



**CONTINGENCY PLAN
FOR
TRANSPORTATION OF AMMONIA BY ROAD**

**FROM
FACT WILLINGDON ISLAND
TO
FACT COCHIN DIVISION / FACT UDYOGAMANDAL
COMPLEX**

**&
FROM
FACT UDYOGAMANDAL COMPLEX
TO
FACT COCHIN DIVISION**

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**THE FERTILISERS AND CHEMICALS TRAVANCORE LTD.
UDYOGAMANDAL – PIN: 683 501, COCHIN.**

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1.0 INTRODUCTION

1.1.FACT has been transporting bulk quantity of liquefied ammonia gas (about 500 tons/day) by road from Udyogamandal to Ambalamedu from the year 1998, since the commissioning of the New Ammonia plant at Udyogamandal as warranted by the ammonia stock situation in FACT Udyogamandal Complex and its demand in FACT Cochin Division at Ambalamedu.

After the re-commissioning of Ammonia storage tank at FACT Willingdon Island facility (FACT-WI), movement of liquefied ammonia gas has been started from FACT-WI to FACT-Cochin Division (FACT-CD), Ambalamedu and to FACT-Udyogamandal Complex (FACT-UC), Udyogamandal. As the in-house production in Udyogamandal Complex is also in operation, the following two scenarios emerge in the transportation of liquefied ammonia gas.

- 1) There is no captive ammonia production and the whole ammonia requirement of FACT is met by import. So there is movement of loaded ammonia truck tankers from FACT-WI to FACT-CD, Ambalamedu & FACT-UC, Udyogamandal.
- 2) There is captive ammonia production in FACT-UC & supply of imported ammonia co-exist. So in addition to the movement of loaded ammonia truck tankers from Willingdon Island to Ambalamedu, there is also the movement of loaded ammonia truck tankers from the FACT-UC, Udyogamandal to FACT-CD, Ambalamedu.

1.2.In light of this, FACT has recast its transport operation with bulk of its transport of ammonia from Willingdon Island to Ambalamedu or Udyogamandal via road. The road movement of ammonia from Udyogamandal to Ambalamedu will also be undertaken depending on the requirement of FACT. All safety precautions are taken while transporting ammonia by road. This document details the contingency plan in the unlikely event of an accident involving the vehicle transporting ammonia. The road transport of goods and chemicals is gaining greater prominence as a result of the development of well-laid highways all over the country.

1.3The document aims to control the damage to the environment to the minimum in the event of an accident. It provides information on the safety measures observed, sources of help available, and the personnel responsible for the control actions. It also provides information on the ammonia transporting arrangement, travel route etc. and a comprehensive response plan to react to foreseeable emergencies anticipated during the transportation of ammonia by road, to contain loss of lives and damage to property, and to return back to near normal conditions at the earliest.

2.0 AMMONIA TRANSPORT PLAN

2.1. Loading / Unloading Facilities at FACT- WI

There are four (4) nos. of ammonia truck loading bays provided at Ammonia Storage & Handling Facility at Willingdon Island. Each loading bay consists of a liquid and a vapour line fitted with quick release coupling at the ends for connecting to the truck tankers.

The liquid ammonia from the storage tank is pumped to a common header, branches off to the individual loading bays. In the liquid lines, latest instruments consisting of control valves and flow meters are provided for filling the predetermined quantity of ammonia. The vapour line is meant for taking back the ammonia vapour from the truck to the storage tank.

The liquid nozzle of the Ammonia truck tanker is connected to the common liquid ammonia header in the unloading/loading bay. The vapour nozzle of the Ammonia Truck tanker is connected to the common vapour ammonia header in the unloading/loading bay.

Ammonia vapors generated during the loading / unloading operation is compressed by the refrigeration compressors, condensed and taken back to the Ammonia storage tanks. This is a safe practice generally followed in ammonia transfer operation.

Unloading of the ammonia from the truck tankers is carried out by pressurising the truck tanker using compressed ammonia. Ammonia vapour from the refrigeration compressor is supplied through the vapour line of the truck tanker. The liquid Ammonia forced out through the liquid line from the truck tanker is diverted to the Ammonia Storage tanks.

Ammonia gas detectors are provided near the loading points to sense immediately any possible ammonia leak.

Eye irrigators are also provided near the loading point.

2.2 Loading / Unloading facilities at FACT-UC-Petrochemical plants

There are four (4) nos. of ammonia truck unloading/loading bays provided in FACT-UC Ammonia Storage & Handling Section. Each loading/unloading bay consists of liquid and vapour arm / line fitted with quick release coupling at the ends for connecting to the Ammonia Truck Tanker.

The liquid ammonia from the storage tanks is pumped to a common header, which branches off to the individual loading bays. In the liquid lines, latest instruments consisting of quick acting control valves and flow meters are provided for filling the predetermined quantity of ammonia in to Ammonia Truck Tankers. The vapour line is meant for taking back the ammonia vapour from the Ammonia tanker to the Ammonia storage tank.

The liquid nozzle of the Ammonia truck tanker is connected to the common liquid ammonia header in the unloading/loading bay. The vapour nozzle of the Ammonia Truck tanker is connected to the common vapour ammonia header in the unloading/loading bay.

Unloading of the ammonia from the truck tankers is carried out by pressurising the truck tanker using compressed ammonia. Ammonia vapour from the refrigeration compressor is supplied through the vapour line of the truck tanker. The liquid Ammonia forced out through the liquid line from the truck tanker is diverted to the Ammonia Storage tanks.

Ammonia vapors generated during the loading / unloading operation is compressed by the refrigeration compressors, condensed and taken back to the Ammonia storage tanks. This is a safe practice generally followed in ammonia transfer operation.

2.3. Unloading facilities at FACT(CD) Ambalamedu

There are 9 (nine) unloading bays provided in FACT-CD Ammonia Storage & Handling Section.. Unloading of the tankers is done by pressurizing the tanker using compressed ammonia. vapour. From unloading points 1-5, the liquid nozzle of the road tanker is connected to the liquid ammonia inlet line leading to the 5000 MT capacity storage Tank. From unloading points 6-9, the liquid nozzle of the road tanker is connected to the liquid ammonia inlet line of the intermediate tank, from where it is pumped to the Ammonia storage tank. The vapour inlet nozzle of the truck tanker is connected to the second stage discharge header of refrigeration compressor by flexible stainless steel hoses. The liquid Ammonia forced out through the liquid line from the truck tanker is diverted to the Ammonia Storage tank.

Ammonia vapours generated during the unloading operation is compressed by the refrigeration compressors, condensed and taken back to the Ammonia storage tanks. This is a safe practice generally followed in ammonia transfer operation.

2.4. Parking area for ammonia tankers – details

2.4.1 In FACT-UC Ammonia loading / unloading point, four (4)nos. truck tankers can be positioned at a time for ammonia filling and sufficient space is also available for parking additional truck tankers.

