which are pending since long time so kindly come up to the solution and officers of AMNS will also co-operate the farmers in this matter so that farmers can get justice. I want to all my young friends that we all have discussed about unemployment. This is a matter of Project of Rs. 50000 Crore and this is a foreign company. We are thankful to Honourable Prime Minister Shri Narendrabhai Modi and we are also thankful to the Ex Chief minister of Gujarat, Shri Vijaybhai Rupani and present Chief minister Shri Bhupendrabhai Patel	previous discussions so we will co- ordinate and proceed accordingly.
27	Jigar Village : Suvali	<ul style="list-style-type: none"> • He has informed in his submission that he was joined with Essar in 2012 and approximately other 48 colleague were also recruited and we were provided assurance every year and we were also given various promises every year and it was told to us that at present the conditions of the condition is not proper but we know that actual production was not that much worst. Thereafter we have done strike and submitted before the Collector but we have not received any positive response. Sir, scandal of drugs was exposed against me and suddenly I was dismissed from the company. I want the reply that company can go up to this level. And I was not given any valid reason and I am unemployed since the year 2017. Now what should I do? I was not provided reason or reply that why I was dismissed from job? 	<ul style="list-style-type: none"> • Representative of the project is informing in his reply that question of Jigar bhai is emotional, personal but related to existence. So even if this is not in line with the environment meeting, you definitely submit details in this regard which will be verified
28	Jaimin chandrakantbhai Patel Village – Hazira	<ul style="list-style-type: none"> • He has informed in his submission that one more public hearing should be organized after a span of 6 months or one year so that we locals could know whether the problems which were discussed in this public hearing has been resolved or not? 	<ul style="list-style-type: none"> • The Regional Officer said that all your issues will be included in the minutes
29	Bhagu Patel Sarpanch : Junagam	<ul style="list-style-type: none"> • He has informed in his submission that Meetings have been held since last 10 days for today's public hearing and whatever is committed based on the meetings will be fulfilled in full and I approve this project on behalf of Junagam. 	<ul style="list-style-type: none"> • Representative of the project has replied that we have considered your submissions.
30	Manishaben patel Village : Damka	<ul style="list-style-type: none"> • She has informed in her submission that I am working as a teacher in the tailoring class of Lok vikas Kendra of CSR. I had joined in the year 2014 and at that time my salary was Rs. 5500/- and at present my salary is Rs. 6500/- so my salary was increased by only Rs. 1000/- in 7 years, therefore it is my request that y salary should also be increased 	<ul style="list-style-type: none"> • Representative of the project has informed in his reply that Manishaben we have considered your submission

Philosophy and Methodology of Risk Assessment

Industries have a wide variety of process involving consumption, production and storage of chemicals. The condition that contributes to the danger, by these chemicals, are when these chemicals are not kept/stable at normal pressure and temperature. Very often these chemicals are kept at/or high pressure and temperatures; these gases in liquefied state by refrigeration, to facilitate storage in bulk quantities. Under these circumstances, it is essential to achieve and maintain high standards of plant integrity through good design, management and operational controls.

However, accidents do occur and these can cause serious injuries to employees or the public, and damage to property. The public concern at such events invariably leads to call for additional control at national and international levels. It is against this background that the various Section and Rules under the Environment Protection Act, 1986, the Factories Act, 1948 and other Acts specify the requirements for a safe and reliable working of an industry. They require carrying out various studies and analysis to assess and mitigate hazards prevalent in the factory in line with the above goal of safe and reliable working. These are more commonly known as “Risk Assessment Studies”. This chapter explains the basis of Risk Assessment and its objectives.

Major hazard installations have to be operated to a very high degree of safety; this is the core responsibility of the management. In addition, management holds a key role in the organization in the implementation of a major hazard control systems. In particular, the management has the responsibility to

- Provide the information required to identify major hazard installations.
- Carry out hazard/risk assessment.
- Report to the authorities on the results of the hazard / risk assessment.
- Conceive Disaster Management plans and carryout “MOCK DRILLS” on the scenarios envisaged.
- Adequately inform the Vulnerability status of the company to district management.
- Undertake measures to in-plant safety assurance systems.
- In order to fulfill the above responsibility, the Management must be aware of the nature of the hazard, of the events that cause accidents and of the potential consequences of such accidents.
- In order to control a major hazard successfully, the Management must have answers to the following questions:
 - Do toxic, explosive or flammable substances in our facility constitute a major hazard?
 - Which failures or errors can cause abnormal conditions leading to a major accident?
 - If a major accident occurs, what are the consequences of a fire, an explosion or a toxic release for the employees, people living outside the factory, the plant or the Environment?
 - What can Management do to prevent these accidents from happening?
 - What can be done to mitigate the consequences of an accident?

The most appropriate way of answering these questions is to carry out a hazard or risk assessment study, the purpose of which is to understand, why accidents occur and how they can be avoided or at least mitigated. A properly conducted RISK assessment will therefore to

- Analyze the existing safety concept or develop a new one;
- Develop optimum measures for technical and organization protection in event of an abnormal plant operation.

Objective of the Risk Assessment Study

The main objectives of the Risk Assessment Studies are as given below:

- To inform the employees, the general public and the authority about the hazards / risk assessed, safeguards provided, residual risk if any and the role to be played by them in the event of emergency.
- To inform Police, Fire Brigade, District Authority and Statutory Bodies to come for help.
- To rescue and give treatment to the casualties and to count the number of injured.
- Evacuation of persons to safe areas and to identify and list any death.
- To identify the persons affected, notify the relatives and extending necessary assistance.
- To provide welfare assistance to the casualties / victims.
- To secure the safe rehabilitation of affected areas and to restore normalcy.

- To provide authoritative information to the media.
- Monitoring and review of current control measures to ensure efficiency and effectiveness e.g. (This might mean that where, in spite of the implemented control measures, there is significant residual risk the hierarchy of control will have to be reapplied).
- Reassessment when there are changes to the work process or the working environment.
- Reassessment if and when an incident occurs to address the causes of the incidents
- Update current risk assessment to reflect the above
- Periodical review to keep up with new trends and knowledge in the sector.
- Outcomes of surveys or inspections involving the health and safety of persons in the organization.
- To preserve records, equipment, etc., and to organize investigation into the cause of emergency and preventive measures to stop its recurrences.
- To ensure safety of the workers before person re - enter and resume work.
- To work out a plan with all provisions to handle emergencies and to provide for emergency preparedness and the periodical rehearsal of the plan.
- To collect information regarding the incident and latest status of the situation and actions taken.
- To define and assess emergencies, including risk and environmental impact assessment.
- To control and contain incidents.
- To safeguard employees and people residing in vicinity of the company and to minimize damage to property and environment through appropriate installed mitigating procedures.
- To be ready for mutual aid if need arise to help neighboring units. Normal jurisdiction of an OEP (ON-SITE EMERGENCY PLAN) is to control events in own premises only. When it comes to the mutual aid it requires catering to Mutual Aid Partners also.

Elements of the RH Study

Storage and Handling of Hazardous Chemicals

Identification, analysis and assessment of hazard and risk are very useful in providing information to risk management. It provides basis for what should be the type and capacity of its, on-site and off-site emergency plans and disaster management plan. Risk analysis is carried out considering storage and handling of various hazardous raw materials, manufacturing process and storage of hazardous finished goods. Toxic Effects of Chemical Substances limits are given in table 6.1

Table 6.1 Toxic Effects of Chemical Substances.

Sr. No	Toxicity	Oral Toxicity D50(mg/kg)	Dermal Toxicity LD50(Mg/Kg)	Inhalation Toxicity LC50(mg/l)
1.	Extremely toxic	> 5	<40	< 0.5
2.	Highly toxic	>5-50	>40-200	< 0.5 - 2.0
3.	Toxic	>50-200	> 200-1000	>2-10

Toxic Hazards of Substances

Toxic substances affect in three ways by ingestion, absorption & inhalation. Adequate provision of safety along with personal protective equipment will be made; emergency kit shall be provided at various locations of the installation.

Assessment of Flammability & Explosive Properties

Flammable Chemicals: what law interprets and gives limits.

- 1. Flammable gases:** Gases which at 20°C and at standard pressure of 101.3 Kpa are: -
 - a) Ignitable when in a mixture of 13 percent or less by volume with air, or;
 - b) Have a flammable range with air of at least 12 percentage points regardless of the lower flammable limits.

Note: The flammability shall be determined by tests or by calculation in accordance with methods adopted by International Standards Organization ISO Number 10156 of 1990 or by Bureau of Indian Standard ISI Number 1446 of 1985.

2. **Extremely flammable liquids:** Chemicals which have flash point lower than or equal to 23°C and boiling point less than 35°C.
 - a) Very highly flammable liquids: Chemicals which have a flash point lower than or equal to 23°C and initial boiling point higher than 35°C.
 - b) Highly flammable liquids: Chemicals which have a flash point lower than or equal to 60°C but higher than 23°C.
 - c) Flammable liquids: Chemicals which have a flash point higher than 60°C but lower than 90°C.
3. **Explosives:** Explosives mean a solid or liquid or pyrotechnic substance (or a mixture of substances) or an article.
 - a) Which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings
 - b) Which is designed to produce an effect by heat, light, sound, gas or smoke or a combination of these as the result of non-detonative self-sustaining exothermic chemical reaction.

Toxic hazards of substances

Intoxication – Analytical Analysis.

The consequences from inhalation of a toxic vapour/gas are determined by the toxic dose.

This dose D is basically determined by:

- Concentration of the vapour in air;
- Exposure duration.

Furthermore, of course, the breathing rates of the victim, as well as the specific toxic mechanism unto the metabolism play an important role.

The dose is defined as $D = C^n \cdot t$, with:

- C = concentration of the toxic vapour, in [ppm] or [mg/m³];
- t = exposure duration, in [sec] or [min];
- n = exponent, mostly > 1.0; this exponent takes into account the fact that a high concentration over a short period results in more serious injury than a low concentration over a relatively longer period of exposure. The value of n should be greater than zero but less than 5.

The given definition for D only holds if the concentration is more or less constant over the exposure time; this may be the case for a (semi) continuous source. In case of an instantaneous source, the concentration varies with time; the dose D must be calculated with an integral equation:

$$D = \int C^n \cdot dt$$

For a number of toxic materials, so-called Vulnerability Models (V.M.) have been developed. The general equation for a V.M. (probit function) is:

$$Pr = a + b \cdot \ln(C^n \cdot t), \text{ with}$$

Pr = probit number, being a representation of the percentage of people suffering a certain kind of damage, for instance lethality

- Pr = 2.67 means 1% of the population;
- Pr = 5.00 means 50% of the population;
- a and b material dependent numbers;

$C^n \cdot t =$ dose D, as explained above.

The values for a and b are mostly derived from experiments with animals; occasionally, however, also human toxicity factors have been derived from accidents in past. In case only animal experiments are available, the inhalation experiments with rats seem to be best applicable for predicting the damage to people from acute intoxication. Although much research in this field have been done over the past decades, only for a limited number of toxic materials consequence models have been developed. Often only quite scarce information is available to predict the damage from an acute toxic exposition. Data transformation from oral intoxication data to inhalation toxicity criteria is sometimes necessary. Generally, in safety evaluations pessimistic assumptions are applied in these transformation calculations. The calculated damage (distance) may be regarded as a maximum. For the purposes of a response to a major incident, the IDLH value level has been chosen for the ‘wounded’ criteria. This type of injury will require medical attention.

Flammability Hazards of Substances

Since the Stone Age term 'fire' is associated with fear. Fire destroys everything when not controlled. It is very dangerous if occurs in uncontrolled manner. It should be clearly understood that when a liquid is used having flash point (Beginning of transformation phase from liquid to vapor) below the normal ambient temperature, it could, in suitable circumstances, liberate a sufficient quantity of vapor to give rise to flammable mixtures with air. Any source of ignition will transform the vapor to fire.

Heat Radiation – Analytical Analysis Parameters.

The consequence caused by exposure to heat radiation is a function of:

- The radiation energy onto the human body [kW/m^2];
- The exposure duration [sec];
- The protection of the skin tissue (clothed or naked body).
- The limits for 1% of the exposed people to be killed due to heat radiation, and for second-degree burns are given in the table herein:

Table Damages to Human Life Due to Heat Radiation

Exposure Duration	Radiation for 1% lethality (kW/m^2)	Radiation for 2 nd degree burns (kW/m^2)	Radiation for first degree burns, (kW/m^2)
10 Sec	21.2	16	12.5
30 Sec	9.3	7.0	4.0

Since in practical situations, only the own employees will be exposed to heat radiation in case of a fire, it is reasonable to assume the protection by clothing. Damages to Human Life Due to Heat Radiation is given in table 7.2. It can be assumed that people would be able to find a cover or a shield against thermal radiation in 10 sec. time. Furthermore, 100% lethality may be assumed for all people suffering from direct contact with flames, such as the pool fire, a flash fire or a jet flame. The effects due to relatively lesser incident radiation intensity are given below in table 6.3.

Table Effects Due to Incident Radiation Intensity

Incident Radiation – kW/m^2	Type of Damage
0.7	Equivalent to Solar Radiation
1.6	No discomfort for long exposure
4.0	Sufficient to cause pain within 20 sec. Blistering of skin (first degree burns are likely)
9.5	Pain threshold reached after 8 sec. second degree burns after 20 sec.
12.5	Minimum energy required for piloted ignition of wood, melting plastic tubing etc.

Explosion Hazards

Release of energy in a rapid and uncontrolled manner gives rise to explosion. Explosion is very dangerous because it has the potential to spread the flammable material and fire on low flammable substances also. This effect of spreading fire instantaneously at different installations due to explosion is called “DOMINO EFFECT”.

Explosion –Analytical Analysis Parameters

In case of vapour cloud explosion, two physical effects may occur:

- * A flash fire over the whole length of the explosive gas cloud;
- * A blast wave, with typical peak overpressures circular around ignition source.

As explained above, 100% lethality is assumed for all people who are present within the cloud proper.

For the blast wave, the lethality criterion is based on:

- * A peak overpressure of 0.1 bar will cause serious damage to 10% of the housing/structures.
- * Falling fragments will kill one of each eight persons in the destroyed buildings.

The following damage criteria given in table 6.4 may be distinguished with respect to the peak overpressures resulting from a blast wave:

Table Damage Due to Overpressures

Peak Overpressure	Damage Type
0.83 bar	Total Destruction
0.30 bar	Heavy Damage
0.10 bar, 0.03 bar	Moderate Damage, Significant Damage
0.01 bar	Minor Damage

From this it may be concluded that $p = 0.17 \text{ E}+5 \text{ pa}$ corresponds approximately with 1% lethality. Furthermore, it is assumed that everyone inside an area in which the peak overpressure is greater than $0.17 \text{ E}+ 5 \text{ pas}$ will be wounded by mechanical damage. For the gas cloud explosion this will be inside a circle with the ignition source as its centre.

Corrosion Hazards

Corrosion is a chemical reaction-taking place at the surface of metal. It is also the effects of tissue damage caused to human beings when contacted accidentally. All substances pH 0-5 & 8.0-12.0 are corrosive. Most corrosive substances will produce chemical burns, while certain chemical substances produce deep ulceration. The effect will be for internal organs also when the fumes are inhaled/ ingested. Other damages are, has a detailing effect on skin and may cause dermatitis.

On contact with metals, corrosive substances will oxidize the load bearing columns, beams and truss structure and bring down the stability factor of the buildings.

M/s. AM/NS India Limited, Surat will take due care to overcome the hazard. The complete structure of the manufacturing area is painted with special type of anticorrosive paint. Good quality materials shall be used for transferring corrosives. Regular thickness testing of equipment, pipelines etc. will be carried out to have the exact picture of effect of corrosion.

Reactivity Hazards

Reactivity is a property of causing a violent chemical reaction when TWO OR MORE compatible materials coming in contact. The resulting impetus shall release energy in the form of heat, detonation, vapors/gases.

The criteria of avoiding reactivity type hazards are to follow the REACTIVITY MATRIX for storing materials given in table 6.5. (Enlarge to view and read).































Details of Manufacturing Process

Detailed Manufacturing process of steel making is given Chapter No.2

Description of Hazardous Chemicals

Both hazardous and non-hazardous materials generated within the manufacturing units and in the proposed modification project facility shall be accommodated in designated storage units within the project facility built/made in line with the safety, health and environmental standards (Gujarat Factories Rules 1963 (2004) and MSIHC rules 1989 (2000)).

Table Incompatible Storage Recommendations.

Chemical Segregation by chemical Group		Class		1	2	3			4		5				6			
																		
Explosives	1		1.0 Explosive			Segregate From	Segregate From	Segregate From	Segregate From	Segregate From	Segregate From	Segregate from				Segregate From		
Flammable Liquids	2				Segregate FROM		Keep Apart						Keep Apart				Keep Apart	
flammable Solids	3		Readily Combustible		Segregate From	Keep Apart							Keep Apart					
			Spontaneously Combustible		Segregate From	Segregate From	KEEP APART							Keep Apart				Keep Apart
			Dangerous When Wet		Segregate From	Segregate From												
Oxidizing Substances	4		OXIDIZING SUBSTANCE		Segregate From	Segregate From							Keep Apart				keep Apart	
			ORGANIC PEROXIDE		Segregate From	Segregate From	Keep Apart							Keep Apart				Keep Apart
Toxic Substances	5				Segregate From	Keep Apart	Keep Apart	Keep Apart		Keep Apart	Keep Apart							
					Segregate From	Keep Apart	Keep Apart	Keep Apart		Keep Apart	Keep Apart							
Corrosive Substances	6				segregate from	Keep Apart	Keep Apart	Keep Apart		Keep Apart	Keep Apart							

Raw Materials Storage

Raw materials are stored in the manufacturing units in many ways. There is different system of storage practices for storing

a. Liquid Raw Materials

a.1 In Storage Tanks - Stored in multiple units of tanks same chemical when the quantity is very large in a tank-farm.

a.2 In Storage Tanks - Stored in a single tank, with other material tanks in a tank –farm. (Mixed materials tank-farm.

a.3 In Storage Tanks - Specific material stored in A TANK / TANKS in a tank-farm demarcated and isolated storage, Licensed and separated with minimum safe distances.

a.4 In Storage Sheds - Separate storage sheds made for storing specifically raw materials in drums and carboys.

b. Solid Raw Materials

b.1 In Silos - Large quantities of powder / Granules are stored in silos. The handling of materials are done pneumatically. The quantity dispatch in terms of weight are measured with the provision of load cells.

b.2 In Bags & Boxes - Solid raw materials are received in bags and boxes are stored in closed sheds as per the compatibility norms.

C. Gaseous Raw Materials

C.1 In Tonners & Gas Cylinders- Flammable and toxic raw materials are stored in demarcated and isolated storage in Licensed premises.

C.2 In Pipelines - Received in pipelines up to the unit and parameters processed in the skid for end use.


The raw materials are planned for storage in drums and carboys in Raw Materials Stores as shown in table 6.6.

Hazardous Chemicals Used in M/s. AM/NS

Hazard Parameters Chart - Raw Materials in Tank Farms, Cylinder, Pipelines, Gas Holder & Drums.