2.4.2 In FACT-CD Ammonia unloading point, nine (9) nos. truck tankers can be positioned at a time for ammonia unloading operation and sufficient space is also available for parking additional truck tankers.

2.4.3 In FACT-WI Ammonia unloading point, four (4)nos. truck tankers can be loaded at a time, three (3) more trucks can also be parked on the side of the road adjacent to the ammonia handling section.

2.5. The route

2.5.1. The route map of the ammonia truck tanker is attached as Annexure-1.

Total distance from FACT-WI, Willingdon Island to FACT-UC, Udyogamandal is 27 KM.

Total distance from FACT-WI, Willingdon Island to FACT-CD, Ambalamedu is 22.6 KM.

Total distance from FACT-UC, Udyogamandal to FACT-CD, Ambalamedu is 28 KM.

The distance indicated above and in the map (Annexure) are indicative only. Also there can be slight variations that can occur at times. The distance will change based on any restriction / rerouting imposed by statutory authorities from time to time.

2.5.2. There are many hospitals nearby capable of offering treatment to the affected. The telephone numbers of these hospitals are given in page-2&3 of Annexure-2.

3.0 SAFETY PRECAUTIONS

3.1. All possible safety precautions are taken during the transportation of ammonia by road. However, in the remote event of an accident, exhaustive steps, on war footing, will be taken to contain the damage to life and property.

3.2. The capacity of the ammonia-tankers is in the range of 10 to 15 MT (tonnes) and the tare weight of a 15 MT capacity truck tanker will be 20 MT.(app). The tanks of the truck tankers are designed for a pressure of 22 Kg/cm²g and temperature range of -34°C to 55°C and tested at a pressure of 30 Kg/cm²g. The maximum pressure normally attained inside the tanker while transporting ammonia is about 7 Kg/cm². All the truck tankers hold a valid license to transport ammonia issued by the Chief Controller of Explosives under Static and Mobile Pressure Vessels (Unfired) Rules 1981. All conditions laid in the Central Motor Vehicles Rules 1989 are strictly complied with.

3.3. The drivers of the truck tankers shall possess a valid driving licence issued by a competent authority and shall be given special instructions for safe driving. The driver shall possess a valid certificate from a recognised institute approved by DGFASLI for transportation of dangerous goods in accordance with Rule 9 of the Central Motor Vehicles Rules 1989, amendment 1993. For each truck, the truck driver is assisted by a helper.

3.4. The truck tankers are equipped with the following safety appliances for emergency and rescue purposes.

- a) Full-face gas masks fitted with ammonia canister and a spare.
- b) Protective gloves, PVC Suits, goggles, gum boots, water container etc.
- c) Gaskets, spark-proof tools, etc.

3.5. All the safety appliances kept in the road tankers are checked periodically and the inspection reports are documented.

3.6. The Transport Emergency Card (TREM Card) of Ammonia (in Hindi, English and Malayalam) is available in the driver's cabin with telephone numbers for contact during emergency (Annexure-3)

3.7. In addition, the telephone numbers of fire Stations of FACT-UC&CD, Safety Dept. and of the senior officers of FACT are kept in the truck tanker's cabin for ready reference. (Page 1 of Annexure-2 & Page 2 of Annexure 3)

4.0 MAJOR HAZARDS AND RESCUE MEASURES

4.1. The contingencies envisaged while transporting liquid ammonia gas between FACT-WI, FACT-CD & FACT-UC are:

- a) Development of leak in the vapour and liquid lines by way of failure of gaskets, from glands of valves, from relief valves and rupture of nipples etc.
- b) Over turning of the tanker
- c) Over turning of the tanker with possible loss of containment
- d) Collision of the tanker with or with out loss of containment.

4.2. The potential consequences of loss of containment are indicated in Table-I.

**Table I
Potential Consequences in case of Accident**

Weight of ammonia in the tanker in MT	Size of the opening					
	0.5 inch		1 inch		2 inch	
	Leakage rate in Kg/min	Max. Threat zone for LOC	Leakage rate in Kg/min	Max. Threat zone for LOC	Leakage rate in Kg/min	Max. Threat zone for LOC
5	117	94 Metres	467	188 Metres	1865	376 Metres
10	118	94 Metres	472	189 Metres	1882	379 Metres
15	118	94 Metres	472	190 Metres	1887	380 Metres

Wind velocity: 2 metres/sec; Stability class: B; Relative Humidity: 85%; Ambient Temperature: 30 deg. C; Ground roughness: Open country; cloud cover 5 tenths; Internal temperature of the tanker: 10 deg. C

4.3. The table indicates the size of the maximum threat zone with air borne concentration of ammonia at 2500 ppm taken as the level of concern (**LOC**). The relevance of a **LOC** of 2500 ppm in table-I is that it is the minimum air borne concentration of ammonia which could be fatal to a person having an exposure of 30 minutes duration. (References :a) Symth H.F.Jr (1956) Improved communication: hygienic standards for daily inhalation. Am. Ind Hyg. Assoc. Q 17(2): 129-185;b)Environment Canada, Table-1 of Model environment emergency plan for anhydrous ammonia). As the figures in the table would suggest the maximum threat zone can be limited to about 400 metres even in the case of a 2-inch leak. Since the larger size nozzles (2 inch) of the tanker are shrouded, the possibility of loss of containment from high leakage rates indicated in the table are unlikely and hence the maximum threat zone normally may be confined in the range of 100 metres to 200 metres.

4.4. The most credible major hazard scenario identified is the overturn of the vehicle, which may result in the failure of the liquid ammonia inlet / outlet nozzle. This may lead to spillage of ammonia. The contingency plan is made taking into account of this scenario. In the event of an accident resulting in spillage of liquid ammonia, the rescue measures taken shall follow the following sequence.

4.5. Communication of the accident

4.5.1 The distance between FACT-UC, Udyogamandal (the originating point) and FACT-CD, Ambalamedu (the terminating point) is about 28 KM. The distance between ammonia installation at FACT-WI, Willingdon Island and FACT-CD, Ambalamedu is about 22.6 KM. The distance between ammonia installation at FACT-WI, Willingdon Island and FACT-UC, Udyogamandal is 27KM. It is considered that FACT-UC & CD will take a lead roll in emergency preparedness and response based on proximity.

The distance indicated above and in the map (Annexure) are indicative only. Also there can be slight variations that can occur at times. The distance will change based on any restriction / rerouting imposed by statutory authorities from time to time.

4.5.2 In case of an accident involving the road tanker, the crew of the vehicle will immediately contact the Fire Station & Safety Dept.of FACT-UC / FACT-CD/ FACT-WI and Senior Officers of FACT-UC / FACT-CD/ FACT-WI installation and nearby Fire Service Stations. List of contact phone numbers is kept in the driver's cabin of the ammonia truck tanker and copy of this is enclosed as Annexure-2.

4.5.3 In case, the crew perishes in the accident, the communication may come from the local authorities or general public. The recipient of the message shall gather details as to the site of the accident, nature of accident, whether there is any leak reported etc.

4.5.4 The recipient of information of the accident shall immediately communicate the details to Fire & Safety Departments and to Senior officers of FACT. who as the situation warrants, shall initiate contingency/rescue measures as per disaster management plan detailed in chapter-5. GM(OP) CD / GM(OP) UC (or in his absence DGM(P)Petro & AC/DGM(P) CD or in the absence of both, MPC) shall appraise GM(CD) / GM(UC) of the details of incident and keep him informed of the situation from time to time.

4.6. Actions at FACT-UC, Udyogamandal

4.6.1. On receipt of information of the incident, GM(OP)UC (or in his absence DGM(P)Petro & AC or in the absence of both, MPC), if warranted as in the case of major leaks, shall initiate action to contact and seek help from Cochin Division and from the nearby fire service stations listed in annexure-2. The help sought from Cochin Division may be for fire services and/or rescue team. The proximity of the site of accident to Cochin Division shall also be considered while seeking help from Cochin Division.

4.6.2. GM(OP)UC (DGM(P)Petro & AC or in his absence or in the absence of both, MPC) shall initiate action to contact the nearby Police Station and other local authorities and statutory bodies to appraise the authorities and, if the situation warrants, seek help in cordoning off the site of accident, evacuation of neighborhood and medical assistance.

4.6.3 GM(OP)UC (DGM(P)Petro & AC or in his absence or in the absence of both, MPC), shall arrange to mobilize and send the following to the site of accident:

- (i) Fire tender with fire crew and Safety Officer.
- (ii) Rescue crew consisting of personnel from Operation familiar with ammonia handling operation such as SM(P)PC / DyM(P)PC/ AM(P)PC, operation staff from Ammonia Storage & Handling Section.
- (iii) Maintenance crew for hooking up connection, arresting leaks etc. Arranging crane / lifting equipments to lift the truck if necessary in the minimum possible time from FACT UC/CD/WI or from external sources. This activity will be organized by DGM(M)Petro & AC.
- (iv) Vehicle for transportation of crew and kits. by DGM(M)Petro & AC

4.6.4 Rescue crew shall carry the following:

- (i) Emergency safety kit with items as listed in Annexure-4

The emergency safety kit shall be periodically checked and kept ready by the respective Safety Departments.

- (ii) Hook up kit as listed in Annexure-4.

The hook up kits shall be kept ready by the DGM(M)Petro & AC and DGM(M)CD or in their absence respective Shift Engineer (Mechanical). The Shift Engineer (Mechanical) shall arrange to transport the hook up kit to the incident site.

Shift engineer (Mechanical) shall also identify the crew to be deputed during emergency operation and inform all concerned at the beginning of the shift so that emergency crew can be mobilized within a short period.

- (iii) Mobile phone and a list of telephone numbers, in order to establish contact with Udyogamandal Complex, shall be entrusted with the first team reaching the site of accident.
- (iv) Copies of write-up on Guidelines for General Public (Annexure-5). This shall be provided by Safety Department.

4.6.5. The GM(OP)UC (or in his absence DGM(P)Petro & AC or in the absence of both, MPC), shall nominate one of the crew members as the Group Leader or if the situation warrants, instruct a senior officer to lead the crew.

4.6.6 GM(OP)UC (or in his absence DGM(P)Petro & AC or in the absence of both, MSP) shall maintain contact with crew at accident site and local authorities in order to ensure no hindrance to rescue operation.

4.6.7 If required, GM(OP)UC (or in his absence DGM(P)Petro & AC or in the absence of both, MPC) shall arrange empty truck from SM(P)/ AGM(P)- NP-CD/SM(P)/ AGM(P)-PC-UC and nitrogen truck from DGM(M)-CD or SMMM(WS)/CD.

4.6.8 In the case of a major leak, an additional rescue team from FACT-CD may be necessary. FACT-UC shall communicate the requirement of a rescue team to FACT-CD.

4.7. Actions at FACT-CD, Ambalamedu.

4.7.1. On receipt of information of the incident, GM(OP)CD (or in his absence DGM(P)-CD or in the absence of both, SM(PC), if warranted as in the case of major leaks, shall initiate action to contact and seek help from FACT-UC and from the nearby fire service stations listed in annexure-2. The help sought from FACT-UC may be for fire services and/or rescue team. The proximity of the site of accident to FACT-UC shall also be considered while seeking help from FACT-UC.

4.7.2. GM(OP)CD (DGM(P)CD or in his absence or in the absence of both, MPC) shall initiate action to contact the nearby Police Station and other local authorities and statutory bodies to appraise the authorities and, if the situation warrants, seek help in cordoning off the site of accident, evacuation of neighborhood and medical assistance.

If FACT-UC seeks the services of the fire brigade, the fire tender with crew shall be sent immediately.

4.7.3 GM(OP)CD (DGM(P)CD or in his absence or in the absence of both, MPC), shall arrange to mobilize and send the following to the site of accident:

- i) Fire tender with fire crew and Safety Officer.
- ii) Rescue crew consisting of personnel from Operation familiar with ammonia handling operation such as SM(P) / AGM(P)- NP CD / DyM(P)NP/ AM(P)NP, operation staff from Ammonia Storage & Handling Section.

iii) Maintenance crew for hooking up connection, arresting leaks etc. Arranging crane / lifting equipments to lift the truck if necessary in the minimum possible time from FACT UC/CD/WI or from external sources. This activity will be organized by DGM(M)CD.

iv) Vehicle for transportation of crew and kits. by DGM(M)CD or SMMM(WS)CD.

4.7.4 Rescue crew shall carry the following:

(i) Emergency safety kit with items as listed in annexure-4

The emergency safety kit shall be periodically checked and kept ready by the respective Safety Departments.

(ii) Hook up kit as listed in annexure-4.

The hook up kits shall be kept ready by the DGM(M)Petro & AC-UC and DGM(M)-CD or in their absence respective Shift Engineer (Mechanical). The Shift Engineer (Mechanical) shall arrange to transport the hook up kit to the incident site.

Shift engineer (Mechanical) shall also identify the crew to be deputed during emergency operation and inform all concerned at the beginning of the shift so that emergency crew can be mobilized within a short period.

(iii) Mobile phone and a list of telephone numbers, in order to establish contact with FACT-CD, shall be entrusted with the first team reaching the site of accident.

(iv) Copies of write-up on Guidelines for General Public (Annexure-5). This shall be provided by Safety Department.

4.7.5 The GM(OP)CD (or in his absence DGM(P)CD or in the absence of both, MPC), shall nominate one of the crew members as the Group Leader or if the situation warrants, instruct a senior officer to lead the crew.

4.7.6 GM(OP)CD (or in his absence DGM(P)CD or in the absence of both, MSP) shall maintain contact with crew at accident site and local authorities in order to ensure no hindrance to rescue operation.