Table Facilities and Inventory OF Hazardous Materials at Various Locations of the plant

Sr. No.	Chemical	Type of storage	Number of vessel/ tank/ cylinder	Capacity of each Vessel	Total Capacity of Tank / Vessel	Types of Hazard	Location of Storage	Protection System	Parameter	
									Pressure	Temp.
A. Highly Toxic Chemicals										
Blast Furnace										
1	BF Gas (CO-22%, CO ₂ -21%, N ₂ - 56%, H ₂ -1.2%, CH ₄ -0.04%, H ₂ O-2%)	Buffer Tank	1	1,35,000 m ³	1,35,000 m ³	CO poisoning, fire explosion (in case of any leakage)	Blast furnace	Warning limit and danger limit are set for movement of piston, Safety bleeding pipe, Main bleeding tube, CO alarm device, Fire water line & hydrants, Elevator (500 Kg capacity) is provided for maintenance and safety purpose, approached up to 74.9 m level platform. Emergency cage (250 Kg capacity) and manual winch (100 Kg) in case of power failure.	800 mm of water column or 0.08 bar	35 °c
Corex Plant										
2	Corex Gas- (CO-44%, CO ₂ -29%, H ₂ -21% H ₂ O-2% CH ₄ - 1% N ₂ - 3 %)	Gas Holder	1	60,000 M ³	60,000 M ³	CO Poisoning, Suffocation, death from asphyxiation, Fire & Explosion.	Corex Plant	Limit Switches are fixed to restrict unsafe movement of piston. CO detector are fixed on piston and roof. Fire water hydrant is extended till roof of the Gas holder. External elevator is provided for emergency rescue. Internal winch is provided for safe approach of piston. U- Seal is provided at inlet/outlet of gas holder. Lighting arrester and earthlings are in place. LHS cable is installed in case of oil temperature inside GH is rising.	700mm of water column or 0.07 bar	35 °c to 40 °c
3	Corex gas (CO-44%, CO ₂ -29%, H ₂ -21% H ₂ O-2% CH ₄ - 1% N ₂ - 3 %)	Pipeline	Network	-	-	CO Poisoning, Suffocation, death from asphyxiation, Fire & Explosion	Corex, SMP-2, DRI MOD- V-V, HSM, 270M W PP.	Schedule is made and followed for thickness check of pipe line. Regular draining of moisture from seal pots are being done once in a shift. Network is being checked once in a shift for any CO leakage.	HP- 1.0 bar & LP- 0.07 bar.	35 °c to 40 °c

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Sr. No.	Chemical	Type of storage	Number of vessel/ tank/ cylinder	Capacity of each Vessel	Total Capacity of Tank / Vessel	Types of Hazard	Location of Storage	Protection System	Parameter	
									Pressure	Temp.
HBI Plant										
4	Tail Gas (CO-19%, CO2-47%, N2 -6%, H2-23%, CH4-5%, H2/CO- 1.29% NCV-1500)	Buffer Tank /Gas holder	2Nos.	1000 M3	2000 M3	CO poisoning, fire & explosion (in case of any leakage)	VPSA Mod – 5 Mod – 6	Warning limit and danger limit are set for movement of piston, Safety bleeding pipe, Main bleeding tube, CO monitoring. CO alarm device, Level monitoring Fire water line, high pressure protection	550 mm of water column (0.055 bar G)	50°C
CRM										
5	Ammonia gas (NH3)	Tank	2	10 MT (19.02 kl)	20 MT (38.04 kl)	Irritating to exposed tissues. Inhalation of vapors may result in pulmonary edema and chemical Pneumonitis.	CRM (galvanizing)	1. Water curtain to dilute ammonia 2. excess flow valve 3. Safety relief Valve 4. NRV	8 to 10 kg/cm2	Ambient
Pipe Mill										
6	H2S	Cylinders	5 Nos	5 Kg	25 Kg	Inhalation may result in bronchitis and death due to respiratory paralysis	Near NACE Lab	Isolated Storage, Online breathing air masks, Water Sprinklers, H2S Detectors	180 kg/cm2	Ambient
B. Highly Hazardous Chemicals										
Blast Furnace										

Sr. No.	Chemical	Type of storage	Number of vessel/ tank/ cylinder	Capacity of each Vessel	Total Capacity of Tank / Vessel	Types of Hazard	Location of Storage	Protection System	Parameter	
									Pressure	Temp.
1	HCl	Storage tank	3	5.5 ton	5.5 ton	Burn Injuries, Fumes can cause Injuries to respiratory system	Blast furnace	Caution boards are provided. Access control provided. 24 hours monitoring by shift engineers. Hazard specific PPEs are used for unloading.	Ambient	Ambient
2	Sulphuric Acid	Drums	50	50 kg	42 kg	Burn Injuries, Fumes can cause Injuries to respiratory system	Blast furnace	Caution boards are provided. Access control provided. 24 hours monitoring by shift engineers. Hazard specific PPEs are used for unloading.	Ambient	Ambient
Corex Plant										
3	Ethanol	Buffer Tank	4	1200 Ltr	4800 Ltr	Fire and Explosion	Corex	MSDS Displayed at storage tank Fire Extinguisher provided	-	35°C
HBI Plant										
4	Natural Gas	Pipeline	A) 1 working / 1 standby B) 1 working / 1 standby	A) 36,000 Nm3/hr. B) 26020 Nm3/hr.	A) 36,000 Nm3/hr B) 26020 Nm3/hr.	Suffocation, Death from asphyxiation, Flash fire, explosion, CO poisoning	a) HRC NGPRS b) Plate mill NGPRS	Lighting arrestor, Earthing, bonding of flanges, Flame proof light fittings, NG sensors, Fire hydrants, fire extinguishers, Fire monitors, Signage's, Thickness measurement as per schedule, Quick shutoff valves, Safety valves.	Inlet- 10-40 bar Outlet 6-8 bar	10 to 40°C
5	Purge gas tank (N2 Gas)	N2 tank	9 Nos.	Mod-1 to 4 – 300 M3 Mod-5 & 6-330	1860 M3	asphyxia	Mod- 1&2: Mod-3 &4: Mod-5 & 6:	Safety valve	9 to 10 Bar G	35°C

Sr. No.	Chemical	Type of storage	Number of vessel/ tank/ cylinder	Capacity of each Vessel	Total Capacity of Tank / Vessel	Types of Hazard	Location of Storage	Protection System	Parameter	
									Pressure	Temp.
				M3						
6	Purge gas tank at PG roof (N2 gas)	N2 Tank	7 Nos.	3.1 M3	21.7 M3	asphyxia	One each at PG roof of Module 1, 2, 3, 4 & 6 and 2 Nos. at Mod 5 PG roof	Safety valves	8 to 9 Bar G	35°C
7	HCl	HCL	1 tank	10 M3	10 M3	Acid Burn, Release of Acidic Fumes	Mod-6 near DM plant	Surrounding wall provided.	Ambient	Ambient
Oxygen Plant										
8	Oxygen gas	Buffer Tank	14	200 M ³ x 5 Nos. 100 M ³ x 5 Nos. 125 M ³ x 4 Nos.	60,750 NM3 (87 MT)	High Pressure, Oxygen enrichment	Oxygen Plant-A	In the purview of SMPV(U), two nos. safety valves on each vessel, online monitoring of pressure at Control Room	30 bar	Ambient
		Buffer Tank	2	2500 M ³ x 2Nos.	80,000 NM3 (114 MT)		INOXA P Plant (Plant-B ASU)		16 bar	Ambient
9	Liquid Oxygen	Cryogenic Storage vessel	2	400 M3	6,38,960 NM3 (912 MT)	Oxygen enrichment in case of leakage	Oxygen Plant-A	Breather at top, Pressure controller, monitoring of pressure and temperature from Control Room	0.1 bar	-183 °c
			1	1150 M3	9,30,000 NM3 (1330 MT)		INOXA P Plant- A		0.34 bar	-183 °c
					11,98,000		INOXA			

Sr. No.	Chemical	Type of storage	Number of vessel/tank/cylinder	Capacity of each Vessel	Total Capacity of Tank / Vessel	Types of Hazard	Location of Storage	Protection System	Parameter	
									Pressure	Temp.
			1	1500 M3	NM3 (1712 MT)		P Plant (Plant-B ASU)		0.15 bar	-183 °c
			1	105 M3	83,000 NM3 (120 MT)				18 bar	-183 °c
10	Nitrogen gas	Buffer Tank	2	2500 M ³ x 2 Nos.	80,000 NM3 (100 MT)	High Pressure, Asphyxiation in case of leaked in large qty.	INOXA P Plant (Plant-B ASU)	In the purview of SMPV(U), two nos. safety valves on each vessel, online monitoring of pressure at Control Room	16 bar	Ambient
11	Nitrogen Liquid	Cryogenic Storage vessel	1	50 M ³	32,800 NM3 (41 MT)	Asphyxiation in case of leaked in large qty.	Oxygen Plant-A	In the purview of SMPV(U), two nos. safety valves, online monitoring of pressure at Control Room	5 bar	-195 °c
			1	794 M ³	5,13,600 NM3 (642 MT)		INOXA P Plant- A	Breather at top, Pressure controller, monitoring of pressure and temperature from Control Room	.0.34 bar	-195 °c
			1	1500 M ³	9,69,600 NM3 (1212 MT)		INOXA P Plant (Plant-B ASU)	Breather at top, Pressure controller, monitoring of pressure and temperature from Control Room	0.15 bar	-195 °c
			1	105 M ³	68,000 NM3 (85 MT)			In the purview of SMPV(U), two nos. safety valves, online monitoring of pressure at Control Room	16 bar	-195 °c
12	Hydrogen Gas	Buffer Vessel	1	13.5 M3	175 NM3 (0.016 MT)	Explosion hazard	Oxygen Plant-A	In the purview of SMPV(U), Water spray nozzles, monitoring from Control Room	13 kg/cm ²	Ambient
CRM										
	Hydrogen gas	Buffer				fire & explosion		2 safety relief valves in each tank, sprinkler system, platform is provided to reach top of the tank for maintenance and safety purpose,		

Sr. No.	Chemical	Type of storage	Number of vessel/ tank/ cylinder	Capacity of each Vessel	Total Capacity of Tank / Vessel	Types of Hazard	Location of Storage	Protection System	Parameter	
									Pressure	Temp.
13		tank	4	9.9 KL	39.6 KL	(in case of any leakage)	CRM	emergency alarm system installed, fire water line and hydrant, wind socks, N ₂ purging system in case of any emergency.	10 bar	Ambient
14	HCl	FRV tank	3	150 / 80KL	310KL	HCL acid spillage, fumes inhalation and Burn injury	CRM- ARP Tank farm	Proper Tank farm storage area with Dyke wall to accommodate acid spillage/Tanks failure disaster, safety showers fixed for flushing, Tank level monitoring by Physical and plc.	Ambient	Ambient to 45°C
15	Spent HCl	FRV tank	7	150 KL	1050	HCL acid spillage, fumes inhalation and Burn injury	CRM- ARP Tank farm	Proper Tank farm storage area with Dyke wall to accommodate acid spillage/Tanks failure disaster, safety showers fixed for flushing, Tank level monitoring by Physical and plc.	Ambient	Ambient
16	Natural Gas	Pipeline	A)1working / 1 standby B)1working / 1 standby	A) 36,000 Nm ³ /hr. B) 26020 Nm ³ /hr.	A) 36,000 Nm ³ /hr. B) 26020 Nm ³ /hr.	Suffocation, Death from asphyxiation, Flash fire, explosion, CO poisoning	A) HRC NGPRS B) PLATE MILL NGPRS	Lighting arrestor, Earthing, bonding of flanges, Flame proof light fittings, NG sensors, Fire hydrants, fire extinguishers, Fire monitors, Signage's, Thickness measurement as per schedule, Quick shutoff valves, Safety valves.	Inlet- 10-40 bar Outlet 6-8 bar	10 to 40°C
Utility										
17	Sulphuric acid	Buffer Storage Tank	15 nos.	3 Ton-1 Nos. 6 Ton- 7 Nos. 9.45 Ton- 5 Nos. 14 Ton-	106 TON	Skin injury if contact in human body	HRC, SMP2, Plate mill	Safety shower. PVC apron must use while handling, SOP for acid handling, Neutralization pit available in case of leakage	Ambient	Ambient

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Sr. No.	Chemical	Type of storage	Number of vessel/ tank/ cylinder	Capacity of each Vessel	Total Capacity of Tank / Vessel	Types of Hazard	Location of Storage	Protection System	Parameter	
									Pressure	Temp.
				1 no.						
C.Other Chemicals										
Blast Furnace										
1	Caustic	Storage tank	2	5 MT	5 MT	Can cause respiratory diseases. Can cause damage to eye if came in contact	Blast furnace	Caution boards are provided. Access control provided. 24 hours monitoring by shift engineers. Hazard specific PPEs are used for unloading.	Ambient	Ambient
2	Magnesium	Storage tank	1	4 MT	3MT	Fire, Burn Injuries	Blast furnace	Caution boards are provided. MSDS displayed at site. Safety Valve, Bleeding valve and Relief valves provided. Area declared as no Hot Work Zone.	3.5 BAR	Ambient
3	Magnesium	Storage tank	1	500KG	300KG	Fire, Burn Injuries	Blast furnace	Caution boards are provided. MSDS displayed at site. Safety Valve, Bleeding valve and Relief valves provided. Area declared as no Hot Work Zone.	4.5 BAR	Ambient
4	Fluidized Lime	Storage tank	1	55 MT	45 MT	Skin and Eye Injury	Blast furnace	Pressure Recovery line provided, Bleeding valve provided.	Ambient	Ambient
5	Fluidized Lime	Storage tank	1	3 MT	3MT	Skin and Eye Injury	Blast furnace	Pressure Recovery line provided, Bleeding valve and Safety Valve.	4.7 BAR	Ambient
HBI Plant										
6	Caustic	Caustic	1 tank	10 M3	10 M3	Caustic Burn	Mod-6 near DM plant	Surrounding wall provided.	Ambient	Ambient
Oxygen Plant										

Sr. No.	Chemical	Type of storage	Number of vessel/ tank/ cylinder	Capacity of each Vessel	Total Capacity of Tank / Vessel	Types of Hazard	Location of Storage	Protection System	Parameter	
									Pressure	Temp.
7	Argon Liquid	Cryogenic Storage vessel	2	20 M3	31,000 NM3 (56 MT)	Asphyxiation in case of leaked in large qty.	Oxygen Plant-A	In the purview of SMPV(U), two nos. safety valves, online monitoring of pressure at Control Room	24 bar	-186 °c
			2	16 M3	25,200 NM3 (45 MT)			Breather at top, Pressure controller, monitoring of pressure and temperature from Control Room	0.5 bar	-186 °c
			1	200 M3	1,54,500 NM3 (278 MT)		INOXA P Plant- A	Breather at top, Pressure controller, monitoring of pressure and temperature from Control Room		-186 °c
			1	250 M3	1,94,880 NM3 (348 MT)		INOXA P Plant (Plant- B ASU)	Breather at top, Pressure controller, monitoring of pressure and temperature from Control Room	0.6 bar	-186 °c
			1	20 M3	15,680 NM3 (28 MT)			In the purview of SMPV(U), two nos. safety valves, online monitoring of pressure at Control Room	16 bar	-186 °c
CRM										
8	Alkali (UNIKLEE N 95L)	Cylindrical, horizontal tank	1	20 M ³	20 M ³	Heavy Skin Irritation, Burn injury	CRM, ST bay col no 21-22	Overflow arrangement provided , level switches provided	Ambient	Ambient
SMP-2										
9	Calcium Carbide	SILO @ 10 m Above earth level	1	150.3 MT.	150.3 MT	Highly Toxic & corrosive	Plant Area	PPE's , eye washer and shower	Ambient	Ambient

Sr. No.	Chemical	Type of storage	Number of vessel/ tank/ cylinder	Capacity of each Vessel	Total Capacity of Tank / Vessel	Types of Hazard	Location of Storage	Protection System	Parameter	
									Pressure	Temp.
10	Magnesium	SILO @ 10 m above earth level	1	167.3 MT	167.3 MT	Highly Toxic & corrosive	Plant Area	PPE's , eye washer and shower	Ambient	Ambient

Table Hazardous Chemicals Used. - Raw Materials Bulk in Tank Farms & RM Stores. - Hazard Parameter

Sr. NO.	RAW MATERIAL	S/L	CAS	NFPA F-H-R-O	STORAGE m3/MT	MOL. WT	WATER SOL	FPc	BP°C	LEL UEL	AUTO	VP mm Hg	VD	SG	TWA ppm	STEL ppm	IDL H	EXPLOSIVE	Cr. Pr Cr.Te	OXYDIZIN	WATER REACT	SPO. IGN	CORROSIVE
1.	BF -CO	G	630-08-0	3-4-0- X	135,000 nm3	28.09	NO	(-) 191.1	(-) 191	10.9 74.2	605	NA	0.97	0.79	75	NA	1200	NO	34.99bar (-) 142	NO	NO	NO	NO
2	COREX- CO GAS HOL	G	630-08-0	3-4-0- X	60,000 nm3	28	NO	(-) 191.1	(-) 191	11 76	605	NA	0.97	0.79	75	NA	1200	NO	34.99bar (-) 142	NO	NO	NO	NO
2A	COREX- CO NETWORK	G	630-08-0	3-4-0- X	3,00,000 nm3	28	NO	(-) 191.1	(-) 191	11 76	605	NA	0.97	0.79	75	NA	1200	NO	34.99bar (-) 142	NO	NO	NO	NO
3	TAIL GAS	G	630-08-0	3-4-0- X	2000 nm3	28	NO	(-) 191.1	(-) 191	11 76	605	NA	0.97	0.79	75	NA	1200	NO	34.99bar (-) 142	NO	NO	NO	NO
4	AMMONIA	L	7664-41-7	1-3-0- X	20 mt	17.03	YES	NA	(-)	16 25	651	76 00	0.6	0.68	30	220	300	NO	NA	NO	NO	NO	CORR TOXIC
5	HYDROGEN SUPFIDE	G	7783-06-4	4-4-0- X	5-cylinders 5 m3	34.08	NO	NA	(-) 60.3	4.3 45	260	15 20 0	1.19	0.910	0.33	0.7 5	100	NO	NA	NO	NO	NO	TOXIC

Sr. NO.	RAW MATERIAL	S/L	CAS	NFPA F-H-R-O	STORAGE m3/MT	MOL. WT	WATER SOL	FPc	BPc	LEL UEL	AUTO	VP mm Hg	VD	SG	TWA ppm	STEL ppm	IDL H	EXPLOSIVE	Cr.Pr Cr.Te	OXYDIZIN	WATER REACT	SPO. IGN	CORROSIVE
6	HCL	L	7647-01-0	0-3-1- X	5+10+310 kl	36.46	YES	NA	50.5	NA	NA	414	NA	NA	1.8	1.8	50	NO	NA	NA	NA	NA	TOXIC
7	H2SO4	L	7664-93-9	0-3-2- W	106 mt	98.08	YES	NA	290	NA	NA	0	3.4	1.84	0.2 mg/m3	0.2 mg/m3	15 mg/m3	NO	NA	NO	YES	NO	CORROXIC
8	NATURAL GAS (LNG)	G	74-82-8	4-3-0- X	62020 m3/hr	16	NO	NA	161(-)	5.314	537.2	NA	NA	0.45	NA	NA	NA	NO	NA	NO	NO	NO	ASPHYXIA NT
9	OXYGEN	G	7782-44-7	0-3-0- OX	201	32	NO	NA	183(-)	NA	NA	NA	NA	1.14	NA	NA	NA	NO	NA	YES	NO	NO	NA
10	LIQUID OXYGEN	L	7782-44-7	0-3-0- OX	4074	32	NO	NA	183(-)	NA	NA	NA	NA	1.14	NA	NA	NA	NO	NA	YES	NO	NO	NA
11	NITROGEN	G	7727-37-9	NA	1881.7 m3	28	NO	NA	196(-)	NA	NA	NA	NA	0.807	NA	NA	NA	NO	NA	NO	NO	NO	NA
12	LIQUID NITROGEN	L	7727-37-9	0-3-0- X	50 m3	28	NO	NA	196(-)	NA	NA	NA	NA	0.807	NA	NA	NA	NO	NA	NO	NO	NO	NA
13	HYDROGEN	G	1333-74-0	4-0-0- X	39.6 kl	2	NO	NA	196(-)	4.075	NA	NA	NA	0.071	NA	NA	NA	NO	NA	NO	NO	NO	FLAME INVISIBLE
14	CAUSTIC	L	NA	NA	10 m3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	YES
15	MAGNESIUM	S	7439-95-4	0-1-1- X	167.3	24.3	NO	NA	1100	NA	473	NA	NA	NA	1.74	NA	NA	NA	NO	NO	YES	YES	NO
16	FLUIDIZED LIME	L	1305-78-8	0-3-1- X	45+3 mt	56.08	NO	NA	VERY	NA	NA	0	NA	NA	6mg/m3	NA	25 mg/m3	NO	NA	NO	YES	NO	IRRITANT

Sr. NO.	RAW MATERIAL	S/L	CAS	NFPA F-H-R-O	STORAGE m3/MT	MOL. WT	WATER SOL	FP	BP	LEL UEL	AUTO	VP mm Hg	VD	SG	TWA ppm	STEL ppm	IDLH	EXPLOSIVE	Cr. Pr Cr. Te	OXYDIZIN	WATER REACT	SPO. IGN	CORROSIVE
17	LIQUID ARGON (Asphyxiant)	L	7440-37-1	NA	727.0 m3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Replaces oxygen
18	UNIKLEEN ALKALI	L	NA	NA	20 m3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
19	CALCIUM CARBIDE	S	75-20-7	3-3-0-W	150.3 MT	64.1	NA	NA	NA	NA	NA	NA	NA	2.2	120 mg/m3	NA	NA	NA	NA	NA	YES	NA	WET C ₂ H ₂
20	ETHANOL	L	64-17-5	3-2-0-X	4.8 KL	46.07	YES	12.7	78.5	3.319	365	50	1.59	0.79	1800	NA	3300	NO	NA	NO	NO	NO	FLAMMABLE

S/L: SOLID/LIQUID, NFPA: HAZARD PARAMETERS LABEL, CAS: CASE ABSTCT REGISTRY NO, TPQ - THRESHOLD PLANNED QUANTITY, MOL WT: MOLECULAR WEIGHT, SOL: SOLUBLE IN WATER, FP – FLASH POINT, BP – BOILING POINT, , AUTO: AUTO IGNITION TEMPERATURE, VP VAPOR PRESSURE, VD – VAPOR DENSITY, SG- SPECIFIC GRAVITY, LEL/UEL – EXPLOSIVE LIMITS, TWA – TIME WEIGHTED AVERAGE, STEL : SHORT TIME EPOSURE LIMIT, IDLH – IMME. DANGER TO LIFE & HEALTH, EXPL: EXPLOSIVE, ACE/AKL: ACID/ALKALI, OXY: OXIDIZING, WATER: WATERREACTIVE, SPON: SPONTENEOSIGNITION, CORR: CORROSIVE **FLAMMABLE****TOXIC**

Risk Scenarios: Quantitative Analysis

The hazardous chemicals are assessed with the scenarios, for deriving and identifying the vulnerable zones are given table 6.8.