4.7.7 If required, GM(OP)CD (or in his absence DGM(P)CD or in the absence of both, MPC) shall arrange empty truck from SM(P) / AGM(P)- NP-CD/SM(P)PC-UC and nitrogen truck from DGM(M)/CD or SMMM(WS)/CD

4.7.8 In the case of a major leak, an additional rescue team from FACT-UC may be necessary. FACT-CD shall communicate the requirement of a rescue team to UC.

4.8 Actions at FACT-(WI)

4.8.1 On receipt of information of the incident, AGM(P)/ SM(P) (WI) or in his absence DyM(P)/ AM(P)- (Ammonia Handling) WI or in absence of both Shift-in –Charge of (Ammonia Handling)- WI should immediately contact GM(OP) CD / DGM(P) CD /SM(PC)- CD for further instructions and act according to the instructions.

4.8.2 AGM(P)(WI) / DyM(P)/ AM(P) - (Ammonia Handling) (Ammonia Handling) WI / Shift-in-Charge (Ammonia Handling) WI should also inform DGM (WI) regarding the incident and instructions from FACT-CD.

4.9. Actions at the site of accident

4.9.1. On reaching the site if the local authorities/Police have already taken control of the site, the crew from FACT-CD / FACT-UC shall discuss with the authorities on the course of action. On assessment of the situation, the crew shall identify the requirements for cordoning off and also the areas qualifying for evacuation. The copies of the write-up on Guidelines for General Public shall be handed over to the local authorities for their understanding and for announcement to the public. If medical help is required the crew shall contact Plant Medical Officer FACT-CD / FACT-UC and arrange for the same.

4.9.2. The crew shall take action if possible to stop the leaks from flanges, valves etc. with the aid of appropriate personnel protective appliances and water curtains.

4.9.3. If there is heavy leak due to loss of containment the site crew shall intimate MPC-CD/UC for arranging help from the nearby fire stations.

4.9.4 In the case of a major emergency the crew shall inform MPC-CD/UC. MPC-CD/UC shall report the matter to GM (OP) CD / GM (OP)UC. GM (OP) CD / GM (OP)UC (or in his absence DGM(P)Petro & AC/DGM(P)CD or in the absence of both, MPC), shall bring this to the attention of District Collector and set in motion the off-site emergency plan. The organizational setup for Off-site emergency plan for Ernakulam district is enclosed as annexure-6. (Annexure-6 is the copy of chapter 1.0 taken from OFF-SITE EMERGENCY PLAN FOR ERNAKULAM DISTRICT that was updated in October 2002).

4.9.5. The crew shall review the scenario and assess the possibility of transferring ammonia into an empty truck tanker.

4.9.6. The following procedure may be adopted for transferring the contents to another truck tanker by the use of pressurized nitrogen:

- i) This procedure can be used when the leaks are minor and the tanker is in the upright position or resting on its side.
- ii) AGM(P)/ SM(P)NPCD/ AGM(P)/ SM(P)PC-UC/ DGM (MAT) (or in the absence AGM(MAT)) shall arrange to mobilize and send empty truck tankers to the site with the help of the transport contractor.

GM (Mat) or in his absence DGM(MAT) or in the absence of both AGM(MAT) shall arrange transportation if required for evacuation.

iii) GM(OP)UC/GM(OP)CD or in his absence DGM(P)Petro & AC/DGM(P)CD or in the absence of both, MPC, shall contact DGM(M)CD/SMMM(WS)CD for arranging filled nitrogen truck that is to be sent to the site.

iv) The Mechanical crew sent to the accident site shall make the necessary connections with the help of hookup kit. Nitrogen supply from the Nitrogen truck shall be connected to the vapour nozzle of the leaking truck tanker. The liquid nozzle of the leaking truck tanker shall be connected to the liquid nozzle empty truck tanker using stainless steel flexible hoses. The vapour nozzle of the empty truck to be connected to a water container.

v) Nitrogen from the truck shall be supplied slowly and ammonia transferred to the empty truck tanker.

4.9.7. However it should be noted that as the liquid nozzles have dip tubes, complete emptying out of the tanker might not be possible unless it is standing in the upright position. In the circumstances of a capsized tanker the option for the disposal of the trapped liquid ammonia may be limited to evaporation and dilution with water.

4.9.8. On successful emptying out of the ammonia tanker and clearing the site, the crew shall return back to their respective head quarters.

5.0. THE DISASTER MANAGEMENT PLAN

5.1. The most important aspect of the plan is to get key personnel of relevant discipline who have knowledge, authority and background to assess the situation and give sensible directions immediately to contain the situation to the utmost satisfaction.

5.2. EMERGENCY CONTROL CENTRES

5.2.1. The following places in FACT-UC / FACT-CD shall be the emergency control centre.

FACT-CD

- i) SM(PC)'s office (during shifts & holidays).
- ii) GM (OP)CD's Conference hall (during day shift).

FACT-UC

- i) MPC's office (during shifts & holidays).
- ii) PD Conference hall (during day shift).

5.3. EMERGENCY RESCUE TEAM

Following team shall carry out the rescue operation.

5.3.1. EMERGENCY COORDINATOR: GM(OP)UC/GM(OP)CD

i) He shall be assisted by DGM(Maint)/CE(M), DGM (Technical Services) and Senior Manager (Fire & Safety) /SM(F&S)

ii) He shall co-ordinate all activities during the disaster and is in charge of the entire situation. He shall take care of the communications with higher management authorities, provide information to the mass media, statutory authorities and other external agencies. He shall contact the District Collector, local authorities, and Police for traffic diversion, evacuation of people etc.

5.3.2. RESCUE OPERATION COORDINATOR: DGM(P)

i) SM (P)NP-CD / SM(P)PC-UC/MPC shall assist him.

ii) He shall ensure all possible steps to contain the ammonia release.

iii) He shall co-ordinate for immediate transfer of all injured personnel to First Aid Centre / Hospitals. This shall be done in consultation with the local authorities and the feed back from the site of accident.

iv) He shall arrange for additional Rescue Team and transportation if required.

5.3.3. HEAD OF SAFETY & FIRE

i) He shall ensure that the emergency kit and other safety appliances are available at site.

ii) He shall direct the Fire Force to the affected area.

iii) Shall arrange water curtain while maintenance crew is plugging the leak and connecting the hoses.

iv) Shall arrange water required for replenishment.

v) Shall identify the water sources along the route and get prior permission for filling the fire tender etc during emergencies.

5.3.5. MEDICAL OFFICERS CMS / PMO

- i)** He shall ensure necessary medical treatment of the affected personnel.
- ii)** He shall monitor and coordinate the movement of ambulance and other vehicles for transportation of injured to the First Aid Center / Hospital.
- iii)** He shall arrange for hospitalization and treatment at outside hospitals as and when required.
- iv)** He shall mobilize extra medical help from outside, as situation warrants.
- v)** He shall contact various service organizations such as Red Cross for their assistance.

The proximity of the site of incident shall be considered while initiating the contingency plan.

Transportation of Ammonia from FACT-UC to FACT-CD:

From Udyogamandal to before Bharathamatha college (in Sea Port-AirPort Road) - To be attended by FACT-Udyogamandal Complex.

From Bharatha Matha College to Ambalamedu - To be attended by FACT-Cochin Division.

Transportation of Ammonia from FACT-WI to FACT-CD.

From Willingdon Island to FACT-CD - To be attended by FACT-Cochin Division.

FACT –UC should extend any help requested from FACT-CD

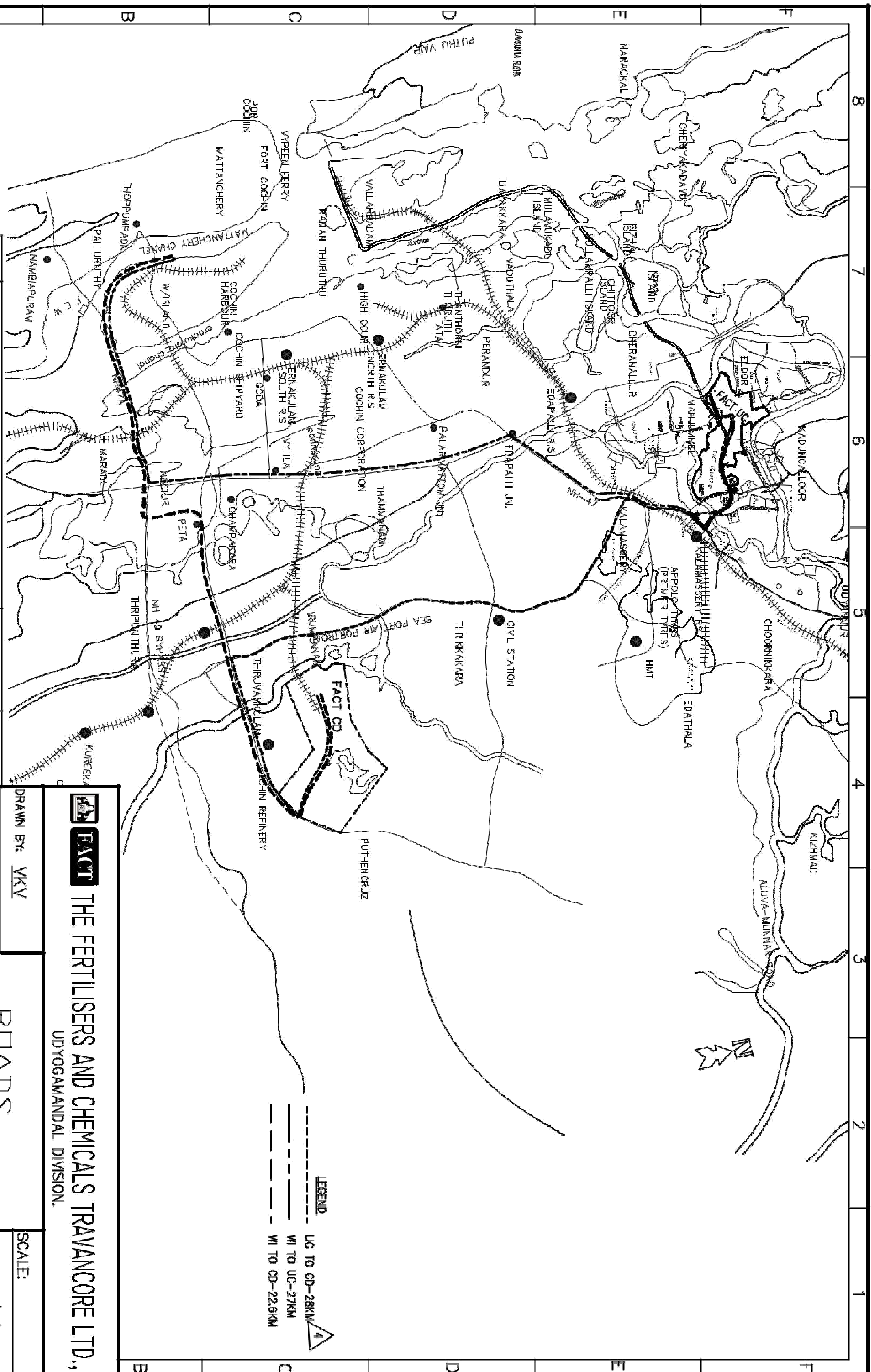
Transportation of Ammonia from FACT-WI to FACT-UC.

From WI to before the Vytilla Junction to be attended by FACT-CD.

From Vytilla Junction to FACT-UC to be attended by FACT-UC.

ANNEXURE – 1

**ROUTE MAP
FOR AMMONIA ROAD TANKERS**



4	DISTANCE REVISED	Vimbo / 05-01-2014	RANIKKUTAN / 05-01-2014
3	REDRAWN	10-12-11 WKY	
REV.NO.	PARTICULARS	CHKD BY.	APPD.BY.
7			
6			
5			
4			

FACT THE FERTILISERS AND CHEMICALS TRAVANCORE LTD.,
UDYOGAMANDAL DIVISION.

DRAWN BY: WKV	
DESD BY: N.GANESAN	
CHKD BY:	
APPD BY: Sebastian John	

ROADS	
TITLE ROUTE MAP FOR ROAD TRANSPORTATION OF AMMONIA WI-CD-UC	SCALE: DATE: 9/7/2001 SHEET No. DRG No. 1B-1-40/2001 R4

ANNEXURE – 2

LIST OF IMPORTANT TELEPHONE NUMBERS

LIST OF IMPORTANT TELEPHONE NUMBERS:

(Revised as on November 2013)

FACT OFFICIALS

SI. No:	CONTACT PERSON / PLACE	Telephone number	
		Office	Residence
1	CMD (FACT)	0484-2545418	0484-2545424
2	Director Finance (FACT)	0484-2545030	0484-2545459
3	Marketing Director (FACT)	0484-2545345	0484-2545053
4	Director Technical (FACT)	0484-2546405	0484-2408211
5	(Corporate Planning)	0484-2546226	0484-2348261
6	GM(UC) FACT(Occupier for Udyogamandal Complex)	0484-2545041	0484-2558968
7	GM(OP)(Factory Manager for Udyogamandal Complex)	0484-2546496 0484-2567737	0484-2672382
8	GM(CD)(Occupier for Cochin Division)	0484-2720902, 0484-2720443	0484-2302571
9	GM(OP)-CD(Factory Manager for Cochin Division)	0484-2720901, 0484-2723260	0484-2532979
10	DGM-WI (Factory Manager for Willingdon Island Installations)	0484-2668165	0484-2557030
11	Commandant-CISF	0484-2546392	9496007701