Table vulnerable zones

Sr. No.	Source Scenarios	Failure Mechanism	RISK Consequences	Probability ¹	Severity ²	Risk Rating ³
1	BF GAS HOLDER – CO Leakage due to fabric sealing arrangement failure. (40 cm long, 7cm wide) WORST CASE SCENARIO	TOXIC GAS Cloth sealing arrangement entangling with structure and gets torn.	TOXIC CLOUD LEAKAGE SPREAD from a height of 85 m.	3	5	15
2	“COREX GAS” GAS HOLDER – CO Leakage due to fabric sealing arrangement failure. (30 cm long, 7cm wide) WORST CASE SCENARIO	TOXIC GAS Cloth sealing arrangement entangling with structure and gets torn.	TOXIC CLOUD LEAKAGE SPREAD from a height of 85 m.	3	5	15
3	STORAGE IN VERTICAL BULLETS: LEAKAGE OF AMMONIA GAS from the main connection outlet point WORST CASE SCENARIO	TOXIC GAS outlet gas fittings leakage near the bullet.	AMMONIA GAS at a pressure leaks out and toxic cloud spreads.	2	5	10
4	PIPELINE LEAKAGE OF HYDROGEN GAS IN HYDROGEN PUMPING AREA TO STORAGE TANKS. WORST CASE SCENARIO	HIGH PRESSURE HYDROGEN FLAMMABLE GAS pipeline filling the vertical storage tanks fail.	HIGH PRESSURE HYDROGEN GAS gushes out and due to light WIEGHT gas moves up fast.	2	5	10
5	H₂S GAS LEAKS when cylinder outlet valve damage during handling of cylinder. WORST CASE SCENARIO	HIGH PRESSURE H ₂ S gas gushes out of the gas cylinder due to damaged valve	HIGHLY flammable, Toxic H ₂ S GAS gushes outside the PIPESHOP premises.	2	5	10

LEGEND

¹probability:

1 – Highly Unlikely

2 – UNLIKE

3 – SOMEWHAT LIKELY

4 – LIKELY

5 – VERY LIKELY

²severity:

1 – Extremely Mild

2 – MILD

3 – MODERATE

4 – SEVERE

5 – MOST SEVERE

³risk Rating:

Probability x Severity

- There are more numbers of TOXIC SEVERITY SCENARIO RISKS from the following chemicals, (OLEUM, ACETIC ACID, ACETIC ANHYDRIDE, HCL, H₂SO₄, CHLORINRE, FORMALDEHYDE, PHENOL), on the Bulk storage and transfer of chemicals.
- Fire protection/ control / mitigation measures are to be planned and fully incorporated.

Software Used for Calculations

ALOHA (Areal Locations of Hazardous Atmospheres):

Aloha is a computer program designed especially for use by people responding to chemical accidents, as well as for emergency planning and training. ALOHA can predict the rates at which chemical vapours may escape into the atmosphere from broken gas pipes, leaking tanks, and evaporating puddles. It can then predict how a hazardous gas cloud might disperse in the atmosphere after an accidental chemical release.

ALOHA is an air dispersion model, which you can use as a tool for predicting the movement and dispersion of gases. It predicts pollutant concentrations downwind from the source of a spill, taking into consideration the physical characteristics of the spilled material. ALOHA also accounts for some of the physical characteristics of the release site, weather conditions, and the circumstances of the release. Like many computer programs, it can solve problems rapidly and provide results in a graphic, easy-to-use format. This can be helpful during an emergency response or planning for such a response.

ALOHA provides output as amount of chemical discharged from the source as well as its concentration in air it takes in to account different levels of concentrations for a specified chemical. Different concentration levels are given below:

ERPG 1: is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined, objectionable odor.

ERPG 2: is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.

ERPG 3: is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.

IDLH: The Immediately Dangerous to Life or Health (IDLH) level. A chemical's IDLH is an estimate of the maximum concentration in the air to which a healthy worker could be exposed without suffering permanent or escape-impairing health effects.

Vulnerability Analysis

A vulnerability analysis is carried out on the MAXIMUM CREDIBLE ACCIDENT SCENARIO and the WORST-CASE SCENARIO. The analysis is carried out using the help of sophisticated computer software which provides the zone of influence as well as the geographical risk contours.

The calculations are complex in nature, and various parameters are defined to assist the software in simulating the risk contours. The parameters include details such as the size of the leakages / holes, quantity of materials released, duration of the release, weather and geographical conditions.

The simulations are generated under standard operating conditions. Data given in the reports and manuals are taken as correct information.

Maximum Credible Accident Scenario

The MAXIMUM CREDIBLE ACCIDENT SCENARIO was analyzed based on flammable vapor and toxic vapor risks. The ALOHA simulation software was used to obtain the risk contours and the zone of influence, as well as levels of risk associated with each zone.

The calculations performed are based on Unified Dispersion Modeling and provide the foot prints of hazardous chemical dispersion and the distances of critical concentrations for flammability and toxicity. The model considers a three-stage method as given in the following illustration.

POOL SPREADING AND VAPORIZATION

The release containing liquid droplets forms a pool. Any evaporation from this pool will contribute to the dispersing pool.

Evaporation
↓

DISPERSION

The vapor cloud disperses in the atmosphere until it has reached harmless concentration.

Calculation of the concentration profile of the cloud
↓

FLAMMABILITY AND TOXICITY

The results of the ALOHA simulation as well as the parameters used for carrying out the simulations is given below in table-6.9. Downwind concentrations of chemicals are shown.

List of Scenarios for Sketching Dispersion Pattern of Hazardous Materials

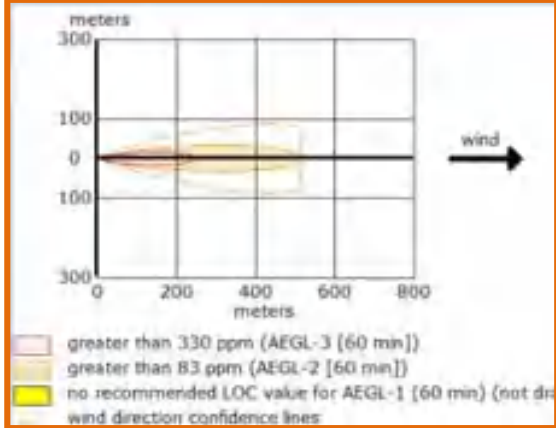
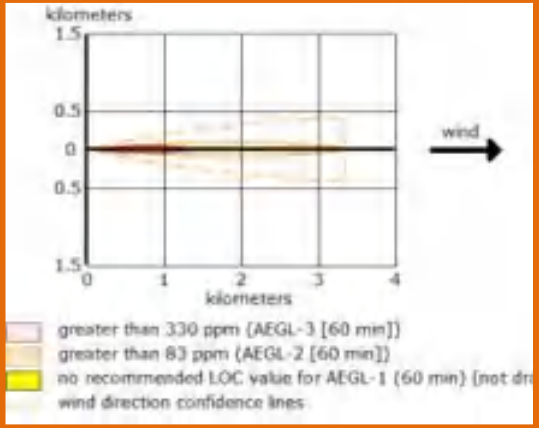
Table List of Risk Dispersion Scenarios:

Sr. No.	Scenario Description for BF-CO GAS	Equipment Involved	Pressure Temp	Effect
A	BF CO GAS – RISK SCENARIOS			
1	BF GAS HOLDER – CO Leakage due to fabric sealing arrangement failure. (40 cm long, 7cm wide) WORST CASE SCENARIO	GAS HOLDER	1.08bar 35°C 1,35,000 nm ³	TOXIC CLOUD
2	BF GAS HOLDER – CO Leakage due to fabric sealing arrangement failure. (40 cm long, 7cm wide) MCAS	GAS HOLDER	1.08bar 35°C 1,35,000 nm ³	FIRE CLOUD
3	BF GAS HOLDER – CO Leakage due to fabric sealing arrangement failure. (40 cm long, 7cm wide) MCAS	GAS HOLDER	1.08 bar 35°C 1,35,000 nm ³	BLAST FORCE
4	PACKAGING WATER AREA BF CO LEAKAGE: near platform 3,50,000 nm ³ /hr - Ø2100 MCAS	Packaging water	1.08 bar 50°C	TOXIC CLOUD
5	STEAM GENERATORS 3 NUMBERS: Supply line Ø600 mm Pipe rupture and leakage of gas. MCAS	Steam Generator	1.08 bar 50°C 75,000nm ³ /hr	TOXIC CLOUD
6	STEAM GENERATORS 3 NUMBERS: Supply line Ø600 mm Pipe rupture and leakage of gas. MCAS	Steam Generator	1.8 bar 50°C 75,000 nm ³ /hr	FIRE CLOUD
7	TRT TURBINE 10 MW: Supply line Ø2100 mm Pipe rupture and leakage of gas. MCAS	TRT Turbine	1.08 bar 38°C 3,50,000 nm ³ /hr	TOXIC CLOUD
8	KALUJIN STOVES: Supply line Ø1800 mm Pipe rupture and leakage of gas (heating arrangement for HOT BLAST) Ø1800mm, flow rate 1,00,000nm ³ /hr, two stoves MCAS	KALUJIN STOVES	1.08 bar 50°C 1,00,000 nm ³ /hr	FIRE CLOUD
9	KALUJIN STOVES: Supply line Ø1800 mm Pipe rupture and leakage of gas (heating arrangement for HOT BLAST) Ø1800mm, flow rate 1,00,000nm ³ /hr, two stoves MCAS	KALUJIN STOVES	1.08 bar 50°C 1,00,000 nm ³ /hr	TOXIC CLOUD
10	PCI COAL DRYING OVENS: Supply line Ø600 mm Pipe rupture and leakage of gas. MCAS	PCI Drying Ovens	1.08 bar 50°C 12,000 nm ³ /hr	FIRE CLOUD

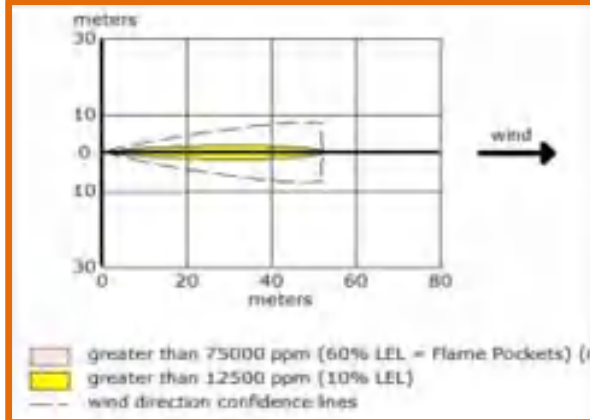
Sr. No.	Scenario Description for BF-CO GAS	Equipment Involved	Pressure Temp	Effect
11	BF FURNACE 10M WORKING PLATFORM AREA: Exposure to different Leakages of CO gas MCAS	BF FURNACE 10m platform	3.5 bar 50°C	TOXIC CLOUD
12	SINTER PLANT: Supply line Ø800 mm Pipe rupture and leakage of gas. MCAS	SINTER Plant	1.08 bar 50°C 6000 nm ³ /hr	TOXIC CLOUD
B	SCENARIO DESCRIPTION FOR COREX - CO GAS.			
1	“COREX GAS” GAS HOLDER – CO Leakage due to fabric sealing arrangement failure. (30 cm long, 7cm wide) WORST CASE SCENARIO	GAS HOLDER	1.07 bar 50°C 60,000 nm ³	TOXIC CLOUD
2	“COREX GAS” GAS HOLDER – CO Leakage due to fabric sealing arrangement failure. (30 cm long, 7cm wide) MCAS	GAS HOLDER	1.07 bar 50°C 60,000 nm ³	FIRE CLOUD
3	“COREX GAS” GAS HOLDER – CO Leakage due to fabric sealing arrangement failure. (30 cm long, 7cm wide) MCAS	GAS HOLDER	1.07 bar 50°C 60,000 nm ³	BLAST FORCE
4	HOT STRIP MILL – CO Supply line Ø800 mm Pipe rupture and leakage of gas. MCAS	Network pipeline route	2.0 bar 50°C 40,000 m ³ /hr	TOXIC CLOUD
5	270 MW POWER HOUSE – Supply line Ø1400 mm Pipe rupture and leakage of gas. MCAS	-Do-	2.0 bar 50°C 1,80,000 nm ³ /hr	TOXIC CLOUD
6	270 MW POWER HOUSE – Supply line Ø1400 mm Pipe rupture and leakage of gas. MCAS	-Do-	2.0 bar 50°C 1,80,000 nm ³ /hr	FIRE CLOUD
7	DRI – 6: Supply line Ø1800 mm Pipe rupture and leakage of gas. MCAS	-Do-	2.0 bar 50°C 90,000 nm ³ / hr	TOXIC CLOUD
8	DRI – 6: Supply line Ø1800 mm Pipe rupture and leakage of gas. MCAS	-Do-	2.0 bar 50°C 90,000 nm ³ / hr	FIRE CLOUD
9	LIME PLANT: Supply line Ø700 mm Pipe rupture and leakage of gas MCAS	NETWORK Pipeline route	2.0 bar 50°C 34,500 nm ³ / hr	TOXIC CLOUD
10	CDI 1-9 FURNACES: Supply line Ø500 mm Pipe rupture and leakage of gas MCAS	-Do-	2.0 bar 50°C 6,500 nm ³ / hr	FIRE CLOUD
11	PLATE MILL: Supply line Ø1800 mm Pipe rupture and leakage of gas. MCAS	LP LINE route	1.07 bar 50°C 48,000 nm ³ /hr	TOXIC CLOUD
12	PLATE MILL: Supply line Ø1800 mm Pipe rupture and leakage of gas. MCAS	LP LINE route	1.07 bar 50°C 48,000 nm ³ /hr	FIRE CLOUD
13	TUNNEL MILL: Supply line Ø1500 mm Pipe rupture and leakage of gas MCAS	-Do-	1.11 bar 50°C 51,000 nm ³ /hr	TOXIC CLOUD
14	TUNNEL MILL: Supply line Ø1500 mm Pipe rupture and leakage of gas MCAS	-Do-	1.11 bar 50°C 51,000 nm ³ /hr	FIRE CLOUD
15	BOILER: Supply line Ø600 mm Pipe rupture and leakage of gas MCAS	-Do-	1.07 bar 50°C 10,000 nm ³ /hr	TOXIC CLOUD
	SMP 2:		1.07 bar 50°C	

Sr. No.	Scenario Description for BF-CO GAS	Equipment Involved	Pressure Temp	Effect
16	Supply line Ø600 mm Pipe rupture and leakage of gas MCAS	-Do-	10,000 nm ³ /hr	TOXIC CLOUD
C	SCENARIO DESCRIPTION FOR AMMONIA GAS.			
1	STORAGE IN VERTICAL BULLETS: LEAKAGE OF AMMONIA FROM THE MAIN CONNECTION OUTLET POINT WORST CASE SCENARIO	MAIN CONNECTION OUTLET	8.0 BAR 30 °C	TOXIC CLOUD
2	PIPELINE CARRYING AMMONIA TO CRACKER PLANT LEAKAGE DUE TO FAILURE. MCAS	¾" PIPELINE.	2.0 BAR 30 °C	TOXIC CLOUD
3	LEAKAGE OF AMMONIA FROM TANKER DECANTING HOSE MCAS	3" FLEXIBLE HOSE PIPE.	8.0 BAR 30 °C	TOXIC CLOUD
D	SCENARIO DESCRIPTION FOR HYDROGEN GAS.			
1.	HYDROGEN STORAGE TANKS – RELEASE THROUGH PUFFING OFF FROM SAFETY RELIEF VALVE- DUE TO HIGH SUMMER DAY TEMPERATURE. MCAS	SAFETY RELIEF VALVE	10.125 BAR AT 50°C	FIRE CLOUD
2	PIPELINE LEAKAGE OF HYDROGEN GAS IN HYDROGEN PUMPING AREA TO STORAGE TANKS. WORST CASE SCENARIO	1" PIPE	14 BAR AT 30°C	FIRE CLOUD
3	PIPELINE LEAKAGE OF HYDROGEN GAS IN HYDROGEN PUMPING AREA TO STORAGE TANKS. MCAS	1" PIPE	14 BAR AT 30°C	EXPLOSION
E	SCENARIO DESCRIPTION FOR HYDROGEN SULPHIDE GAS.			
1	GAS CYLINDER OUTLET VALVE DAMAGE DURING HANDLING OF CYLINDER. WORST CASE SCENARIO	Filled Cylinder Dropped During Handling G	15 bar 30 °C	TOXIC CLOUD
2	GAS CYLINDER OUTLET VALVE DAMAGE DURING HANDLING OF CYLINDER. MCAS	Filled Cylinder Dropped During Handling	15 bar 30 °C	FIRE CLOUD

Dispersion Scenarios of Hazchem - Emergency Releases. Blast Furnace “CO” Scenarios:
Site Data: Location: AM / NS INDIA, HAZIRA, GUJARAT. Building Air exchanges per Hour: 10 (user specified)

<p>1.A BF CO GAS HOLDER – CO Leakage due to fabric sealing arrangement failure. (40 cm long, 7cm wide). Toxic cloud Atmospheric stability: ‘D’ (worst case scenario)</p>	<p>1.B BF CO GAS HOLDER – CO Leakage due to fabric sealing arrangement failure. (40 cm long, 7cm wide). Toxic cloud Atmospheric stability: ‘F’ (worst case scenario)</p>
	
<p>THREAT ZONE: Model Run: Gaussian Red : 243 meters --- (330 ppm = AEGL-3 [60 min]) Orange: 520 meters --- (83 ppm = AEGL-2 [60 min]) Yellow: no recommended LOC value -(N/A = AEGL-1 [60 min])</p> <p>THREAT AT POINT: Concentration Estimates at the point: Downwind: 50 meters Off Centerline: 25 meters Note: Concentration not drawn because there is no significant concentration at the point selected.</p> <p>CHEMICAL DATA: Chemical Name: CARBON MONOXIDE CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm LEL: 125000 ppm EL: 742000 ppm Ambient Boiling Point: -191.5°C Vapor Pressure at Ambient Temperature: greater than 1 atm Ambient Saturation Concentration: 1,000,000 ppm or</p> <p>ATMOSPHERIC DATA: (MANUAL INPUT OF DATA) Wind: 10 meters/second from 225° true at 3 meters Ground Roughness: open country Cloud Cover: 5 tenths Air Temperature: 32° C Stability Class: D No Inversion Height Relative Humidity: 50%</p> <p>SOURCE STRENGTH: Leak from hole in vertical cylindrical tank Flammable chemical escaping from tank (not burning) Tank Diameter: 45 meters Tank Length: 85 meters Tank Volume: 135,187 cubic meters Tank contains gas only Internal Temperature: 32° C Chemical Mass in Tank: 187 tons Internal Press: 1.12 atmospheres Opening Length: 40cm Opening Width: 7 cm Release Duration: ALOHA limited the duration to 1-hour Max Average Sustained Release Rate: 166 kilograms/min (averaged over a minute or more) Total Amount Released: 8,539 kilograms</p>	<p>THREAT ZONE: Model Run: Gaussian Red : 1.4 kilometers --- (330 ppm = AEGL-3 [60 min]) Orange: 3.4 kilometers --- (83 ppm = AEGL-2 [60 min]) Yellow: no recommended LOC value --- (N/A = AEGL-1 [60 min])</p> <p>THREAT AT POINT: Concentration Estimates at the point: Downwind: 50 meters Off Centerline: 25 meters Note: Concentration not drawn because there is no significant concentration at the point selected.</p> <p>CHEMICAL DATA: Chemical Name: CARBON MONOXIDE CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm LEL: 125000 ppm EL: 742000 ppm Ambient Boiling Point: -191.5°C Vapor Pressure at Ambient Temperature: greater than 1 atm Ambient Saturation Concentration: 1,000,000 ppm or 100.0%</p> <p>ATMOSPHERIC DATA: (MANUAL INPUT OF DATA) Wind: 3 meters/second from 45° true at 3 meters Ground Roughness: open country Cloud Cover: 5 tenths Air Temperature: 25° C Stability Class: F (user override) No Inversion Height Relative Humidity: 50%</p> <p>SOURCE STRENGTH: Leak from hole in vertical cylindrical tank Flammable chemical escaping from tank (not burning) Tank Diameter: 45 meters Tank Length: 85 meters Tank Volume: 135,187 cubic meters Tank contains gas only Internal Temperature: 25° C Chemical Mass in Tank: 191 tons Internal Press: 1.12 atmospheres Opening Length: 40 cm Opening Width: 7 cm Release Duration: ALOHA limited the duration to 1-hour Max Average Sustained Release Rate: 168 kilograms/min (averaged over a minute or more) Total Amount Released: 8,659 kilograms</p>

2A BF CO GAS HOLDER – CO Leakage due to fabric sealing arrangement failure. (40 cm long, 7cm wide). **FIRE cloud** Atmospheric stability: ‘D’
(MAXIMUM CREDIBLE ACCIDENT SCENARIO)



THREAT ZONE: Model Run: Gaussian
Threat Modeled: Flammable Area of Vapor Cloud
Red 21 meters (75000 ppm = 60% LEL = Flame Pockets)
Note: Threat zone was not drawn because effects of near-field patchiness make dispersion predictions less reliable for short distances.
Yellow: 52 meters --- (12500 ppm = 10% LEL)

THREAT AT POINT: Concentration Estimates at the point: Downwind: 50 meters Off Centerline: 25 meters
Note: Concentration not drawn because there is no significant concentration at the point selected.

CHEMICAL DATA: Chemical Name: CARBON MONOXIDE CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm LEL: 125000 ppm UEL: 742000 ppm, Ambient Boiling Point: 191.5°C, Vapor Pressure at Ambient Temperature: greater than 1 atm, Ambient Saturation Concentration: 1,000,000 ppm

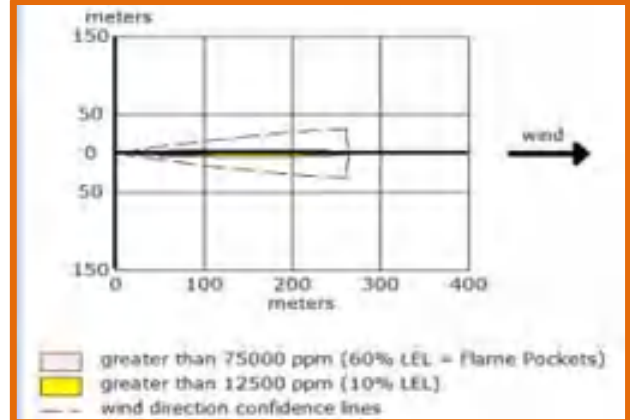
ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)

Wind: 10 meters/second from 225° true at 3 meters
Ground Roughness: open country Cloud Cover: 7 tenths
Air Temperature: 32° C **Stability Class: D**
No Inversion Height Relative Humidity: 75%

SOURCE STRENGTH: Leak from hole in vertical cylindrical tank Flammable chemical escaping from tank (not burning)
Tank Diameter: 45 meters Tank Length: 85 meters Tank Volume: 135,187 cubic meters Tank contains gas only Internal Temperature: 32° C Chemical Mass in Tank: 187 tons Internal Press: 1.12 atmospheres Opening Length: 40 cm

Opening Width: 7 cm Release Duration: ALOHA limited the duration to 1-hour Max Average Sustained Release Rate: 166 kilograms/min (averaged over a minute or more)
Total Amount Released: 8,539 kilograms

2B BF CO GAS HOLDER – CO Leakage due to fabric sealing arrangement failure. (40 cm long, 7cm wide). **FIRE cloud** Atmospheric stability: ‘F’
(MAXIMUM CREDIBLE ACCIDENT SCENARIO)



THREAT ZONE: Threat Modeled: Flammable Area of Vapor Cloud Model Run: Gaussian
Red : 105 meters - (75000 ppm = 60% LEL = Flame Pockets)
Yellow: 265 meters --- (12500 ppm = 10% LEL)

THREAT AT POINT: Concentration Estimates at the point Downwind: 50 meters Off Centerline: 25 meters
Note: Concentration not drawn because there is no significant concentration at the point selected

CHEMICAL DATA:

Chemical Name: CARBON MONOXIDE CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm LEL: 125000 ppm UEL: 742000 ppm Ambient Boiling Point: -191.5° C Vapor Pressure at Ambient Temperature: greater than 1 atm Ambie Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)

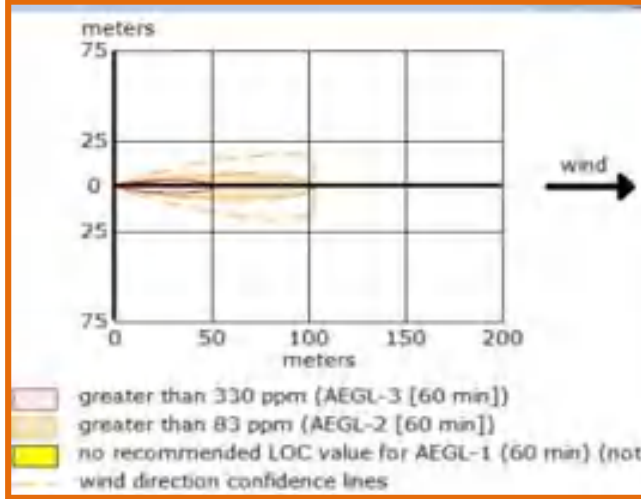
Wind: 3 meters/second from 45° true at 3 meters
Ground Roughness: open country Cloud Cover: 5 tenths Air Temperature: 25° C **Stability Class: F (user override)**
No Inversion Height Relative Humidity: 50%

SOURCE STRENGTH: Leak from hole in vertical cylindrical tank Flammable chemical escaping from tank (not burning)
Tank Diameter: 45 meters Tank Length: 85 meters Tank Volume: 135,187 cubic meters Tank contains gas only Internal Temperature: 25° C Chemical Mass in Tank: 191 tons
Internal Press: 1.12 atmospheres Opening Length: 40 centimeters Opening Width: 7 centimeters Release Duration: ALOHA limited the duration to 1-hour Max Average Sustained Release Rate: 168 kilograms/min (averaged over a minute or more)
Total Amount Released: 8,659 kilograms

<p>3A. BF CO GAS HOLDER – CO Leakage due to fabric sealing arrangement failure. (40 cm long, 7cm wide). Blast force Atmospheric stability: ‘D’ (MAXIMUM CREDIBLE ACCIDENT SCENARIO)</p>	<p>3B. BF CO GAS HOLDER – CO Leakage due to fabric sealing arrangement failure. (40 cm long, 7cm wide). Blast force Atmospheric stability: ‘F’ (MAXIMUM CREDIBLE ACCIDENT SCENARIO)</p>
<p>Threat Modeled: Overpressure (blast force) from vapor cloud explosion Type of Ignition: ignited by spark or flame Level of Congestion: uncongested Model Run: Gaussian Red : LOC was never exceeded --- (8.0 psi = destruction of buildings) Orange: LOC was never exceeded --- (3.5 psi = serious injury likely) Yellow: LOC was never exceeded --- (1.0 psi = shatters glass)</p>	<p>Threat Modeled: Overpressure (blast force) from vapor cloud explosion Type of Ignition: ignited by spark or flame Level of Congestion: uncongested Model Run: Gaussian Red : LOC was never exceeded --- (8.0 psi = destruction of buildings) Orange: LOC was never exceeded --- (3.5 psi = serious injury likely) Yellow: LOC was never exceeded --- (1.0 psi = shatters glass)</p>
<p>THREAT ZONE: Threat Modeled: Overpressure (blast force) from vapor cloud explosion Model Run: Gaussian Type of Ignition: ignited by spark or flame Level of Congestion: uncongested Red : LOC was never exceeded --- (8.0 psi = destruction of bldg. b Orange: LOC was never exceeded --- (3.5 psi = serious injury likely) Yellow: LOC was never exceeded --- (1.0 psi = shatters glass)</p> <p>THREAT AT POINT: Overpressure Estimate at the point: Downwind: 50 meters Off Centerline: 25 meters. There is no significant overpressure at the point selected.</p> <p>CHEMICAL DATA: Chemical Name: CARBON MONOXIDE CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm LEL: 125000 ppm UEL: 742000 ppm Ambient Boiling Point: -191.5° C Vapor Pressure at Ambient Temperature: greater than 1 atm Ambient Saturation Concentration: 1,000,000 ppm or 100.0%</p> <p>ATMOSPHERIC DATA: (MANUAL INPUT OF DATA) Wind: 10 meters/second from 225° true at 3 meters Ground Roughness: open country Cloud Cover: 7 tenths Air Temperature: 32° C Stability Class: D No Inversion Height Relative Humidity: 75%</p> <p>SOURCE STRENGTH: Leak from hole in vertical cylindrical tank Flammable chemical escaping from tank (not burning) Tank Diameter: 45 meters Tank Length: 85 meters Tank Volume: 135,187 cubic meters Tank contains gas only Internal Temperature: 32° C Chemical Mass in Tank: 187 tons Internal Press: 1.12 atmospheres Opening Length: 40 centimeters Opening Width: 7 centimeters Release Duration: ALOHA limited the duration to 1-hour Max Average Sustained Release Rate: 166 kilograms/min (averaged over a minute or more) Total Amount Released: 8,539 kilograms</p>	<p>THREAT ZONE: Threat Modeled: Overpressure (blast force) from vapor cloud explosion Model Run: Gaussian Type of Ignition: ignited by spark or flame Level of Congestion: uncongested Red : LOC was never exceeded --- (8.0 psi = destruction of bldg Orange: LOC was never exceeded - (3.5 psi =serious injury likely) Yellow: LOC was never exceeded --- (1.0 psi = shatters glass)</p> <p>THREAT AT POINT: Overpressure Estimate at the point: Downwind: 50 meters Off Centerline: 25 meters Overpressure: 0.176 psi</p> <p>CHEMICAL DATA: Chemical Name: CARBON MONOXIDE CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm AEGL-3 (60 min) IDLH: 1200 ppm LEL: 125000 ppm UEL: 742000 ppm Ambient Boiling Point: -191.5° C Vapor Pressure at Ambient Temperature: greater than 1 atm Ambient Saturation Concentration: 1,000,000 ppm or 100.0%</p> <p>ATMOSPHERIC DATA: (MANUAL INPUT OF DATA) Wind: 3 meters/second from 45° true at 3 meters Ground Roughness: open country Cloud Cover: 5 tenths Air Temperature: 25° C Stability Class: F (user override) No Inversion Height Relative Humidity: 50%</p> <p>SOURCE STRENGTH: Leak from hole in vertical cylindrical tank Flammable chemical escaping from tank (not burning) Tank Diameter: 45 meters Tank Length: 85 meters Tank Volume: 135,187 cubic meters Tank contains gas only Internal Temperature: 25° C Chemical Mass in Tank: 191 tons Internal Press: 1.12 atmospheres Opening Length: 40 centimeters Opening Width: 7-centimeter Release Duration: ALOHA limited the duration to 1 hour Max Average Sustained Release Rate: 168 kilograms/min (averaged over a minute or more) Total Amount Released: 8,659 kilograms.</p>

4A. PACKAGING WATER AREA BF CO LEAKAGE: near platform

TOXIC cloud Atmospheric stability: 'D'
(MAXIMUM CREDIBLE ACCIDENT SCENARIO)



THREAT ZONE: Model Run: Gaussian\

Red : 51 meters --- (330 ppm = AEGL-3 [60 min])
Orange: 103 meters --- (83 ppm = AEGL-2 [60 min])
Yellow: no recommended LOC value --- (N/A = AEGL-1 [60 min])

THREAT AT POINT: Concentration Estimates at the point: Downwind: 10 meters Off Centerline: 5 meters
Note: Concentration not drawn because there is no significant concentration at the point selected.

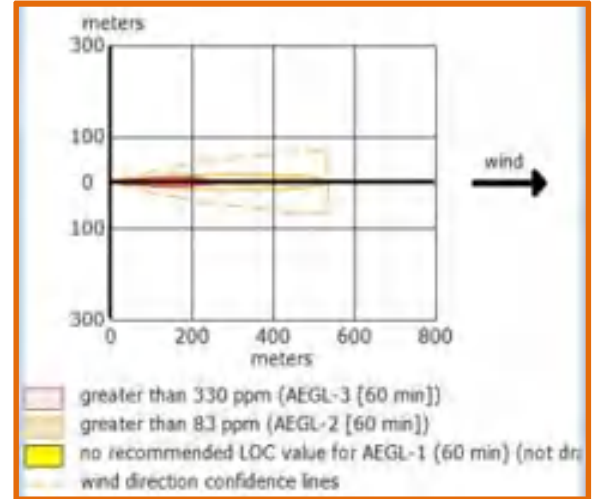
CHEMICAL DATA: Chemical Name: CARBON MONOXIDE
CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol
AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm
AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm
LEL: 125000 ppm UEL: 742000 ppm
Ambient Boiling Point: -191.5° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
Wind: 10 meters/second from 225° true at 3 meters
Ground Roughness: open country Cloud Cover: 5 tenths
Air Temperature: 32° C Stability Class: D
No Inversion Height Relative Humidity: 50%

SOURCE STRENGTH:
Source: 500 kilograms/ hr Pipe Ø2100 mm Pr. 2.0 atm,
Release from a pipe crack opening,
Source Height: 0 Release Duration: 60 minutes
Release Rate: 8.33 kilograms/min
Total Amount Released: 500 kilograms (Assumed).

4B. PACKAGING WATER AREA BF CO LEAKAGE: near platform

TOXIC cloud Atmospheric stability: 'F'
(MAXIMUM CREDIBLE ACCIDENT SCENARIO)



THREAT ZONE: Model Run: Gaussian

Red : 258 meters --- (330 ppm = AEGL-3 [60 min])
Orange: 537 meters --- (83 ppm = AEGL-2 [60 min])
Yellow: no recommended LOC value --- (N/A = AEGL-1 [60 min])

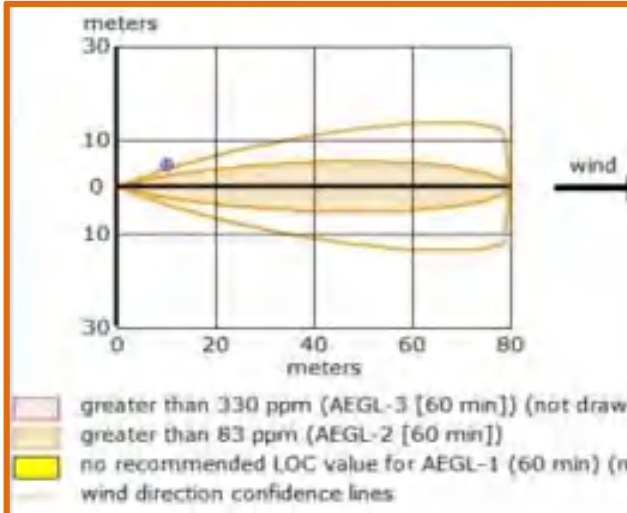
THREAT AT POINT: Concentration Estimates at the point: Downwind: 10 meters Off Centerline: 5 meters
Note: Concentration not drawn because there is no significant concentration at the point selected

CHEMICAL DATA: Chemical Name: CARBON MONOXIDE
CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol
AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm
AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm
LEL: 125000 ppm UEL: 742000 ppm
Ambient Boiling Point: -191.5° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
Wind: 3 meters/second from 45° true at 3 meters
Ground Roughness: open country Cloud Cover: 5 tenths
Air Temperature: 25° C Stability Class: F (user override)
No Inversion Height Relative Humidity: 50%

SOURCE STRENGTH:
Direct Source: 500 kilograms/ hr Pipe Ø2100 mm Pr. 2.0 atm,
Release from a pipe crack opening,
Source Height: 0 Release Duration: 60 minutes
Release Rate: 8.33 kilograms/min
Total Amount Released: 500 kilograms (Assumed).

5A. BF STEAM GENERATORS 3 NUMBERS: Supply line Ø600 mm Pipe rupture and leakage of gas **TOXIC cloud**
Atmospheric stability: 'D'
(MAXIMUM CREDIBLE ACCIDENT SCENARIO)



THREAT ZONE: Model Run: Gaussian
Red : 39 meters --- (330 ppm = AEGL-3 [60 min])
Note: Threat zone was not drawn because effects of near-field patchiness make dispersion predictions less reliable for short distances.
Orange: 80 meters --- (83 ppm = AEGL-2 [60 min])
Yellow: no recommended LOC value (N/A = AEGL-1 [60 min])

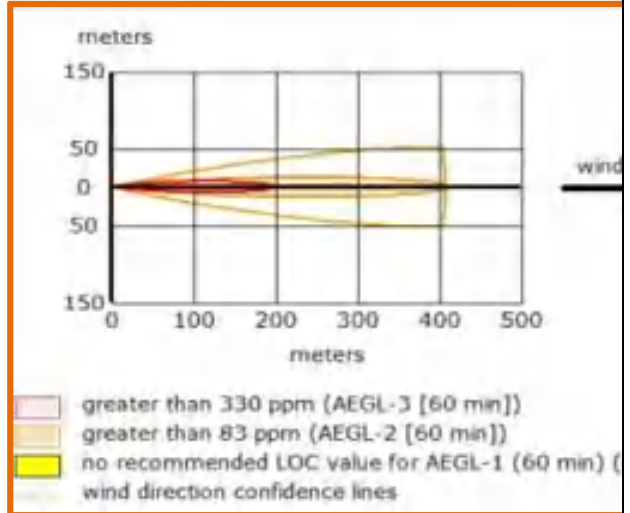
THREAT AT POINT: Concentration Estimates at the point: Downwind: 10 meters Off Centerline: 5 meters
Note: Concentration not drawn because there is no significant concentration at the point selected.

CHEMICAL DATA: Chemical Name: CARBON MONOXIDE
CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol
AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm
AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm LEL: 125000 ppm UEL: 742000 ppm
Ambient Boiling Point: -191.5° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
Wind: 10 meters/second from 225° true at 3 meters
Ground Roughness: open country Cloud Cover: 5 tenths
Air Temperature: 32° C Stability Class: D
No Inversion Height Relative Humidity: 50%

SOURCE STRENGTH:
Direct Source: 300 kilograms/hr Source
Height: 0 Pipe Ø600 Pr. 2.0 atm flow 75,000 nm³/hr,
Release Duration: 60 minutes Release Rate: 5 kilograms/min
Total Amount Released: 300 kilograms

5B. BF STEAM GENERATORS 3 NUMBERS: Supply line Ø600 mm Pipe rupture and leakage of gas **TOXIC cloud**
Atmospheric stability: 'F'
(MAXIMUM CREDIBLE ACCIDENT SCENARIO)



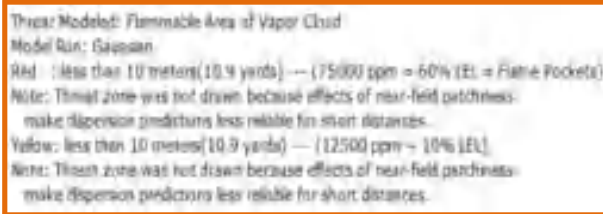
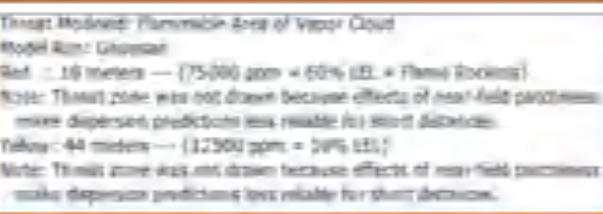
THREAT ZONE: Model Run: Gaussian
Red : 198 meters --- (330 ppm = AEGL-3 [60 min])
Orange : 408 meters --- (83 ppm = AEGL-2 [60 min])
Yellow: no recommended LOC value --- (N/A = AEGL-1 [60 min])

THREAT AT POINT: Concentration Estimates at the point: Downwind: 10 meters Off Centerline: 5 meters
Note: Concentration not drawn because there is no significant concentration at the point selected

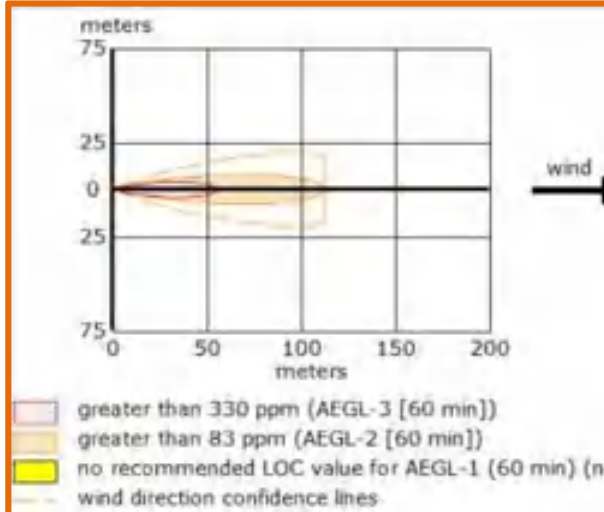
CHEMICAL DATA: Chemical Name: CARBON MONOXIDE
CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol
AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm
AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm LEL: 125000 ppm UEL: 742000 ppm
Ambient Boiling Point: -191.5° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
Wind: 3 meters/second from 45° true at 3 meters
Ground Roughness: open country Cloud Cover: 5 tenths
Air Temperature: 25° C Stability Class: F (user override)
No Inversion Height Relative Humidity: 50%

SOURCE STRENGTH:
Direct Source: 300 kilograms/hr Source
Height: 0 Pipe Ø600 Pr. 2.0 atm flow 75,000 nm³/hr,
Release Duration: 60 minutes Release Rate: 5 kilograms/min
Total Amount Released: 300 kilograms

<p>6A. BF STEAM GENERATORS 3 NUMBERS: Supply line Ø600 mm Pipe rupture and leakage of gas FIRE cloud Atmospheric stability: 'D' (MAXIMUM CREDIBLE ACCIDENT SCENARIO)</p>	<p>6B. BF STEAM GENERATORS 3 NUMBERS: Supply line Ø600 mm Pipe rupture and leakage of gas FIRE cloud Atmospheric stability: 'F' (MAXIMUM CREDIBLE ACCIDENT SCENARIO)</p>
<p>THREAT ZONE:</p> 	<p>THREAT ZONE:</p> 
<p>THREAT AT POINT: Concentration Estimates at the point: Downwind: 10 meters Off Centerline: 5 meters Note: Concentration not drawn because there is no significant concentration at the point selected.</p> <p>CHEMICAL DATA: Chemical Name: CARBON MONOXIDE CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm LEL: 125000 ppm UEL: 742000 ppm Ambient Boiling Point: -191.5° C Vapor Pressure at Ambient Temperature: greater than 1 atm Ambient Saturation Concentration: 1,000,000 ppm or 100.0%</p>	<p>THREAT AT POINT: Concentration Estimates at the point: Downwind: 10 meters Off Centerline: 5 meters Note: Concentration not drawn because there is no significant concentration at the point selected.</p> <p>CHEMICAL DATA: Chemical Name: CARBON MONOXIDE CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm LEL: 125000 ppm UEL: 742000 ppm Ambient Boiling Point: -191.5° C Vapor Pressure at Ambient Temperature: greater than 1 atm Ambient Saturation Concentration: 1,000,000 ppm or 100.0%</p>
<p>ATMOSPHERIC DATA: (MANUAL INPUT OF DATA) Wind: 10 meters/second from 225° true at 3 meters Ground Roughness: open country Cloud Cover: 7 tenths Air Temperature: 32° C Stability Class: D No Inversion Height Relative Humidity: 75%</p> <p>SOURCE STRENGTH Direct Source: 300 kilograms/hr Source Height: 0 Pipe Ø600 Pr. 2.0 atm flow 75,000 nm³/hr, Release Duration: 60 minutes Release Rate: 5 kilograms/min Total Amount Released: 300 kilograms</p>	<p>ATMOSPHERIC DATA: (MANUAL INPUT OF DATA) Wind: 3 meters/second from 45° true at 3 meters Ground Roughness: open country Cloud Cover: 5 tenths Air Temperature: 25° C Stability Class: F (user override) No Inversion Height Relative Humidity: 50%</p> <p>SOURCE STRENGTH: Direct Source: 300 kilograms/hr Source Height: 0 Pipe Ø600 Pr. 2.0 atm flow 75,000 nm³/hr, Release Duration: 60 minutes Release Rate: 5 kilograms/min Total Amount Released: 300 kilograms</p>

7A. BF TRT TURBINE 10 MW: Supply line Ø2100 mm Pipe rupture and leakage of gas. Atmospheric stability: 'D' **MAXIMUM CREDIBLE ACCIDENT SCENARIO)**



THREAT ZONE: Model Run: Gaussian
Red : 56 meters --- (330 ppm = AEGL-3 [60 min])
Orange: 114 meters --- (83 ppm = AEGL-2 [60 min])
Yellow: no recommended LOC value --- (N/A = AEGL-1 [60 min])

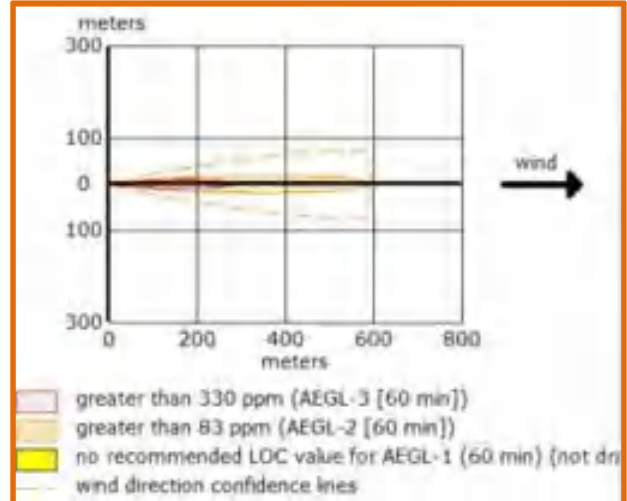
THREAT AT POINT: Concentration Estimates at the point: Downwind: 10 meters Off Centerline: 5 meters
 Note: Concentration not drawn because there is no significant concentration at the point selected.