FIRE SERVICES

SI. No:	CONTACT PERSON / PLACE	Telephone number	
		Office	Residence
1	Fire Station, FACT Udyogamandal	0484-2546148 0484-2545109	
2	Fire Station, FACT-CD, Ambalamedu	0484-2720246 0484-2723333	
3	Fire & Rescue Services, Eloor	0484-2545500	
4	Fire & Rescue Services, Ernakulam	101	
5	Fire & Rescue Services, Gandhi Nagar, Ernakulam	0484-2353550	
6	Fire & Rescue Services, Club Road, Ernakulam	0484-2355101	
7	Fire & Rescue Services, Kakkanad, Ernakulam	0484-2423100	
8	Fire & Rescue Services, Fort cochin	0484-2215909	
9	Fire & Rescue Services, Cochin Port	0484- 2666555	
10	Fire & Rescue Services, Mattanchery	0484-2225555	
11	Fire & Rescue Services, Perumbavoor	0484-2523123	
12	Fire & Rescue Services, Trikkakara	0484-2423100	
13	Fire & Rescue Services, Trippunithura	0484-2775388	
14	Fire & Rescue Services, Naval Base	0484-2662200	
15	Divisional Fire Officer, Fire & Rescue Services	0484-2206131	

Sl. No:	CONTACT PERSON / PLACE	Telephone number	
		Office	Residence
16	Fire & Rescue Services, Aluva	0484-2624101	
17	Fire Services, KRL	0484-2720789,	0484-2305169
	Chief Fire Officer, Manager (Fire/Safety)	0484-2722061 to 69	0484-2705074
18	Fire Station, HOC	0484-2720808	
	Manager (Fire)	0484-2720911	
	Sri: Gopal	0484-2720840	
19	Cochin International Air Port	0484-2610115-	
	Chief Fire Officer	Extn-105	
		0484-2610148 0484-2610094	
20	Fire Services, BSES, Udyogamandal	0484-3085101	

STATUTORY BODIES

Sl. No:	CONTACT PERSON / PLACE	Telephone number	
		Office	Residence
1	District Collector	0484-2423001, 0484-2382445	0484-2372902
2	Collectorate	0484-2422292	
3	IG of police	0484-2360800	0484-2204566
4	DIG of police	0484-2353469	0484-2204566
5	City police commissioner	0484-2394770	0484-2382260
6	Police Control room	100	
7	Police station, Kalamassery	0484-2532050	
8	Police station, Eloor	0484-2543437, 0484-2546365	
9	Police station, Hill Palace, Tripunithura	0484-2780228	
10	Police station, Karimugal	0484-2720491	
11	Sr: Joint Director of Factories & Boilers, Ernakulam.	0484-2422258	0484-2427422
	Inspector of Factories & Boilers (Chemical)		
12	Inspector of Factories and Boilers, Kakkanadu	0484-2422272	
13	Controller of explosives, Ernakulam	0484-2427276	
14	Dy Chief Controller of explosives, Ernakulam	0484-2427286	
15	Regional Transport Officer	0484-2422246	
16	Kerala State Pollution Control Board, Regional office, Ernakulam- Chief Environmental Engr.	0484-2207783 to 86	
17	Kerala state pollution control board, Local office, Eloor, Environmental Engineer	0484-2545678	

HOSPITALS			
1	ESI hospital, Udyogamandal	0484-2545632	
2	St: Josephs hospital , Manjummel	0484-2555344	

Sl. No:	CONTACT PERSON / PLACE	Telephone number (office)	Telephone number (RES)
3	Amritha Hospital, Ernakulam	0484-2801234, 0484-2802100	
4	Co-operative Medical College Hospital, HMT(via) Kalamassery	0484-2411463	
5	General Hospital, Ernakulam	0484-2361251	
6	MAJ Hospital, Edappilly	0484-2344996	
7	PVS Hospital, Ernakulam	0484-2345451, 0484-2345471	
8	Lissie Hospital, Ernakulam	0484-2401006, 0484-2402308	
9	PNVM Hospital, Ernakulam	0484-2390097	
10	Sree Sudindhra medical mission hospital, Ernakulam	0484-2382390, 0484-2354139	
11	City Hospital, Ernakulam	0484-2378980, 0484-3043011	
12	Krishna Nursing Home, Ernakulam	0484-2368230	
13	Cochin Hospital, Ernakulam	0484-2378980	
14	Medical Trust Hospital, Ernakulam	0484-2358002, 0484-2358008	
15	Lourde hospital, Ernakulam	0484-2391452, 0484-2392547	
16	Ernakulam Medical center, Palarivattam	0484-2807101	
17	Indira Gandhi -Co-operative Hospital, Ernakulam	0484-2206734, 0484-2204110	
18	Lakshmi Hospital, Ernakulam	0484-2382111	
19	Giridhar Eye Hospital, Ernakulam	0484-2316791	
20	Specialists Hospital, Ernakulam	0484-2395066	
21	Medical Mission hospital, Kolenchery	0484-2760251	
22	RCM Hospital, Tripunitura	0484-2776318	
23	Vijaya Kumara Menon Hospital, Tripunitura	0484-2777619	
24	Varma Medical Clinic, Tripunitura	0484-2781506	
25	Devi Hospital, Tripunitura		
26	Lakeshore Hospital, Nettur	0484-2701032, 0484-2701033	
27	Lakshmi Hospital, Tripunitura	0484-2776981	
28	Samaritan Hospital, Pazanganad		
29	Carmel hospital, Aluva	0484-2621314	
30	Govt Hospital, Aluva	0484-2629242	
31	Lakshmi Hospital, Aluva	0484-2623721	

CONTACT PHONE NUMBERS DURING EMERGENCIES:

Designation	Telephone Number	Designation	Telephone Number
Fire Station Udyogamandal Complex	0484-2546148 0484-2545109	Fire Station Cochin Division.	0484-2720246
Manager, Shift Production, Udyogamandal Complex	9446381118 0484-2545858 0484-2553666	Shift Production Coordinator, Cochin Division.	0484-2723600 0484-2723334
Senior Manager(Safety)UC, FACT UDYOGAMANDAL COMPLEX- PETROCHEMICAL PLANTS	9447607707 0484-2546148	SENIOR MANAGER (FIRE & SAFETY) COCHIN DIVISION	0484-2723241 9995116113 (MOB)
Assistant General Manager Production / Senior Manager(P) (Pollution Control) FACT UDYOGAMANDAL COMPLEX- PETROCHEMICAL PLANTS	0484-2568344, 04842568301, 04842568692 0484-2546357 (R)	Assistant General Manager Production / Senior Manager(P)- NP FACT COCHIN DIVISION	0484-2723645 0484-2723535 0484-2723725
Officer (Fire Services) Udyogamandal Complex	0484-2546148 9847881115	SM(F&S) COCHIN DIVISION	0484-2720246 9995116113
Deputy General Manager(P) Petro & AC FACT UDYOGAMANDAL COMPLEX- PETROCHEMICAL PLANTS	0484- 2568200, 0484-2546259	Deputy General Manager(P) FACT COCHIN DIVISION	0484-2723642, 0484-2785333 (R)
DGM (Willingdon Island)	0484-2668165, 0484-2667709 0484-2557030 (R)	General Manager (Operation), Udyogamandal Complex	0484-2546496 0484-2545257 0484-2545125 (R)
General Manager, (Operation), Cochin Division.	0484-2720901, 0484-2723260, 0484-2532979 (R)	General Manager, Udyogamandal Complex	0484 - 2546926 0484 - 2545041 0484 -- 2547301
General Manager (Materials)	0484 - 2546609		