CHEMICAL DATA: Chemical Name: CARBON MONOXIDE
 CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol
 AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm
 AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm
 LEL: 125000 ppm UEL: 742000 ppm
 Ambient Boiling Point: -191.5° C
 Vapor Pressure at Ambient Temperature: greater than 1 atm
 Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
 Wind: 10 meters/second from 225° true at 3 meters
 Ground Roughness: open country Cloud Cover: 7 tenths
 Air Temperature: 32° C Stability Class: D
 No Inversion Height Relative Humidity: 75%

SOURCE STRENGTH
 Direct Source: 300 kilograms/hr
 Source Height: 0 Pipe Ø600 Pr. 2.0 atm flow
 75,000 nm³/hr,
 Release Duration: 60 minutes Release Rate: 5 kilograms/min
 Total Amount Released: 300 kilograms

7A. BF TRT TURBINE 10 MW: Supply line Ø2100 mm Pipe rupture and leakage of gas. **TOXIC cloud** Atmospheric stability: 'F' **MAXIMUM CREDIBLE ACCIDENT SCENARIO)**



THREAT ZONE: Model Run: Gaussian
Red : 284 meters --- (330 ppm = AEGL-3 [60 min])
Orange: 594 meters --- (83 ppm = AEGL-2 [60 min])
Yellow: no recommended LOC value --- (N/A = AEGL-1 [60 min])

THREAT AT POINT: Concentration Estimates at the point: Downwind: 10 meters Off Centerline: 5 meters
 Note: Concentration not drawn because there is no significant concentration at the point selected.

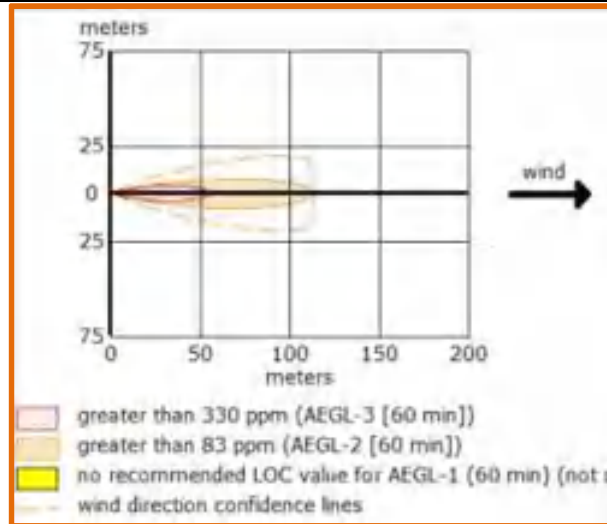
CHEMICAL DATA: Chemical Name: CARBON MONOXIDE
 CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol
 AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm LEL: 125000 ppm
 UEL: 742000 ppm Ambient Boiling Point: -191.5° C
 Vapor Pressure at Ambient Temperature: greater than 1 atm
 Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
 Wind: 3 meters/second from 45° true at 3 meters
 Ground Roughness: open country Cloud Cover: 5 tenths
 Air Temperature: 25° C Stability Class: F (user override)
 No Inversion Height Relative Humidity: 50%

SOURCE STRENGTH:
 Direct Source: 600 kilograms/hr
 Source Height: 0 Pipe Ø600 Pr. 1.12.0 atm flow
 3,50,000 nm³/hr,
 Release Duration: 60 minutes Release Rate: 10 kilograms/min
 Total Amount Released: 600 kilograms.

8A. BF KALUJIN STOVES: Supply line Ø1800 mm Pipe rupture and leakage of gas (heating arrangement for HOT BLAST)

TOXIC CLOUD Atmospheric stability: 'D'
(MAXIMUM CREDIBLE ACCIDENT SCENARIO)



THREAT ZONE: Model Run: Gaussian
Red : 56 meters --- (330 ppm = AEGL-3 [60 min])
Orange: 114 meters --- (83 ppm = AEGL-2 [60 min])
Yellow: no recommended LOC value --- (N/A = AEGL-1 [60 min])

THREAT AT POINT: Concentration Estimates at the point: Downwind: 10 meters Off Centerline: 5 meters
Note: Concentration not drawn because there is no significant concentration at the point selected.

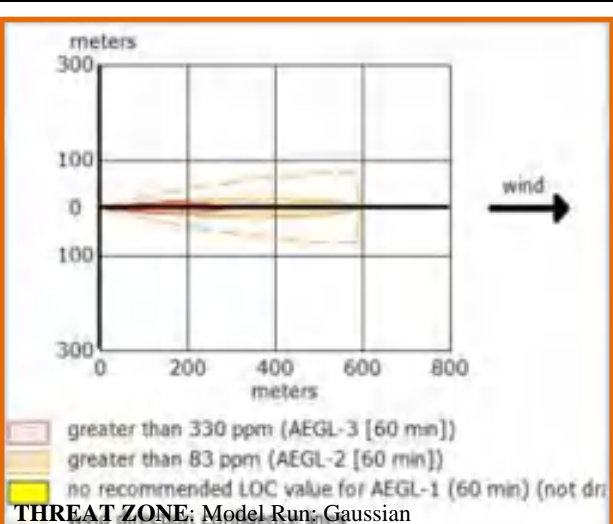
CHEMICAL DATA: Chemical Name: CARBON MONOXIDE
CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol
AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm
AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm
LEL: 125000 ppm UEL: 742000 ppm Ambient Boiling Point: -191.5° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
Wind: 10 meters/second from 225° true at 3 meters
Ground Roughness: open country Cloud Cover: 5 tenths
Air Temperature: 32° C Stability Class: D
No Inversion Height Relative Humidity: 50%

SOURCE STRENGTH:
Direct Source: 600 kilograms/hr Source Height: 0
Pipe Ø 1800 Pr. 1.08 atm Temp: 32°C Flow rate: 1,00,000 nm³/hr
Release Duration: 60 minutes
Release Rate: 10 kilograms/min
Total Amount Released: 600 kilograms

8B. BF KALUJIN STOVES: Supply line Ø1800 mm Pipe rupture and leakage of gas (heating arrangement for HOT BLAST)

TOXIC CLOUD Atmospheric stability: 'F'
(MAXIMUM CREDIBLE ACCIDENT SCENARIO)



THREAT ZONE: Model Run: Gaussian
Red : 284 meters --- (330 ppm = AEGL-3 [60 min])
Orange: 594 meters --- (83 ppm = AEGL-2 [60 min])
Yellow: no recommended LOC value --- (N/A = AEGL-1 [60 min])

THREAT AT POINT: Concentration Estimates at the point: Downwind: 10 meters Off Centerline: 5 meters
Note: Concentration not drawn because there is no significant concentration at the point selected

CHEMICAL DATA: Chemical Name: CARBON MONOXIDE
CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol
AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm
AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm LEL: 125000 ppm
UEL: 742000 ppm Ambient Boiling Point: -191.5° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
Wind: 3 meters/second from 45° true at 3 meters
Ground Roughness: open country Cloud Cover: 5 tenths
Air Temperature: 25° C Stability Class: F (user override)
No Inversion Height Relative Humidity: 50%

SOURCE STRENGTH:
Direct Source: 600 kilograms/hr Source Height: 0
Pipe Ø 1800 Pr. 1.08 atm Temp: 25°C Flow rate: 1,00,000 nm³/hr
Release Duration: 60 minutes
Release Rate: 10 kilograms/min
Total Amount Released: 600 kilograms

9A. BF KALUJIN STOVES: Supply line Ø1800 mm Pipe rupture and leakage of gas (heating arrangement for HOT BLAST) **FIRE CLOUD** Atmospheric stability: 'D' **(MAXIMUM CREDIBLE ACCIDENT SCENARIO)**

Threat Modeled: Flammable Area of Vapor Cloud
Model Run: Gaussian
Red: < 10 meters (10.9 yards) --- (75000 ppm = 60% LEL = Flame Pockets)
Note: Threat zone was not drawn because effects of near-field patchiness make dispersion predictions less reliable for short distances.
Yellow: 12 meters --- (12500 ppm = 10% LEL)
Note: Threat zone was not drawn because effects of near-field patchiness make dispersion predictions less reliable for short distances.

THREAT ZONE: Model Run: Gaussian

THREAT AT POINT: Concentration Estimates at the point:
Downwind: 10 meters Off Centerline: 5 meters
Note: Concentration not drawn because there is no significant concentration at the point selected.

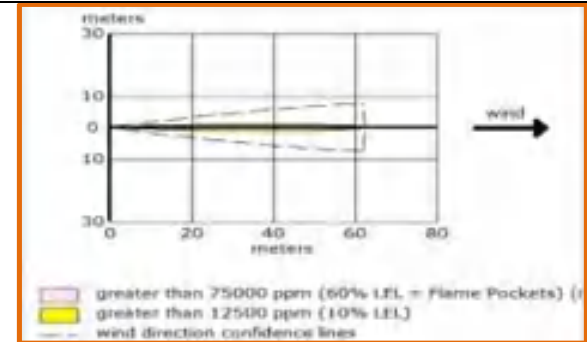
CHEMICAL DATA: Chemical Name: CARBON MONOXIDE
CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol
AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm LEL: 125000 ppm UEL:
742000 ppm Ambient Boiling Point: -191.5° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
Wind: 10 meters/second from 225° true at 3 meters
Ground Roughness: open country Cloud Cover: 7 tenths
Air Temperature: 32° C Stability Class: D
No Inversion Height Relative Humidity: 75%

SOURCE STRENGTH:
Direct Source: 600 kilograms/hr Source Height: 0 Pipe
Ø 1800 mm Pr. 1.08 atm Temp: 32°C
Flow rate: 1,00,000 nm³/hr
Release Duration: 60 minutes Release Rate: 10 kilograms/min
Total Amount Released: 600 kilograms

9B. BF KALUJIN STOVES: Supply line Ø1800 mm Pipe rupture and leakage of gas (heating arrangement for HOT BLAST)

FIRE CLOUD Atmospheric stability: 'F' **(MAXIMUM CREDIBLE ACCIDENT SCENARIO)**



THREAT ZONE: Threat Modeled: Flammable Area of Vapor Cloud Model Run: Gaussian

Red : 25 meters --- (75000 ppm = 60% LEL = Flame Pockets) Note: Threat zone was not drawn because effects of near-field patchiness make dispersion predictions less reliable for short distances.

Yellow: 63 meters --- (12500 ppm = 10% LEL) Model Run: Gaussian **THREAT AT POINT:** Concentration Estimates at the point: Downwind: 10 meters Off Centerline: 5 meters

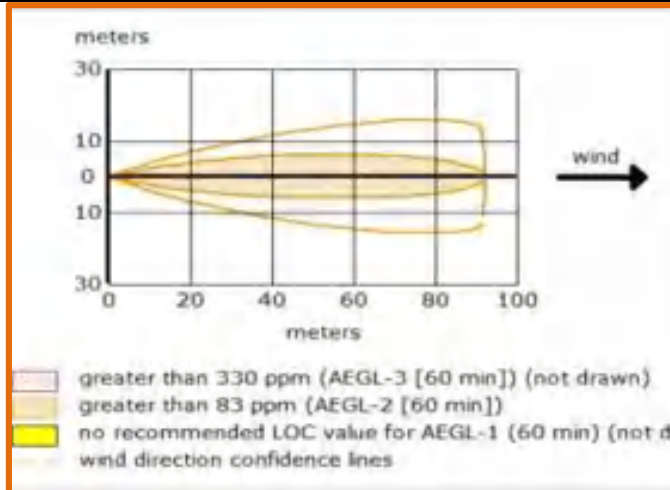
Note: Concentration not drawn because there is no significant concentration at the point selected

CHEMICAL DATA: Chemical Name: CARBON MONOXIDE
CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol
AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm LEL: 125000 ppm UEL:
742000 ppm Ambient Boiling Point: -191.5° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
Wind: 3 meters/second from 45° true at 3 meters
Ground Roughness: open country Cloud Cover: 5 tenths
Air Temperature: 25° C Stability Class: F (user override) No Inversion Height
Relative Humidity: 50%

SOURCE STRENGTH:
Direct Source: 600 kilograms/hr Source Height: 0
Pipe Ø 1800 Pr. 1.08 atm Temp: 25°C Flow rate : 1,00,000 nm³/hr Release Duration: 60 minutes
Release Rate: 10 kilograms/min
Total Amount Released: 600 kilograms

10 A. BF PCI COAL DRYING OVENS: Supply line Ø 600 mm
Pipe rupture and leakage of gas. **FIRE CLOUD**
Atmospheric stability: 'D'
(MAXIMUM CREDIBLE ACCIDENT SCENARIO)



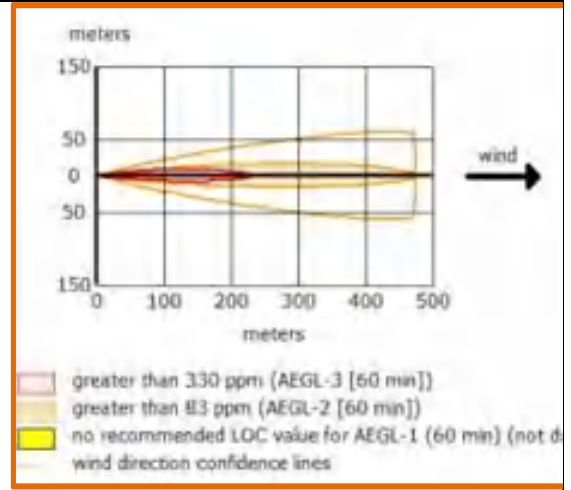
THREAT ZONE: Model Run: Gaussian
Red : 45 meters --- (330 ppm = AEGL-3 [60 min])
Note: Threat zone was not drawn because effects of near-field patchiness make dispersion predictions less reliable for short distances.
Orange: 92 meters --- (83 ppm = AEGL-2 [60 min])
Yellow: no recommended LOC value --- (N/A = AEGL-1 [60 min])
THREAT AT POINT: Concentration Estimates at the point:
Downwind: 10 meters Off Centerline: 5 meters
Note: Concentration not drawn because there is no significant concentration at the point selected.

CHEMICAL DATA: Chemical Name: CARBON MONOXIDE
CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol
AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm LEL: 125000 ppm UEL: 742000 ppm Ambient Boiling Point: -191.5° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
Wind: 10 meters/second from 225° true at 3 meters Ground
Roughness: open country Cloud Cover: 7 tenths Air
Temperature: 32° C Stability Class: D
No Inversion Height Relative Humidity: 75%

SOURCE STRENGTH:
Direct Source: 400 kilograms/hr Source Height: 0 Pipe
Ø600 Mm Pressure: 1.08 atm Flow RATE: 12,000 nm³/hr
Release Duration: 60 minutes Release Rate: 6.67
kilograms/min. Total Amount Released: 400 kilograms

10 B. BF PCI COAL DRYING OVENS: Supply line Ø 600 mm
Pipe rupture and leakage of gas.
FIRE CLOUD Atmospheric stability: 'F'
(MAXIMUM CREDIBLE ACCIDENT SCENARIO)



THREAT ZONE: Model Run: Gaussian
Red : 230 meters --- (330 ppm = AEGL-3 [60 min])
Orange: 476 meters --- (83 ppm = AEGL-2 [60 min])
Yellow: no recommended LOC value --- (N/A = AEGL-1 [60 min])

THREAT AT POINT: Concentration
Estimates at the point: Downwind: 10 meters
Off Centerline: 5 meters
meters
Note: Concentration not drawn because there is no significant concentration at the point selected

CHEMICAL DATA: Chemical Name: CARBON MONOXIDE
CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol
AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm LEL: 125000 ppm UEL: 742000 ppm Ambient Boiling Point: -191.5° C
Vapor Pressure at Ambient Temperature: greater than 1 atm
Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
Wind: 3 meters/second from 45° true at 3 meters
Ground Roughness: open country Cloud Cover: 5 tenths Air
Temperature: 25° C Stability Class: F (user override)
No Inversion Height Relative Humidity: 50%

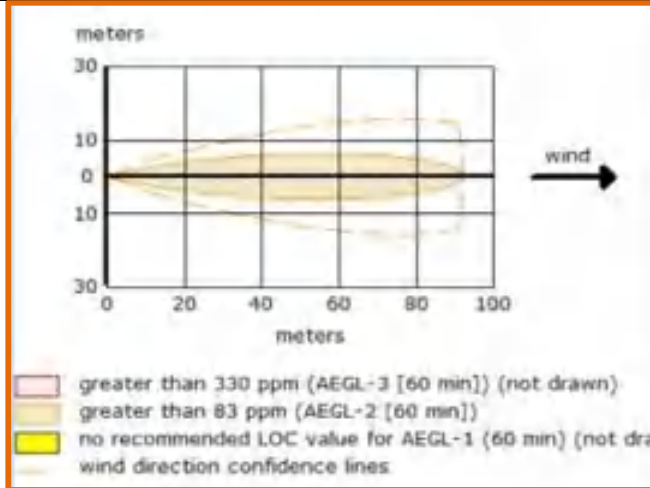
SOURCE STRENGTH:
Direct Source: 400 kilograms/hr Source Height: 0 Pipe Ø600 Mm Pressure: 1.08 atm Flow RATE: 12,000 nm³/hr
Release Duration: 60 minutes Release Rate: 6.67 kilograms/min. Total Amount Released: 400 kilograms

11A. BF FURNACE 10M WORKING PLATFORM AREA:

Exposure to different Leakages of CO gas **TOXIC CLOUD** Atmospheric stability: 'D'

(MAXIMUM)

UNIQUE CREDIBLE ACCIDENT SCENARIO)



THREAT ZONE: Model Run: Gaussian

Red: 45 meters --- (330 ppm = AEGL-3 [60 min])
 Note: Threat zone was not drawn because effects of near-field patchiness make dispersion predictions less reliable for short distances.
 Orange: 92 meters --- (83 ppm = AEGL-2 [60 min])
 Yellow: no recommended LOC value --- (N/A = AEGL-1 [60 min])
THREAT AT POINT: Concentration Estimates at the point:
 Downwind: 10 meters Off Centerline: 5 meters
 Note: Concentration not drawn because there is no significant concentration at the point selected.

CHEMICAL DATA: Chemical Name: CARBON MONOXIDE
 CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol
 AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm LEL: 125000 ppm UEL: 742000 ppm Ambient Boiling Point: -191.5° C
 Vapor Pressure at Ambient Temperature: greater than 1 atm
 Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

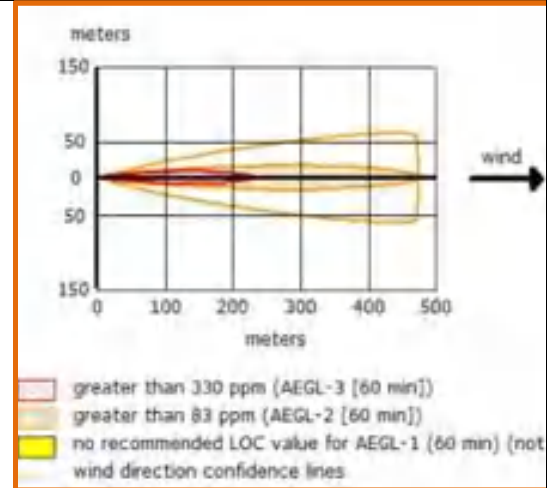
ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
 Wind: 10 meters/second from 225° true at 3 meters Ground Roughness: open country Cloud Cover: 5 tenths Air Temperature: 32° C Stability Class: D
 No Inversion Height Relative Humidity: 50%

SOURCE STRENGTH: Direct Source: 1000 kilograms/hr
 Source Height: 0 Pressure: 1.0 atm Temp: 50° C
 Release Duration: 60 minutes Release Rate: 6.67 kilograms/min.
 Total Amount Released: 1000 kilograms

11B. BF FURNACE 10M WORKING PLATFORM AREA:

Exposure to different Leakages of CO gas **TOXIC CLOUD** Atmospheric stability: 'F'

MAXIMUM CREDIBLE ACCIDENT SCENARIO)



THREAT ZONE: Model Run: Gaussian

Red: 230 meters --- (330 ppm = AEGL-3 [60 min])
 Orange: 476 meters --- (83 ppm = AEGL-2 [60 min])
 Yellow: no recommended LOC value --- (N/A = AEGL-1 [60 min])

THREAT AT POINT: Concentration Estimates at the point:
 Downwind: 10 meters Off Centerline: 5 meters

Note: Concentration not drawn because there is no significant concentration at the point selected

CHEMICAL DATA: Chemical Name: CARBON MONOXIDE
 CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol
 AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm LEL: 125000 ppm UEL: 742000 ppm Ambient Boiling Point: -191.5° C
 Vapor Pressure at Ambient Temperature: greater than 1 atm
 Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

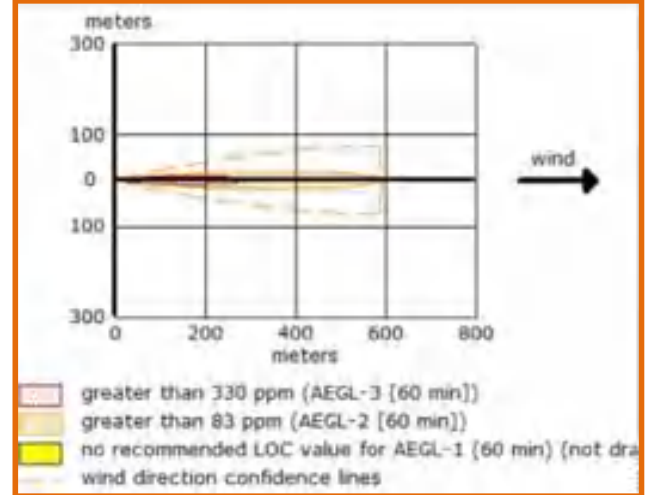
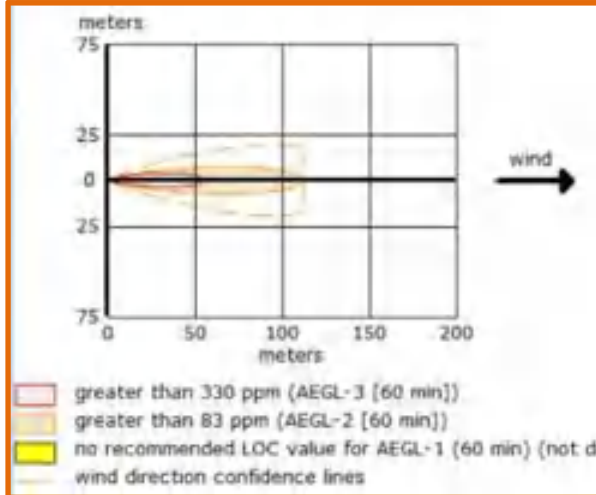
ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)

Wind: 3 meters/second from 45° true at 3 meters Ground Roughness: open country Cloud Cover: 5 tenths Air Temperature: 25° C Stability Class: F (user override)
 No Inversion Height Relative Humidity: 50%

SOURCE STRENGTH: Direct Source: 1000 kilograms/hr Source Height: 0 Pressure: 1.0 atm Temp: 50° C
 Release Duration: 60 minutes Release Rate: 6.67 kilograms/min. Total Amount Released: 1000 kilograms

12 A SINTER PLANT: Supply line Ø800 mm Pipe rupture and leakage of gas. Atmospheric stability: 'D' **MAXIMUM CREDIBLE ACCIDENT SCENARIO**

12 B SINTER PLANT: Supply line Ø800 mm Pipe rupture and leakage of gas. **TOXIC CLOUD** Atmospheric stability: 'F' **MAXIMUM CREDIBLE ACCIDENT SCENARIO**



THREAT ZONE: Model Run: Gaussian
Red : 56 meters --- (330 ppm = AEGL-3 [60 min])
Orange: 114 meters --- (83 ppm = AEGL-2 [60 min])
Yellow: no recommended LOC value --- (N/A = AEGL-1 [60 min])

THREAT ZONE: Model Run: Gaussian
Red : 284 meters --- (330 ppm = AEGL-3 [60 min])
Orange: 594 meters --- (83 ppm = AEGL-2 [60 min])
Yellow: no recommended LOC value --- (N/A = AEGL-1 [60 min])

THREAT AT POINT: Concentration Estimates at the point: Downwind: 10 meters Off Centerline: 5 meters
 Note: Concentration not drawn because there is no significant concentration at the point selected.

THREAT AT POINT: Concentration Estimates at the point: Downwind: 10 meters Off Centerline: 5 meters
 Note: Concentration not drawn because there is no significant concentration at the point selected

CHEMICAL DATA: Chemical Name: CARBON MONOXIDE
 CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol
 AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm
 AEGL-3 (60 min): 330 ppm IDLH: 1200 ppm LEL: 125000 ppm UEL: 742000 ppm
 Ambient Boiling Point: -191.5° C
 Vapor Pressure at Ambient Temperature: greater than 1 atm
 Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

CHEMICAL DATA: Chemical Name: CARBON MONOXIDE
 CAS Number: 630-8-0 Molecular Weight: 28.01 g/mol
 AEGL-1 (60 min): N/A AEGL-2 (60 min): 83 ppm AEGL-3 (60 min): 330 ppm
 IDLH: 1200 ppm LEL: 125000 ppm UEL: 742000 ppm
 Ambient Boiling Point: -191.5° C
 Vapor Pressure at Ambient Temperature: greater than 1 atm
 Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
 Wind: 10 meters/second from 225° true at 3 meters
 Ground Roughness: open country Cloud Cover: 5 tenths
 Air Temperature: 32° C Stability Class: D
 No Inversion Height Relative Humidity: 50%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)
 Wind: 3 meters/second from 45° true at 3 meters
 Ground Roughness: open country Cloud Cover: 5 tenths
 Air Temperature: 25° C Stability Class: F (user override)
 No Inversion Height Relative Humidity: 50%

SOURCE STRENGTH: Direct Source: 600 kilograms/hr
 Source Height: 0 Pressure: 1.08 atm Pipe Ø 800 mm
 Temp: 50°C Release Duration: 60 minutes Release Rate: 6.67 kilograms/min.
 Total Amount Released: 600 kilograms

SOURCE STRENGTH: Direct Source: 600 kilograms/hr
 Source Height: 0 Pressure: 1.08 atm Pipe Ø 800 mm
 Temp: 50°C Release Duration: 60 minutes Release Rate: 6.67 kilograms/min.
 Total Amount Released: 600 kilograms

Management of Risk and Health Scenarios

Risk Assessment & Management-

- A written OHS policy which is a statement of the management commitment to health and safety in the organization
- Defines and allocates various responsibilities accountabilities and authorities in the organization
- Ensures effective arrangements for the full participation of workers and their representatives in the fulfillment of the OHS policy
- Defines the necessary competencies and training needs
- Ensures the availability of information to workers in a language they can understand
- Establishes and maintains proper documentation and communication arrangements
- Identifies the hazards and carry out assessments of the specific risks to health and safety of workers in the workplace.
- Establishes hazard prevention and control measures including emergency prevention, preparedness and response arrangements
- Establishes procedures for compliance with OHS requirements in purchasing and leasing specifications for contractors on site.
- Develops, establishes and review procedures to monitor measure and record OHS performance
- Identifies and implements preventive and corrective actions for continual improvement.

Health Management (Large Hazard Unit)

- Occupational health management encompasses the physical, mental and social well-being of the people working in the company
- Occupational health management promotes the safety of employees, contractors and visitors by preventing personal injuries in the workplace
- Deal with accidents, dangerous occurrences and incidents that may involve hazards or risks to safety and health from the production
- Competency of persons working shall be fully established. Work related trainings shall be imparted periodically. Records are to be maintained.
- Roles and responsibilities shall be assigned clearly and reviewed periodically. Performance indicators shall be devised and assessed for performance of the personnel.
- PPEs shall be kept at designated places and indicated on the layout plan. Daily shift-wise tool box talk shall emphasis these points.
- Periodic Mock Drills of GROUND LEVEL shall be conducted. Records shall be maintained. These records shall be available at the PLANT concerned.
- Firefighting using first aid fire extinguishers and hydrant system shall be practiced at monthly intervals. Every workman, management staff have to undergo the training. Records have to be maintained.
- Personal Hygiene practices shall be strictly implemented to avoid, inhalation and ingestion of gases.
- Regular practice sessions for wearing the equipment shall be undertaken.
- Periodic health checkup programs have to be organized and records maintained. Critical Health parameters of the employees have to be monitored.
- Establishment of a system to record, report and monitor occupational accidents and diseases, and dangerous occurrences.

Description of Information or Organizational Systems Used to Carry on Industrial Activity Safety, Namely

Maintenance & Inspection Schedule

Schedule for maintenance & Inspection of equipment involved in continuous and safe operation in manufacturing, handling and storage, are categorized as per following;

Planned Maintenance

Preventative Maintenance

The regular planned activity set by the engineering Department consists of:

- Checking Electrical equipment in classified areas.
- The checking of flameproof electrical fitting in flammable zone.
- Checking of safety devices like safety valve, pressure gauge.
- Computer Operating System
- Pipelines, Joints, Valves etc.
- Regular Inspection
- Tightening Connections and checking
- General Cleaning removal of oil, dust etc.
- Scrubber at chlorine handling area and water shower with eye washer at chlorine location.
- Electric wires, switches, lights, siren
- Machine guarding, fencing etc.

Periodical Maintenance

The equipment, instruments, vessels, pipelines etc. are required to get examined & certified by competent person to comply statutory provisions. Such list is given as below:

- Lifting Tackles, Chain pulley blocks etc.
- Lift, Hoist
- Pressure vessels, Air receivers, Boilers etc.
- Furnace, Ladle furnace etc.
- Noise, Vibration, Illumination etc.
- Monitoring Working environment & stack.
- Fire extinguishers, Fire alarm system & Fire prevention.
- Communication system

Unplanned Maintenance

Sudden Breakdown OF equipment/Process/Operation

As far as possible, the plan maintenance schedule eliminates the breakdown maintenance. But, wherever the breakdown take place, the equipments or area are promptly attended with the help of experienced technicians & expert person. It is ensure that adequate stock of the spares shall be available for such purposes. Further, breakdown is carried out on more sound basis rather than as a more patch up activity.

Inspection of Equipment

The safety aspect of the plant & equipment as a whole always are dealt more timely in our complex. All the equipment, process plant, involved in safety in the areas of hazardous substances are frequently inspected and kept in total working condition.

Schedule Maintenance

- Monthly monitoring- Toxic & Flammable gas detection system etc.
- Daily- All alarms & Interlock/trips system etc. functioning of sensors.
- Annually - All critical instruments, control valves etc.
- Continuously - Ambient air quality

Guidelines for the Training of Personnel

Safety training for all levels of employees/workers/ Contractor's workers is given great emphasis. Various safety training programmes, Safety seminars, competition etc. are organized for motivation and to increase effectiveness of all personnel.

The major programs are explained as:

1. New Recruits (Including Contractor's workers): All the new entrants have to undergo basic safety training programme at training centre.

- 2. First Aid Training:** The first aid training is conducted and certificate are awarded by St. John Ambulance.
- 3. Transportation Safety:** Special Training programme for transport drivers on defensive driving and transportation safety was conducted.
- 4. Comprehensive Safety Orientation Programme:** The subjects such as process safety, Manual Handling, Electrical safety, working in confine space, Safety permits etc. are included.
- 5. Special Training Programme:** Special safety training programme, OSAS-18001, BSC, 5-S, safety provisions under applicable statutes, Hazop study, Risk assessment etc. training programme are regularly conducted.
- 6. Constructional Safety:** The workers engaged in construction work are trained on constructional safety at the training centre.
- 7. Emergency Mock- drills/exercise:** To create preparedness, awareness amongst the workers, a mock drill on emergency is conducted periodically by involving them.
- 8. Industrial Visit:** Similar type of process industries are visited to enhance knowledge.
- 9. Faculties:** The training is imparted with the help of internal faculties, external faculties or through professional institution like Gujarat Safety Council, Rams Safety consultant, Synergic Safety Engineers, DNV, BSE-UK etc.

Allocation and Delegation of Responsibility for plant Safety

Each HOD is responsible for the safety of his plant. Fire and Safety department looks after the fire and safety work. The guide lines for involvement of safety by individuals explained below

Responsibility of Employee's

- Every employee, contractor's workers are expected to get trained in the subject of safety and pertaining Safety Rules which are designed basically to protect employee/workers in the plants against potential hazards. The employees/workers have responsibility to protect themselves, their fellow employees and plants by way of proper compliance of safety Rules and Regulations.
- They should go through various Safety Rules, Instructions & Procedures and follow them time-to-time.
- They must wear the personal protective equipments issued to them while they are in process area.
- They are also expected to see instruction notices, safety slogans, safety signs, safety operational instruction as displayed at different locations in the plants.
- It is the responsibility of employees/workers to report promptly to their immediate manager of any dangerous or unsafe condition which noticed by them.

Responsibility of Manager

- The manager must ensure that the person engaged in any job/operation as fully aware of the hazards associated with the job and they have to follow the safe methods of working.
- It must be observed that responsible person must be present, where job involving high hazards is carried out. It must not be left to the workers only to decide whether the job is safe or not.
- Manager must go through all the safety rules and regulations along with procedures. He will ensure that all rules are followed in the interest of the safety.
- It is responsibility of Manager to follow various safety permit systems during various maintenance and repair jobs in the plants or areas.
- Manager shall arrange to maintain all the safety equipments, PPEs, Fire Extinguishers, First aid boxes in good condition and in easily accessible position. In case of any defect or unavailability, they should try to get them replacement from concern department.
- It will be responsibility of the Manager to ensure that workers, under him come in proper clothing, PPE

and other instruments as required.

- The Manager must check by taking frequent rounds of the plant or work area that all jobs are being done with observing safety precautions.
- The manager should also get themselves familiar with statutory requirements on safety and follow them in their work area.
- The manager must always set the right example by strictly following all safety rules & regulations and taking right type of precautions in any job and also by wearing PPE or other safety equipments as provided.

Responsibility of Safety Personnel

- The functions of safety department and safety personnel are to develop safety consciousness among all level of workers, contractor workers, visitors etc. in order to reduce the accidents & losses.
- The safety personnel will make frequent safety inspection of the plants, processes and various departments in order to check up observance of safety rules & practices and as an advisory capacity.
- Wherever any major or hazardous nature of job or work is to be carried out in the plant, they advise plant, maintenance and engineering departments.
- Safety departments is organizing various safety training programme to impart training on safety rules, regulations, safe method of working, safety motivation etc. for employees as well as contractor's workers also.

Implementations of Safety Procedure

- Procedures for test, examination, and certification of lifting tackles, chain pulley blocks, slings, cranes, overhead cranes.
- Procedures for test, examination, and certification of pressure vessels, air receivers, vaporizers, boilers etc.
- All type of safe work permits procedure.
- Procedure for checking & Inspection of instrumentations, trips, safety devices, alarms, siren etc.
- Procedure for checking & Inspection of safety valves, breathers, gas detectors, smock detectors.
- Procedure for checking & Inspection of Ladles, furnace etc.
- Procedure for checking & Inspection of earthing, jumpers etc.
- Procedure for checking of fire extinguishers, fire hydrant, fire pipeline network, fire detection system etc.
- Accident/injury reporting and investigation
- Procedure for procurement of PPE
- Procedure for organizing safety training program.
- Procedure for modification, addition, alternation in the plant
- Procedure for testing work environment, noise level, vibration, illumination & Periodicity.
- Procedure for preparedness and awareness amongst the workers and officers for emergency situation.
- Organizing safety committee meeting and maintaining the minutes.
- Display of safety posters, safety slogans, notices, instructions etc.
- Preparing safety budgets.
- Preparation of safety documents like safety manual, safety reports, safety audit, Risk Assessment etc.

Risk Prevention and Risk Mitigation

Accident prevention is the primary safety goal of any organization. There are risks that can be eliminated through preventive measures and those which can be reduced through mitigation measures.

Preventive Measures

The 4 E's for elimination of hazards and prevent accidents are as follows:

1. Engineering and technological innovation to improve reliability

2. Experience in the study of hazards and operations- Risk analysis
3. Enforcement of decisions on study results – Preventive mechanisms
4. Education, awareness, and practice in prevention of accidents (Training & drills)

Various measures will be adopted at each stage of the project for ensuring safety of people, environment, and property. These measures include the following:

1. Site selection
2. Choice of technology
5. Incorporation of interlocks and protection systems in plant design
6. Safety awareness for key management persons
7. Safety training of all operational, maintenance staff
8. Regular safety monitoring - Audits and inspections
3. Equipment design incorporating domestic and international safety codes
4. Plant layout with utmost consideration given to operational safety aspects

A. Site Selection

The plant is located in at Hazira, about 18 km away from the Surat City.

The site soil conditions are rigid and safe, complying with the requirements of the load bearing capacity of various installations.

The size of the plot is large enough to ensure proper layout of plant buildings with adequate interconnecting roads and distance from administrative areas.

B. Choice of Technology

The process is carefully chosen for reducing wastes, reducing the risk to human beings and the environment. It is the proven one and acknowledged internationally.

C. Equipment Design

Equipment will be designed environment friendly and with all necessary safety features.

General / Other Areas

- The plant is laid out in such a way that hazards are either eliminated or isolated so as to manage it effectively.
- The location of the disaster-prone areas of the plant is such that, they cause less impact to the nearby factories or inhabitations.
- Buildings housing heat generating equipment or containing chemicals are well-ventilated with adequate air circulation.
- Administrative office is located away from process plants and storage tanks.
- Security office is located close to gate and away from process plants and storage tanks.
- Workers' rest area, shower, and dispensary is located close to administrative office, away from process plants.
- Canteen is located close to administrative office and away from process plants.
- A large area has been provided on site in the upwind direction for emergency evacuation Assembly Points
- Interconnecting roads within the plot are made circular so that more than one get-away is available at any point.
- A second trackable gate is provided for use in case of emergency.
- Proper drainage and enclosures are provided to drain away storm water from unforeseen flooding.
- Flame proof areas have been isolated from the non-flameproof areas.
- DG room and electrical transformer located away from administrative office, process plant and storage tanks.
- The storage tanks of Hazchem are located in an isolated area, protected by dykes with adequate facilities for handling spills and leakages.
- Fire hydrant system covers the entire operating area of the plant.
- Separate installation for fire water storing and pump house, with alternate and independent power

source.

- Separate power distribution and isolation boards in each building.
- Hazardous waste bins are located away from processing and administrative areas in an area clearly demarcated for the same.
- Warning boards will be put up in areas where entry is restricted
- No Smoking boards will be put up at the entrance and at other locations throughout the plant
- Boards showing the numbers and contact details of government / district officials as well as fire department, police department, district commissioner, etc. will be installed at security gate as well as in the operational area.
- Hazardous chemicals shall be stored as per compatibility and based on corrosive and reactive capabilities as per the guidelines in the MSDS.
- MSDS of all hazardous chemicals will be kept in the areas where such materials are used and stored.
- Waste containers will be located at appropriate locations throughout the plant and will be coded according to the type of waste.

E. Safety Awareness for Key Management

1. Key management personnel will be made aware from the beginning of the project of the key issues regarding the safety in design and operation of the plant.
2. Project management personnel have visited several industrial plants where Hazchem is used in bulk as a raw material for the production of finished products. Discussions with operational staff of the plants during these visits has given them valuable insight into the safety aspects of handling of Hazchem.
3. Discussions on safe handling of hazchems have been carried out with various safety experts, technical collaborators, and with overseas suppliers through conference calls.

F. Safety Training for All Operational Staff

1. All operational staff will be given safety training as a compulsory part of their induction program.
2. Safety training will include, among other things, the following important aspects:
 - Awareness of hazards of individual chemicals through study of MSDS
 - Correct usage of Personal Protective Equipment (PPE)
 - Explanation of the hazards and risks present in the premises, as well as their analysis
 - Impact on safety, health, and environment due to improper handling of hazardous chemicals
 - Guidelines for safety in operations
 - Do's and Don'ts

G. Safety Audits and Inspections

- Regular safety audit will be conducted once a year to ascertain the safety levels followed in the plant and suggestions for improvement
- Special safety audits will be conducted whenever there is process-related equipment / operational changes made in the plant
- Safety audits will be carried out jointly by HSE personnel and external agencies, and corrective actions will be recorded and presented to management for review.
- Daily safety inspections are carried out throughout the plant by HSE personnel.
- Testing and inspection of high pressure equipment with periodical hydrotesting and thickness testing will be carried out once in a year during maintenance shutdown
- Testing of pressure safety valves and setting will be carried out once in a year during maintenance shutdown
- Calibration of control valves, instruments as and when required, but at least once in a year during maintenance shutdown
- Testing of thickness of all equipments with thickness meter will be carried out at least once in three

- years during maintenance shutdown
- Testing of electrical measurements, such as earthing resistance, will be carried out every month
- Testing of all fire hydrant installations, fire extinguishers, fire pumps, fire water level monitors will be carried out on a daily basis by HSE personnel.

Disaster Management Plan

Introduction

The term ‘Disaster’ owes its origin to the French word disaster, which is a combination of two words ‘des’ meaning bad and ‘aster’ meaning star. Thus, the term ‘disaster’ refers to ‘Bad or Evil Star’. In earlier days disasters were considered to be an outcome or outburst of some unfavorable star.

Ideally, a disaster may be defined as “an event concentrated in time and space which threatens a society or a relative self-sufficient subdivision of a society with major unwanted consequences as a result of the collapse of precautions which had hitherto been culturally accepted as adequate”.

Disaster according to the Disaster Management Act 2005 means “a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or manmade causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area”.

Disasters are extreme events which cause great loss to life and property. They pose a serious threat to the normal life as well as the process of development and strike with sudden violence, tearing bodies, destroying lives and structures and throwing apart families. Natural disasters, which are both sudden and powerful, damage national economy and cause hardships to a large section of the population. They are the single largest concern for most of the nations as they take a heavy toll of human life, destroy belongings and infrastructure and have far reaching economic and social consequences for communities. Thus, the impact of disasters on human life is multi – dimensional, affecting it in all aspects- domestic, social, economic etc.