ANNEXURE – 3

TRANSPORT EMERGENCY CARD

TRANSPORT EMERGENCY CARD (ROAD)

CARGO : LIQUID AMMONIA
Colourless Liquid with pungent odour

NATURE OF HAZARD:

- Inhalation causes sore throat, coughing, shortness of breath & laboured breathing.
- Causes blurred vision & skin burns
- Irritating gas
- Causes lung oedema
- Ingestion may cause headache, dizziness, nausea and vomiting
- Reacts with moisture(water) with generation of heat
- Long exposure may result in destruction of tissues.

PROTECTIVE DEVICE:

- Suitable respiratory protective equipments
- Plastic/rubber gloves, suits, boots, hood, etc.
- Goggles giving complete protection of eyes

EMERGENCY ACTION:

- INFORM POLICE AND FIRE BRIGADE IMMEDIATELY
- INFORM FACT AUTHORITIES

Meanwhile,

- If possible, park the vehicles in an isolated area
- Mark roads and warn road users
- Keep/ stay perpendicular to wind direction
- Put on protective clothing.

SPILLAGE:

- Contain leaking liquid with sand or earth, consult an expert.
- Dilute vapours with plenty of water

FIRE:

- Keep containers cool by spraying with water if exposed to fire
- Stop flow of gas, if possible
- Use water spray / fog

FIRST AID:

- Inhalation: Remove the victim to fresh air area, provide artificial respiration or oxygen, if needed. Skin: Remove the contaminated clothes and wash the affected area with plenty of water and soap. Flush with plenty of water for 15 mins. Seek Medical Aid.

CONTACT PHONE NUMBERS DURING EMERGENCIES:

Designation	Telephone Number	Designation	Telephone Number
Fire Station Udyogamandal Complex	0484-2546148 0484-2545109	Fire Station Cochin Division.	0484-2720246
Manager, Shift Production, Udyogamandal Complex	9446381118 0484-2545858 0484-2553666	Shift Production Coordinator, Cochin Division.	0484-2723600 0484-2723334
Senior Manager(Safety)UC, FACT UDYOGAMANDAL COMPLEX- PETROCHEMICAL PLANTS	9447607707 0484-2546148	SENIOR MANAGER (FIRE & SAFETY) COCHIN DIVISION	0484-2723241 9995116113 (MOB)
Assistant General Manager Production / Senior Manager(P) (Pollution Control) FACT UDYOGAMANDAL COMPLEX- PETROCHEMICAL PLANTS	0484-2568301, 0484-2568344 04842568692 0484-2546357 (R)	Assistant General Manager Production / Senior Manager(P)- NP FACT COCHIN DIVISION	0484-2723645 0484-2723535 0484-2723725
Officer (Fire Services) Udyogamandal Complex	0484-2546148 9847881115	SM(F &S) COCHIN DIVISION	0484-2720246 9995116113
Deputy General Manager(P) Petro & AC FACT UDYOGAMANDAL COMPLEX- PETROCHEMICAL PLANTS	0484- 2568200, 0484-2546259 (R)	Deputy General Manager(P) FACT COCHIN DIVISION	0484-2723642, 0484-2785333 (R)
DGM (Willingdon Island)	0484-2668165, 0484-2667709 0484-2557030 (R)	General Manager (Operation), Udyogamandal Complex	0484-2546496 0484-2545257 0484-2545125 (R)
General Manager, (Operation), Cochin Division.	0484-2720901, 0484-2723260, 0484-2532979 (R)	General Manager, Udyogamandal Complex	0484 - 2546926 0484 - 2545041 0484 -- 2547301
General Manager (Materials)	0484 - 2546609		

ANNEXURE – 4

EMERGENCY KITS TO BE MAINTAINED

A. Emergency kits to be maintained at FACT-Udyogamandal Complex & Cochin Division.

The Safety departments of FACT-Udyogamandal Complex & Cochin Division shall be responsible for the availability of the Emergency kit. The following items shall be maintained in the Emergency kits in Safety Departments of Udyogamandal Complex & Cochin Division.

Sl. No:	Item	Quantity
1	Self contained breathing apparatus	2 Nos
2	Spare air cylinder	2 Nos
3	Portable breathing apparatus with hand operated air blower.	1 No.
4	Ammonia mask with canisters	3 Nos
5	PVC gloves	3 pairs
6	PVC suit	2 set
7	Goggles	5 Nos
8	Mobile Phone	1 No.
9	List of contact numbers.	

B. Hook-up kit to be maintained at FACT-Udyogamandal Complex & Cochin Division.

The Mechanical maintenance Group at FACT-Udyogamandal Complex & Cochin Division shall be responsible for the availability of the Hook-up kit. The Mechanical maintenance Group at Udyogamandal Complex & Cochin Division shall maintain the following items in the Hook-up kit.

Sl. No:	Item	Quantity
1	Assembled unit of two numbers 50 NB flexible Stainless Steel flanged metallic hose of 10 meters each in length and equipped with the male part of the 50 NB Quick Release Coupling (QRC) at one end, and the other end flanged. The flanged ends of the hoses shall be connected each other so that the assembled hose shall have the male part of the 50 NB Quick Release Coupling (QRC) at both ends.	1 Set
2	Assembled unit of two numbers 25 NB flexible Stainless Steel flanged metallic hose of 10 meters each in length and equipped with the male part of the 40 NB Quick Release Coupling (QRC), and suitable threaded nipple to receive the connection in the Nitrogen truck at one end, and the other end flanged. The flanged ends of the hoses shall be connected each other so that the assembled hose shall have the male part of the 40 NB Quick Release Coupling (QRC) at one end and threaded nipple to receive the connection in the Nitrogen truck at the other end.	1 Set
3	Gaskets, tools and tackles for connecting hoses, tightening of glands, flanges etc.	
4	Set of clamps (50NB) for on-line leak sealing.	
5	Belzona, M-seal etc.	

C. Nitrogen Truck to be maintained at FACT-Cochin Division

The DGM (P) (CD)/AGM(P) / SM(P)NP of Cochin Division shall be responsible for the availability of filled nitrogen truck at Cochin Division. DGM (P) CD or in his absence, MPC shall arrange to send the filled nitrogen truck to the site of accident site if required.