Disaster Management Act:

The Disaster Management Act, 2005 provides for the requisite institutional mechanism for drawing up and monitoring the implementation of the DM Plans ensuring measures by various wings of government for prevention and mitigation effects of disasters and for undertaking a holistic coordinated and prompt response to any disaster situation. The Act seeks to institutionalize the mechanisms at the national, state and district levels to plan, prepare and ensure a swift response to both natural calamities and man-made disasters/accidents IN THREE LEVELS.

1. National Level
2. State Level
3. District Level (In a state) - Local level in a district.

Types of Disasters:

Generally, disasters are of two types – Natural and Manmade. Based on the devastation, these are further classified into major/minor natural disaster and major/minor man-made disasters. Some of the disasters are listed below:

Major natural disasters	Minor natural disasters	Major man-made disaster:	Minor man-made disaster:
Flood	Cold wave	Setting of Fires	Road / train accidents, riots
Cyclone	Thunderstorms	Epidemic	Food poisoning
Drought,	Heat waves	Deforestation	Environmental pollution
Earth quake	Mud slides	Wars	
Major Forest Fires	Storm	Pollution due to prawn cultivation	
Major Epidemic Breakup		Industrial disaster/Crisis	
		Chemical disaster/pollution	

Industrial hazards are threats to people, and life-support systems that arise from the mass production of goods and services. When these threats exceed human coping capabilities, or the absorptive capacities of environmental systems, they give rise to industrial disasters.

Industrial hazards can occur at any stage in the production process, including extraction, processing, manufacture, transportation, storage, use, and disposal. Losses generally involve the release of damaging substances (e.g. chemicals, radioactivity, and genetic materials) or damaging levels of energy from industrial facilities or equipment into surrounding environments.

The growth of chemical industries has led to an increase in the risk of occurrence of incidents associated with hazardous chemicals (HAZCHEM). A chemical industry that incorporates the best principles of safety can largely prevent such incidents. Common causes for chemical accidents are deficiencies in safety management systems and human errors, or they may occur as a consequence of natural calamities or sabotage activities. Chemical accidents result in fire, explosion and/or toxic release.

The nature of chemical agents and their concentration during exposure ultimately decides the toxicity and damaging effects on living organisms in the form of symptoms and signs like irreversible pain, suffering, and death. Meteorological conditions such as wind speed, wind direction, height of inversion layer, stability class, etc., also play an important role by affecting the dispersion pattern of toxic gas clouds.

The Bhopal Gas tragedy of 1984—the worst chemical disaster in history, where over 2000 people died due to the accidental release of the toxic gas Methyl Iso-cyanate, is still fresh in our memories. Such accidents are significant in terms of injuries, pain, suffering, loss of lives, damage to property and environment. A small accident occurring at the local level may be a prior warning signal for an impending disaster. Chemical disasters, though low in frequency, have the potential to cause significant immediate or long-term damage.

Objectives of Emergency Procedures

Measures, which are required, to be taken during emergencies include co-ordination of activities with several concerned departments/services and outside resources.

The objectives of the procedures include defining the role of key personnel of different services during major emergencies who can be effectively utilized to:

- Warn the relevant person/company who might get affected.
- Assembling the inside resources
- Guide them to use emergency escape route
- Get information about incident and bring it under control
- Inform the rescue team and ambulance
- Identification of affected persons, inform to relatives and give them proper medical assistance.
- Providing relevant information to higher authority.
- Plan the precaution list for future
- Turn off the plant and Alert everyone with help of emergency siren.
- Guide them to use emergency escape route
- Collect all information about loss.
- Welfare assistance for those who lose their lives

Disaster Management is with the guidelines of

1. ON –SITE EMERGENCY PLAN - prepared by the plant
2. OFF-SITE EMERGENCY PLAN- Prepared by DDMA

On-Site Emergency

Disaster within the premises of the PLANT / FACTORY describes the action scenarios, complying with a documented Plan, to manage and eliminate the Disaster by the Plant personnel.

An emergency plan generally constitutes system of organization used to fight the emergency, the alarm and communication routes, guidelines for fighting the emergency and examples of possible accident sequences. Being an alert management, On-Site Emergency plan is prepared & updated from time to time, the plan helps provide clear action lines to the designated person.

The objectives of On-Site Emergency plan are as follows:

- To provide information to higher authorities, police and the news media.
- To control and comprehend incidents.
- To safeguard employees and people in the neighborhood.
- To minimize damage to property or/and the environment.
- Inform everyone about the emergency siren and with the help of wireless and inform the fire brigade or ambulance to come for help, guide everyone about emergency escape route or assembly point.
- To be ready for mutual aids if need arises to help neighboring unit. Normal jurisdiction of an on-site emergency is the own premises only but looking to the time factor in arriving the external help or off-site plant agency, the jurisdiction is extended outside to the extent possible in case of emergency occurring outside.
- To affect rescue and treatment of casualties to count injured.
- To identify and list any who lose their lives. And help their relatives.
- To rescue the safe rehabilitation of affected areas and restore normalcy.
- Turn off the plant and describe and assess the emergencies, including risk and environmental impact.
- To carefully preserve records, equipment etc. and to organize investigation into the cause of the emergency and preventive measures to stop this recurrence.
- Take care of safety precautions before the start of the work.
- Inform everyone about the emergency siren and with the help of wireless and inform the fire brigade or ambulance to come for help, guide everyone about emergency escape route or assembly point.
- To be ready for mutual aids if need arises to help neighboring unit. Normal jurisdiction of an on-site emergency is within own premises only, but looking into the time factor in arriving for the external help or off-site plant agency, the jurisdiction is extended outside to the extent possible in case of emergency occurring outside.

Off-Site Emergency

Disaster spilled outside the factory premises, describes the action scenarios, complying with a documented plan to manage and eliminate the disaster, by both the plant personnel and District Disaster Management Authorities. This plan will be prepared by DDMA seeking the details from plant authorities.

Co-ordination with the District Collector or district Emergency Authority and its Off-site Emergency Plan are as follows:

The unit has intimated the district emergency authorities and local authorities by the submission of various information. Moreover, the unit is a member of the Local Crisis Group for Hazira-Olpad Taluka & Surat District Crisis Group, being a MAH unit. One representative from the unit attends the meeting of Local Crisis Group as well as District Crisis Group from time to time. Being a member of the offsite emergency plan, the factory has all emergency phone nos. of District authorities, who can be contacted during major emergency/offsite emergency. Further, a tracking system has been adopted to connect directly with the authority by a wireless. List of Emergency Telephone Nos., which includes Telephone Nos. of District Authority like Collector, Director Industrial safety & Health, Police Department, Central Control Room, Hospitals, Fire Stations, etc. are displayed at conspicuous places including main security office and the emergency control center.

Glossary

Terms and Interpretations:

Disaster: “means a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man-made causes, or by accident or negligence which results in substantial loss of life & sufferings or damage & destruction of property, or damage & degradation of environmental systems, and is of such a magnitude as to be, beyond the coping capacity of the community of the affected area”

Management: “means a group of employees unifying to mitigate the undesirable effects of a disaster, controlling and eliminating its effects fully to bring back to erstwhile normal operating conditions”

Emergency: “an undesirable state of events of loss, beyond the coping capacity of the designated operating personnel of the plant”

Plan: “means set of activities laid in series, arrangements made in advance with internal trained personnel & external agencies, to perform them in a systematic way to mitigate, control and eliminate an emergency”

On-Site Emergency: “means an EMERGENCY SITUATION – Radiation, Toxicity, impact on environment, confined to the plant premises” to cause loss.

Off-Site Emergency: “means an adverse emergency situation- radiation, toxicity, impact on environment, spilling outside the plant premises to cause loss”

Loss: “means - ill health to people, destruction to property, stoppage of plant operations, forced layoff to employees, increased debt burden of loans on purchase of plant & machinery, good will loss, loss of employee’s confidence level, impact on environmental systems which supports life in the area. (Loss of greenery, loss of cattle, and loss of aquatic life, land and water pollution)”

Emergency Control Room: “means designated room for the “incident controller” to perform his role on mitigating, controlling, eliminating the emergency and bring the plant back to normal working environment.”

Incident Controller (IC): “means a designated person, vested with overall responsibility & authority to mitigate, control and eliminate emergency and put the plant in normal working condition.” “it includes controlling the entire operations as a team leader and reporting to top management / owners of the plant. normally this position is given to the plant coordinator or no.1 position holder of the plant.”

Accident Site Controller (ASC): “means a designated person, vested with overall responsibility to mitigate, control and eliminate emergency from the designated site / sites inside the plant premises. He mitigates, controls, and eliminates the actual accident which has later become an emergency. (Engineering team, Rescue & Relief team, Firefighting team, and other miscellaneous services will report to him.)”. Normally this position is held by concerned plant head.

Rescue & Relief Head (RRH): “means a designated person, who will perform rescue operations, take relief measures to the injured, co-ordinates with liaison officer. rescue operations in the entire plant being a big operation he will have a fairly big team to perform this operation.” this position is given to the head - civil department.

Engineering Head (EH): “means a designated person, who will advise operations to save damages to plant & machinery, operations to mitigate and control processes, performs safe shutdown operations, safely operating the utility services (electricity, instrument air, various water systems, waste water systems,). this position is given to the head - maintenance (mechanical, utility, electrical & instrumentation).

Liaison Head (LH): “means a person authorized by incident controller for coordinating the external resources & services. he interacts with incident controller and communicates to mainly district disaster management authorities. he receives the requirements, analyses and conveys the same to his spokesperson, who in turn, contacts the concerned external agency, and gets the required external resources sought.”

Spokes Person: “means a person authorized by liaison head to contact and arrange for external resources / help (like district administration-collector, commissioner of police, commissioner of labor, factory inspectorate, health inspector, fire brigade head, local panchayat head, district transport officer.....etc.”).

Key Emergency Personnel: “means employees, who take responsibilities and take positions to mitigate, control and eliminate emergency. they report to their respective team heads. during the entire course of emergency these personnel will be inside the plant to perform above operations. they will note down the real performance of operations carried out, analyze the gaps in the performance and discuss the same in the post emergency feedback meeting.”

Non-Emergency Personnel: “means employees, visitors, contractors and other outsiders required to be evacuated from the factory premises on “declaration of emergency”.

Safety Materials: “means additional materials, tools, PPEs and appliances required for use during EMERGENCY operations by the persons inside the factory.” Also, the additional safety materials required to be provided to district administration in the event of an OFF-SITE EMERGENCY”.

Emergency Plan: “means an authorized document (preconceived, discussed and agreed methodology of operations and responsibilities) having clear cut action scenarios without aberrations, to be performed by key emergency personnel, during MOCK DRILLS or REAL EMERGENCY situations.”

Site Plan: “means a print copy of the layout of the plant / factory displaying the locations of different buildings, facilities, storage locations, roads, referred for easy communication and action during emergency.

Area Plan: “means plan showing the area e.g., jolwa industrial area to scale. useful for assessing the affected area in the event of an off-site emergency and preparations for evacuation of people till the emergency is over.

Toxicity: “means - Toxicity is, the degree to which a substance can damage an organism.

Three types of toxicity are

1. CHEMICAL
2. BIOLOGICAL
3. PHYSICAL

The entry routes for damage of the organism are

1. INHALATION
2. INGESTION
3. SKIN ABSORPTION

Isolation from the source of origination is the effective way of safe guard. The degree of toxicity is given by the Threshold Limit Value (TLV), Immediate Danger to Life & Health (IDLH).

Flammability: “means- Flammability is, as how easily matter will burn or ignite, causing FIRE or COMBUSTION.” The degree of flammability is determined by the explosion limits of the hazardous chemical, and its quantity & calorific value determines the “thermal radiation flux” liberated on combustion.

Spot Fire: “means fire liberated from a point or line opening of a container due to leakage of a flammable gas.”

Flash Point/ Fire Point: - “the flash point of a volatile liquid is the lowest temperature at which it can vaporize to form an ignitable mixture in air”. The fire point, a higher temperature, is defined as the temperature at which the vapor continues to burn after being ignited.

Threshold Limit Value: “means -The threshold limit value (TLV) of a chemical substance, is a level to which it is believed, a worker can be exposed day after day, for a working lifetime without adverse health effects.” It is expressed in ppm or mg/kg of body weight.

Threshold Quantity: “means the highest quantity of a Hazchem (in m³ or mt) of liquid or solid stored in a manufacturing unit storage area (in one or more vessels) at any point of time throughout the year, above which certain regulatory compliances are required.

Scenario: “means the mathematically arrived “virtual physical effects” of an accident, for the input conditions given.” It is presented in the form of a x-y graph.

Dispersion: “means the spread of any flammable combustible vapor or toxic cloud of vapor, in the atmosphere for a given set of wind speed and atmospheric stability conditions.”

Dispersion Foot Prints: “means graphical mapping of the dispersion clouds in the x-y-z coordinates with respect to distance traveled and over a said period of time.

Thermal Radiation Flux: “means the amount of thermal energy released by a flammable cloud of vapor in the atmosphere on a unit area, and its radiation effects, at a particular distance in the hazardous zone.

Safe Zone: “means a safe limit of toxic vapor cloud existing in an area where there is no damage to human beings or environment when they live in a free exposed condition for an hour or more. “means a safe limit of thermal radiation flux existing in an area, where there is no damage to human beings or environment when they live in a free exposed condition.”

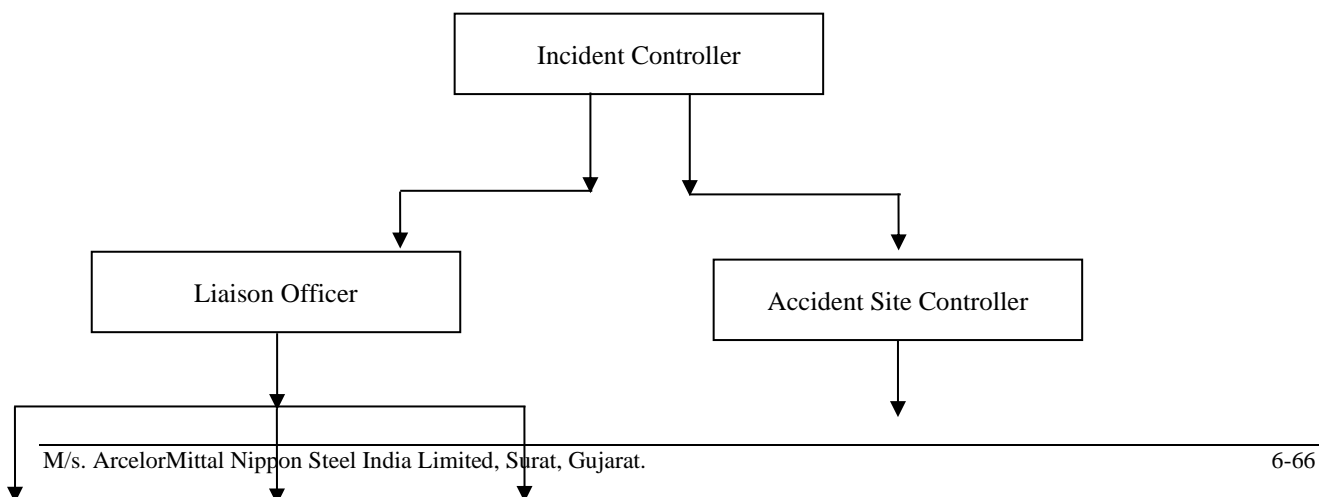
Emergency Siren: “means a siren with a blowing range of 1 km radius, all around the source, and capable of giving long and short variances sound for a period of minimum 3 minutes.”

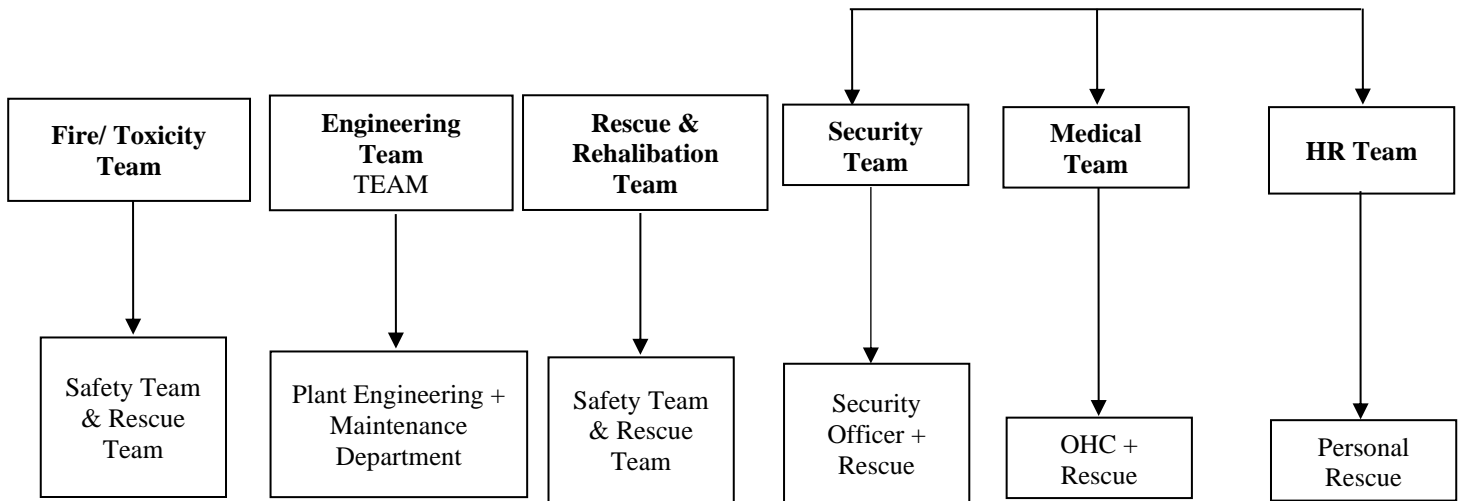
All Clear Siren: “means a siren with a blowing range of 1km radius, all around the source, and capable of giving a continuous non-variant sound for 5 minutes.”



Organization set Up Plan

- Approved ON-SITE, OFF-SITE EMERGENCY plans shall be available with OH&S Head.
- All plant personnel have to be trained on the Emergency Plans.
- Rescue members have to be additionally trained as per the TEAM responsibility.
- Mock drills have to be performed once in every 6 Months. The drills shall be witnessed by DISH officials OR Senior management members of same group of Industries. The EXTERNAL OBSERVERS concept in MOCKDRILLS will improve the quality of drills.
- All the improvements suggested in the Mock Drills have to be implemented through a MOM.
- The reports of MOCKDRILLS have to be sent to DISH officials as a record.
- A list of Risk Scenarios has to be identified and listed for performing the Mock Drills at periodic intervals.

ORGANIZATION SET UP FOR EMERGENCY





	Final EIA/EMP Report for proposed Modification in Existing Plant by installing Auxiliary Facilities without increasing Plant Capacity by M/s. ArcelorMittal Nippon Steel India Limited	
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Teams Fitment Plan

Sr. No.	Team	Team Leaders
1	Incident Controller	Senior Management Person
2	Accident Site Controller	in Charge of Accident plant Sr. Supervisor /Chemist (II shift & III shift)
3	Liaison HEAD	HOD -HR
4	Engineering Team	Senior Management Personnel from projects, design, maintenance
5	Rescue & Relief Team	Senior Management Personnel from personnel, accounts
6	Fire Team	Safety Personnel
7	Medical Team	OHC Personnel
8	Security Team	Security Officers Security Guards

Responsibilities of Key Emergency Personnel - Teams

Incident Controller – Responsibilities

- The head of the PLANT will be normally the Incident Controller (IC). Ensures the emergency is properly dealt with, eliminated and normal operating conditions are restored as soon as possible.
- Ensures all the managers and officers of the plant are included as “key emergency personnel.”
- Ensures the On-site Emergency Plan is prepared, and general training is given to all the employees of the plant. On-site Emergency Plan is submitted to Department of Industrial safety & Health for review.
- Ensures Mock drills (Virtual Emergency) are conducted quarterly in different shifts as per the provisions of On-Site Emergency plan.
- Ensures one or two District disaster management Authority (DDMA) personnel are invited to participate in the mock-drills.
- Ensures On-Site Emergency Plan is revised, based on the Mock-drill feed backs, till he is satisfied, that the plan is acceptable to all key emergency personnel.
- To officiate a person responsible to co-ordinate with District Disaster Management Authorities to prepare OFF-SITE EMERGENCY PLAN for the plant. The LIASION HEAD may be the appropriate person for the same.
- Ensure the firefighting system, safety materials required for use during real emergency, and first-aid medical facilities, are in order by review of documents, inspections and trials.
- Ensures to name the alternate key emergency personnel IC, ASC, LH, EH, RRH in case the emergency is reported after general shift hours. The key emergency personnel will take positions as soon as possible and replace the alternate team. (Mock drills conducted in II & III shifts will give necessary guidance to select the personnel)

On Declaration of Real Emergency

- Soon after hearing the emergency from the Main gate security or SMS –Emergency, incident controller rushes to ECC.
- He takes control on all operations to deal with the emergency from ECC.
- He ensures all the team leaders are in their respective positions of operation, soon after ordering to blow the emergency siren.
- On the advices of ASC, LH, EH, RRH analyzes the actual situation at periodic intervals and declares off-site emergency if required.
- He ensures through liaison head, external emergency services are informed and called for help in time.
- Take periodic rounds to provide guidance and help to team leaders for effectively discharging their duties. notes down the short comings in the operations.
- Once the risk is eliminated completely as declared by accident site controller, he orders to blow “all clear siren”.

- He calls a feedback meeting at ECC. all the key emergency personnel are to attend the meeting and participate in the deliberations.
- He co-ordinaries with department heads to normalize the plant for regular production activities and support services.

Accident Site Controller - Responsibilities

- Coordinates with ENGG TEAM, FIRE TEAM, RESCUE & RELIEF TEAM to mitigate emergency conditions'
- Ensures to finally eliminate the Emergency condition completely inside the plant.
- Ensures after eliminating emergency the area/s worked, are kept clean for normal operations.
- Ensures the required number of teams and personnel are kept ready for eliminating the emergency.
- Ensures all required materials, equipment and resources are available for eliminating the emergency. Is requested and brought in time.
- Ensures right information is given to IC at periodic intervals.

On Declaration of Real Emergency

- Soon after hearing the emergency siren or SMS Emergency, ACCIDENT SITE CONTROLLER rushes and takes control of the site inside the plant, which created an emergency situation.
- He assesses the risk, computes the requirements of teams, the requirement of key emergency personnel for each team, requirement of reserve teams in case the risk spreads, and orders them to take their positions.
- He assesses the complete scenario and decides whether to declare off-site emergency and informs to IC accordingly.
- Ensures all the requirements for fighting the Emergency is available to eliminate the emergency at the shortest possible time.
- Ensures all requirements of external resources are informed in time to liaison team.
- He takes regular rounds and gives necessary guidance and help to teams to deal with emergency.
- He applies strategies and tries all possible permutations & combinations to limit the emergency as on-site emergency.
- Ensures all the key emergency personnel, are operating strictly complying safety parameters.
- Gives constant feedback on the Emergency situation and post his requirements to IC.
- He ensures emergency conditions are completely eliminated, areas are cleared, and informs to IC for blowing all clear siren.
- Notes down the short comings in the operations performed for eliminating the emergency, during his rounds.

LIAISON HEAD - RESPONSIBILITIES

- Head – HR department is nominated as Liaison Head.
- Ensures district disaster administration authorities are informed about the declaration of emergency and constantly keeps in touch with them. Informs the actions initiated by district administration officials to IC.
- Ensures local in habitations are well informed and measures taken for their safety.
- Ensures the external resource help is given in time to ASC.
- Ensures the medical assistance for the injured, in nearby Hospitals, and transport for non-emergency personnel movement.
- Ensures constant dialogue with nearby industries and arranges all possible help through district administration.
- Ensures proper gate security is maintained for preventing outside persons unauthorized entry inside the industry.

On Declaration of Real Emergency

- Soon after hearing the emergency siren or SMS Emergency, Liaison Head rushes to main gate.

- Briefly informs the district administration of the Emergency situation and the help required.
- Informs the Fire Brigade for fire tenders and transport department for buses to evacuate the non-emergency employees.
- Informs the nearby industries about the impact and precautions to be taken by them. On request distribute chemical masks for the employees inside factory.
- Takes periodic rounds of the affected areas and studies the situation. Notes down the points of concern of the Egg. Team, Fire mitigation Team, Rescue & Relief teams.
- Asks his spokesperson to meet the nearby village head and brief the actions taken for the safety of the people of that village.
- Keeps the district administration informed about the latest situation and the help required.

Engineering Team- Responsibilities

- Engineering team head is nominated from Maintenance Department.
- Mechanical, Electrical & Instrumentation & Utility Maintenance Head will be the team leaders.
- Ensures the Plant & Machinery inside the plant are protected from damages.
- Isolates EB power and takes essential operations on standby power.
- Ensures the plant with minimum required illumination to carryout emergency operations.
- Ensures the systematic stoppage of plant and machinery to cause minimum LOSS, and pave way for easy restart conditions.
- Ensures isolation of systems which can otherwise raise the risk level of emergency.
- Ensures the semi-finished products on the process line are protected from unwanted reactions and prevent it from becoming a waste.
- Ensures all the machines are in shut- off condition.
- Ensures the unaffected storage locations are well protected, using the built-in safety protection systems.

On Declaration of Real Emergency

- Soon after hearing the emergency siren or SMS - emergency, Engineering Heads rushes and takes control of his key personnel to deal with the conditions of emergency.
- Associates with the site controller wherever he demands help in controlling the emergency.
- Isolates EB power and takes the unit on standby power.
- Provides minimum illumination required for the control of emergency operations throughout the plant.
- Puts off all running equipment and shuts off the continuous process plant following emergency shut-down procedures.
- Ensures unwanted chemicals are drained off the reactor vessels, heat exchangers and other systems as the plant demands.
- Keeps the waste water treatment plant running to clear off the excess load on the system
- In the Tank storage farms take appropriate actions like – draining the Hazchem in the dyke, transferring from one vessel to another standby vessel, additional cooling arrangements of the equipment wherever required.

Rescue and Relief Team – Responsibilities

- On receiving information from SMS emergency rushes to accident site and coordinates activities with ASC.
- Group the team members and inform all non-emergency personnel to assemble at assembly points (Assembly points are located near main security gate).
- Subdivide the group and perform intensive search operation at all location to find out the injured.
- Make arrangements to transport to injured on stretcher to the medical team stationed at medical center.
- Search for the missing person given in the list by LH. Give periodic feedback to ASC.

On Declaration of Real Emergency

- Soon after hearing the emergency siren or SMS - emergency, Rescue and Relief Team Head rushes to accident site.
- Associates with the accident site controller wherever he demands help in controlling the emergency.
- Makes arrangements to search employees, contract persons and visitors missing in the HEAD COUNT.
- Search teams go all around the plant to search for the missing persons in the head count.

Fire Team – Responsibilities

- Fire Team head is nominated from Safety Department.
- Fire Team consists of Key emergency personnel from safety Department, First aid center, process department and security departments.
- He ensures all electrical systems are isolated except emergency lighting systems.
- He ensures all the fuel /heating systems are isolated from both the ends of flow.
- He ensures required numbers of fire mitigation equipment are fully operational.
- He ensures all firefighting persons are performing the operations safe.
- He ensures all external help required is informed to ASC in time.
- He ensures the water resources are fully operational.
- He ensures smooth co-ordination with external Fire Mitigation Agencies.

On Declaration of real Emergency

- Soon after hearing the emergency siren or SMS Emergency FIRE Team Head rushes to Accident site and takes Instructions from ASC.
- He plans with ASC and EH to isolate systems prior to start of fire extinguishing operations.
- He takes note of wind direction and proper ventilation systems prior to start of fire-fighting.
- He ensures the required number of fire-fighting teams is kept for fire-fighting and preventing fire spreading.
- He ensures appropriate extinguishing systems are optimally used for controlling the situation.
- He ensures wherever inert gases are used for controlling the fire, safe systems of operations are adopted.
- He ensures personal safety is given utmost importance.
- After ensuring complete extinguishment reports to ASC.
- He ensures complete cleanup operations are performed prior to allowing persons for inspection.

Security Team – Responsibilities

Security Team head is nominated from Security Department.

- Security Team reports to Liaison Head. It is divided into three divisions
 - a) Gate security Team
 - b) Team to associate fire team
 - c) Team to perform inside factory security and cordoning operations.
- He ensures overall assistance is given to all teams.
- He ensures non-emergency persons are guided to Assembly points.
- He ensures traffic regulation inside the plant is done to the requirement.
- He ensures gate security team protects all inside plant persons. Records the in time of key emergency personnel.
- Stops all persons/ vehicular movements as soon as Emergency Call is received.
- Allows DDMA vehicles, emergency service vehicles and guides them properly.
- He ensures all instructions given by Liaison Head are strictly followed.

On Declaration of Real Emergency

- Soon after hearing the emergency call OR SMS-emergency, Security Team Head rushes and takes Instructions from LH.

- He plans his persons for various operations and assigns a security supervisor for the same.
- He takes note of wind direction and guides the persons to Assembly point/s.
- He controls the gate operations and records the movement of vehicles and persons after the declaration of emergency.
- He interacts with LH and performs his instructions.

Medical Team – Responsibilities

- Medical Team head is nominated from OHS Department.
- He ensures the ambulance and one male nurse is kept in the accident site.
- Ensures CPR is given to unconscious persons in the accident site.
- Depending on the requirement requests LH for additional ambulances.
- He ensures proper prearrangements are done at nearby hospitals for treatment of injured.
- Keeps records of injured persons and monitor the progress of injured regularly.

On Declaration of Real Emergency

- Soon after hearing the emergency call OR SMS - emergency, Medical Team Head rushes and takes Instructions from LH.
- He will be stationed in OHS center and monitor the medical needs of the injured.
- He will ensure the required medicine, fire blankets, first aid boxes, and other essentials are kept ready for the injured persons.
- One additional ambulance will always be kept at OHC depending on the emergency conditions.
- He will have constant interactions with LH on the medical treatment to injured persons.

Communication System

Communication will be exchanged mainly from team to team or person to person using

- Mobile cell phones, Group SMS for Key emergency personnel.
- Land line phones wherever available.
- Designated intercom cell phones.
- Public Address system installed in offices & Plants.

First - Incident Information:

The first incident information about, informing an incident/accident will be given by an employee, who has seen the incident. He will give the information to the main Security Main Gate/ Fire Room, giving his identity in full.

The security officer on duty/ Safety Person on duty, who receives the information informs to their Heads. Both the fire team lead by safety supervisor/ security persons will rush to incident site immediately for mitigating the emergency. The Head of Safety/Security passes information by flashing SMS message (Template) to all the KEY EMERGENCY PERSONNEL by group SMS using Mobile Cell phone. For easy sending, each group is recommended to have 10 persons. The person informed is requested to REPLY positively.

By this system all the Key members of the emergency will be officially informed about the emergency. Their replies will confirm their receipt. The replies shall be as concise as 'YES'.

Emergency Siren

Emergency 'on' Siren:

Fire mode / Toxic Mode

0-0-0-0-0-0-0-0 Wailing Siren

(10 sec) (5 sec) (10 sec) (5 sec) ... UP-Down-UP-Down - for Three Minutes All Clear Siren: Continuous Siren for 5 Minutes

Emergency Control Centre (ECC)

ECC will be occupied by Incident Controller. It will have provisions for seating five persons, a conference room to house 15 persons, and a store to accommodate safety materials storage required during Emergency.

The following documents, (latest revisions) will be kept in the emergency Control Center, for immediate reference and use, in the event of an Emergency. A key will be kept with IC.

Reference Documents

- On-site Emergency Plan – 5 copies
- Off-site Emergency Plan – 5 copies
- Plant - site plan - 5 copies
- MSDS of all HAZCHEMS – Each chemical.
- Short note books -25 no's
- Ball pens, Pencils, erasers, sharpeners -25+10 + 10+ 2 no's
- Digital Cameras – 2 no's
- Laptops – 2 no's networks connected.

List of Safety Materials

- | | |
|--|------------|
| • Self-Contained Breathing Apparatus- 10kg | - 10 no's |
| • Full Face masks | - 25 no's |
| • Trolley mounted oxygen cylinders | - 05 no's |
| • Full body chemical protection suits | - 10 no's |
| • Chemical splash proof goggles | - 50 no's |
| • Aluminized firefighting suits | - 10 no's |
| • 25mm hose clips with screw clips | - 10 no's |
| • Gum boots full length | - 25 pairs |
| • Leather hand gloves | - 50 pairs |
| • Electrical hand gloves | - 05 pairs |
| • Non-permeable hand gloves | - 25pairs |
| • Safety helmets | - 50 no's |
| • Safety shoes sizes | - 60 pairs |
| • Pick axes | - 02 no's |
| • Shovels | - 05 no's |
| • Rain coats full size | - 10 no's |
| • Stretchers | - 02 no's |

First- aid Medical Services

A First –Aid service center is available in the Main gate of plant. There is a doctor and qualified medical nurses. They will be assisted by trained first aiders whenever there is an urgent need.

Medical examinations are out sourced, and reports are maintained by the HR department. EHS manager has a formal agreement, with “Full-fledged hospitals” in the nearby area of the plant, for immediate admission and treatment to the injured.

Assembly Point/s

Assembly point is the place, where the non-emergency employees are assembled for head count. Later they are assembled at the same place OR shifted to a safer place on the advice of IC. Two assembly points are planned.

Assembly point is located inside the site of the plant. Normally assembly points are away from the bulk storage locations, near to the plant main security gate, and located in upward side of the predominant wind direction. The wind sock is installed, for instantly knowing the current wind direction, is located on the top of the plant building, and is clearly seen from the assembly points.

FIRST ASSEMBLY POINT: Near ADMIN building

SECOND ASSEMBLY POINT: Near the MAIN GATE.

Fire Fighting built in Facilities

- Fire hydrant system – Fire water storage, Fire Pump, Jockey pump, PP Power / DG Power, Fire Room, systems to control water supply and power.
- Hydrant Pipes, Risers, Spray Nozzles, control gate valves, Hydrant boxes, Hydrant control valves.
- DCP, CO₂, FOAM portable fire extinguishers of different capacity.
- Water and Foam Fire Tender stationed at CP.

The firefighting activity in M/s. AMNS India Ltd. is coordinated with safety, this is identified as a good system. A well-structured FIRE DEPARTMENT is headed by HOD (Fire & Safety) and assisted by- 1 DGM assisted by 1 senior manager and other managers. The fire station is manned round the clock in 3 shifts. Each shift is managed by a “shift in change” with fire crew. The fire control room is equipped with the modern communication facilities like Micro Pressure based computerized addressable Fire Alarm System, the wireless (VHF) and mobile phones. The fire department can identify, probable emergency situation like gas leakage, Hydraulic Oil leakage, Toxic release, fire explosion (such as failure of furnace) etc. and can control such situation effectively.

Fire Hydrant Network

The entire M/s.AMNS INDIA LIMITED complex is protected by a well-designed Fire Hydrant Network, which consists of the following:

- Fire Pump Houses - 04 Nos.
- Jockey pump - 08 Nos. (40 m³/hr at 9.5 Bar)
- Centrifugal pump -07 Nos. (Electrical Motor -410 m³/hr at 8.8 Bar)
- Centrifugal pump -07 Nos. (Diesel engine - 410 m³/hr at 8.8 Bar)
- Double Headed Hydrant (DSC + Jetty) -20 Nos.
- Single Headed Hydrant - 316 Nos.
- Fire Escape Hydrant - 16 Nos.
- Hydrant on risers - 52 Nos.
- Fixed Type Water monitors - 12 Nos.
- Water/Foam monitors - 08 Nos.
- Hose Boxes - 404 Nos. (Hose-2, Branch -1)

Fire Water Reservoir

- 1.Independent Pumping Station
- 2.HBI, HRC and 1 Fire Water Reservoirs (which can last more than 4hours)

Fire Fighting Appliance

- Foam Tender - INO
- Combined DCP CUM foam Tender - 01 No.
- Portable pumps - 03 Nos.
- Fire Jeep - 01 No.
- Foam Trolley - 03 Nos.
- S.B.A. sets - 32 Nos. (+43 spare cylinders)
- Exhaust cum blowers -10 Nos.

Portable Fire Extinguishers

- 1.DCP, CO₂, ABC, Clean Agent, Foam – As per the standard requirement

Fire Detection & Protection Systems

- Smock Detectors - 1065 Nos. (ISD & PSD)
- Heat Detectors - 105 Nos.
- Manual Call Points - 54 Nos.
- Fire Alarm system - covering all plant
- Harm Flooding System - 1301

- CO2 Total Flooding System - At Electrical Arc Furnace, Ladle Furnace, Caster Turrets, Transformers, Generators, Turbines.
- Automatic Foam/Water spray system - LPG Plant & NGL Tank
- Medium Velocity Water spray - Cable Tunnel
- Foam Compound - 10,000 Liters AFFF
- Fire Entry Suit - 1 No.

Alarm/ Siren

- Microprocessor based computerized addressable Fire alarm system is installed in entire complex.
- Wireless (V.H.F.)
- Mobile Phones
- Fire services & local authorities - Wireless Network
- Electric Siren
- Security staff Messenger
- Trunk System

Pollution Control

- The water used for firefighting will be diverted to ETP
- The wastes collected at the site of accident will be sent to waste yard in designated packages. EHS environment department will do the necessary formalities for its disposal.

Wind Socks

- Wind socks are installed on buildings to instantly catch up the wind direction. The sock flying indicates the DOWNWIND direction. Luminous chemical coated windsocks will glow in the nights also.
- TWO wind socks shall be installed. One at the NE corner, and the second at SW corner.

Rescue Teams.

- The positions of RESCUE TEAM MEMBERS are created in all plants, departments and service centers. They are given a RED HELMET for easy identification. They are being trained in different aspects of activities involving emergencies. They are from workers, operators, supervisors and chemists. They are well distributed in the shifts so that their availability is felt, round the clock.
- On hearing the emergency siren, the RESCUE team members (Respective shift) are requested to rush to the emergency site location and assemble at the Ground floor. Information will be given about their arrival to accident site controller.
- They will form the team members for performing necessary activities as per the directions of their respective team leaders.
- Both during accidents and big events like emergencies they will be fully utilized.

Occupational Health and Safety Program- mitigating measures.

Health hazards associated with the occupation are called occupational hazards. In chemical industry due to handling of toxic and hazardous chemicals there are possibilities of developing occupational diseases. The manufacturing process does not involve hazardous chemicals of high health effects.

These diseases are caused due to

1. Acute exposure of chemical vapors
2. Chronic effects of exposure of chemical vapors

M/s. AM/NS, has planned for the following checks to curb the problem:

- Pre - employment medical checkup at the time of employment.
- Annual medical check must be done for all employees.
 - * <30 years - Once in five years
 - * 31-40 years - Once in four years
 - * 41-50 years - Once in two years
 - * >50 years once every year.

- i. Occupational Health center for rendering immediate first aid prior to sending to nearby hospitals. First aid training must be given to “a section” of employees.
- ii. Monitoring of occupational hazards like noise, ventilation, chemical exposure shall be carried out at frequent intervals, the records of which shall be documented.
- iii. Suitable PPEs have to be provided and application enforced. All the PPEs procured are of BIS approved products. Work place enforcement of wearing is done regularly. The same will be followed in the extension unit also.
- iv. All the hazardous chemicals are to be identified by the Hazchem visuals. All the workmen have to be properly trained.
- v. Evaluation of health of workers viz. chest x ray, Audiometry, Spirometry Vision testing (Far and Near vision, color vision and any other ocular defect) ECG, during pre-employment and periodical examinations must be carried out.
- vi. The injuries record and the gas effect record shall be maintained for assessing the controls at the workplace monitoring.

Occupational Health center. (OHC)

- The OHC shall be maintained and controlled by qualified medical team consisting of doctors, nurses and other Para medical staff.
- Medical center at Nand Niketan is working as Medical Treatment Dispensary employing qualified doctors & para–Medical Staff and beds with facilities. Further, a local medical Centre is also working, which is called as medical Centre at plant or Occupational Health Centre.
- The Occupational Health Centre with adequate arrangement is maintained by the management. M.S.D.S. of hazardous chemicals are available with safety department and user department.
- The OHC shall be maintained for 24x7 – 365 days operation.
- All the available antidotes as available, shall be maintained by the OHC personnel.
- A fully loaded ambulance shall be maintained for carrying persons to nearby Hospitals.
- The safety officer shall maintain the legal requirement records in the prescribed formats as called in different laws.
- Symptomatic treatment is given to the persons affected by chemicals by the authorized Medical Practitioner.
- HSE monthly reports have to be maintained.

OHC provides round the clock coverage at Plant Medical Centre and Nand Niketan. Details of officials available at Medical Center (OHC) are as follows:

- Head Medical Services (M.D. Internal Medicine (AFIH))
- Sr. Medical Officer (MBBS.AFIH)
- Sr. Consultant (MD(Anae), AFIH)
- Medical Officer (MBBS.AFIH)
- Medical Officer (MBBS)

Equipment

Following equipment are available at OHC:

- Automatic external defibrillator – Useful for cardiac arrest pt.
- Artificial respiration set (Ambu Bag)
- X-Ray Machine
- Oxygen Cylinder
- Nebulizer
- Blood Glucose Monitor
- Suction Machine
- Stitching material
- Autoclave Machine
- Emergency beds– 4+ tables
- All emergency & routine medicine, I/V Fluids, Injections etc.

- Ambulance – Fully equipped ambulance available for
- Transportation of emergency patient.
- Well Equipped Laboratory.

HSE Organization.

The systems to be maintained by HSE department shall be taken from BIS 14489 1998. There shall be appropriate staff qualified as per the requirement of law, has to be maintained in the HSE department.

Periodic reports shall be sent to director of industrial safety & health (dish) authorities as specified in the law books.

The Inspection book remarks made by the Factory Inspector shall be fully complied and records maintained.

DOS & DON'TS to be Followed.

- All the machines are to undergo Preventive Maintenance latest by once in a year. Productive maintenance rounds (Daily visual rounds) have to be undertaken periodically to assess the healthiness of the machines. Records to be maintained.
- For critical machines: All fasteners, gaskets, oil rings, lubricating oils, plastic parts, hose pipes etc., have to be changed at the time of maintenance.
- All load bearing members of the machine parts have to be thoroughly cleaned and visually inspected for any cracks and other defects.
- All the PPEs procured shall conform to BIS or other equivalent standards.
- Use of PPEs in the form of visuals has to be displayed at appropriate places.
- All Hygiene practices are to be followed, restrictions for entry to specified places have to be displayed.
- Emergency escape routes and exit points have to be vividly displayed.
- Near- miss inspections have to be carried out, discussed with area owners and hazards to be mitigated.
- Ammonia used in the chilling plants have to be suitably disposed, when there is leakage.
- REUSE, RECYCLE, RECOVERY of chemicals and liquids shall be devised and practiced.
- All hazardous wastes in the form of solids and liquids shall be disposed off as per the stipulated regulations.
- EMERGENCY mitigation equipment locations and routing has to be displayed at prominent locations.
- Pressure and temperature parameters have to be monitored and records maintained wherever called for.
- All cooling arrangements for controlling temperatures shall have standby arrangements.
- All continuous processing facilities shall have power backup facility.
- Emergency lighting system shall be available during emergencies.