ANNEXURE – 5

**GUIDELINES
FOR GENERAL PUBLIC**

Guide-lines for General Public

In the event of a major emergency, public will be informed through loud speakers of the disaster and the action to be taken:

DO`s

If told to stay Indoors,

1. Go inside your house or some other building and remain there until there is further announcement by the Emergency Co-ordinator.
2. Close all doors, windows and ventilators, switch off all air cooling system.
3. Be alert to receive any other instruction.
4. Keep your pets inside.

If told to evacuate,

1. Get ready to leave your house for several hours, taking all essentials.
2. Switch off lights and other household appliances.
3. Close gas cylinder valves etc.
4. Take all family members together.
5. Inform your neighbours, especially at night.
6. Run perpendicular to the wind direction. A string / strip of paper to cloth held loosely will indicate wind direction.
7. Cover your nose and eyes to minimize harmful effects.

DON`Ts

If your children are at School, do not panic and try to reach them, as the School, authorities will take care of them. The Emergency Co-ordinator will arrange to co-ordinate the matter with schools with the help of the District Administration.

ANNEXURE – 6

**ACTION PLAN FOR OFF-SITE
EMERGENCIES IN ERNAKULAM DISTRICT**

ACTION PLAN FOR OFF-SITE EMERGENCY PLAN IN ERNAKULAM-DISTRICT

CONTROL ROOM

A twenty four hour working full fledged District Emergency Control Room is to be set up at the Collectorate and till such arrangements, the Control Room at the City Police Commissioner's Office, High Court Junction, Ernakulam is to be used as Control room. The Control room of Fire Force Department at club road, Ernakulam is to be used as second stand by.

STRUCTURE

The emergency control cell shall have the following structure

- District Emergency Controller (DEC): District Collector
- Emergency Coordinators: ADM/CPC/SP(R) / Divisional Fire Officer

ARRANGEMENT / FACILITY

The emergency control room shall have the following arrangement/ facility

1. Duty Operator under 24 hours service.
2. At least two independent telephones so as to ensure the working of minimum one phone.
3. Wireless communication facility.
4. Wireless equipped vehicle.
5. Copy of off-site emergency plan.
6. List of Telephone numbers, both official and residential, and residential addresses of officials notified in the Action Plan.
7. The road map of the district clearly showing the location of control room, hazardous industries, hospitals, schools, police stations, fire stations, important other offices etc. Any traffic restrictions on the route shall be shown with distinct colour code.
8. Details such as the quantity and location of availability
of Medicines for first aid
Fire fighting equipment
Water sources
Chart depicting 'Do's' & 'Don'ts'
Emergency power generator

SERVICE AGENCIES

The various service agencies involved are listed below along with their respective responsibilities in brief.

A. Police

1. Inform other agencies.
2. Provide support to other service agencies.
3. Traffic and mob control.
4. Arrange for evacuation of people on advice from District Emergency Controller or Emergency Coordinators.
5. Broadcast on advice from District Emergency Controller, or Emergency Coordinators.

B. Fire Services

1. Fight fire and prevent spread of fire.
2. Stop gas/chemical leakage.
3. Rescue and salvage operation.
4. Assist evacuation.

C. Medical

1. First Aid.
2. Provide proper medical attention to victims during transit to hospital.
3. Medical treatment of persons affected by the mishap.

SUPPORT AGENCIES

A. Technical:

(Joint Director of Factories & Boilers, Chief Environmental Engineer, KSPCB, Controller of Explosives, NEERI etc)

Provide necessary technical assistance as required by service agencies to investigate the cause of disaster.

B. Rehabilitation.

(ADM, ADC, Tahsildars, Village Officers, District Supply Officer, Corporation Secretary, Municipal Secretaries etc.)

1. Make arrangements for transport and evacuation.
2. Make arrangements for rehabilitating people evacuated.
3. Provide emergency measure in the area with necessary facilities.
4. Make arrangements for food, medical & hygiene facilities.
5. Maintain telephone and other communication facilities in efficient working condition.

OPERATION

Once the operator in the control room receives the information regarding the chemical accident he shall immediately get into contact with the On-Site-

Emergency controller or near by Police Station to assess the actual situation and correctness of the news. On confirmation he shall contact immediately the District Emergency' Controller (DEC), the District emergency coordinators and all other service agencies to move over to the situation. The District Emergency Controller and other agencies shall move to the location and take charge of the situation as planned.

RESPONSIBILITIES OF DISTRICT EMERGENCY CONTROLLER (DEC)

The responsibilities are:

1. Immediately on knowing about the emergency, he shall proceed to the site and take charge of the overall control.
2. Depending upon seriousness of the emergency, ensure help from nearby districts.
3. Exercise control of the unaffected areas.
4. Maintain a continuous monitoring of the situation.
5. Ensure that casualties are receiving adequate attention and relatives are advised through District Information Officer.
6. Ensure availability of funds to meet the contingency.

DUTIES OF EMERGENCY COORDINATORS

The major duties of the District Emergency Coordinators are given below.

1. Immediately on knowing about the emergency, they shall proceed to the site.
2. Assess the magnitude of the situation and decide its line of action.
3. Pending the arrival of District Emergency Controller, assume the duties of his post.
4. Provide advice and information to the service agencies as and when they arrive.
5. Ensure that the affected persons are evacuated to the relief centres.
6. Report all significant developments to the District Emergency Controller.
7. Provide information in any subsequent enquiry into the cause and circumstances of the emergency.
8. Assess the damages caused in the disaster.
9. Prepare disaster planning sheet.

CONNECTED AGENCIES

The duties of the service agencies and other related support agencies are briefly explained below. For further details of service agencies reference shall be made to chapters 3 to 5.

ANNEXURE – 7

**RESOURCES AVAILABLE
IN FIRE & SAFETY (FACT)**

**RESOURCES AVAILABLE IN FACT UDYOGAMANDALCOMPLEX AND
FACT COCHIN DIVISIONS**

a) SAFETY EQUIPMENT

SI No	Name of Equipment	Quantity at UC, Nos	Quantity at CD, Nos
1	(a)Breathing apparatus (45 and 30 minutes duration) (b)Emergency life saving apparatus (15 minutes)	58 10	25
2	Auer Face Mask	150	50
3	Spare Canisters for Ammonia Organic vapors Acid gases NOx gases	265 60 25 25	75 40
4	Safety Belts	80	40
5	Helmets	200	150
6	Ear muff	50	40
7	Ear plug	500	400
8	Face Shield	10	20
9	PVC suit	95	40
10	Asbestos suits	5	5
11	Apron- PVC/Rubber/Asbestos etc	23 each	--
12	PVC gloves Supported/Unsupported	250 pairs each	300 pairs each
13	Leather gloves	100 pairs	50 pairs
14	Asbestos gloves	500 pairs	-
15	Cotton gloves	1500 pairs	3000 pairs
16	Rigger Gloves	1000 pairs	-
17	Gum boots	200 pairs	250 pairs
18	Fire Entry Suit	2	-
19	Fire Proximity suit	11	2
20	Chemical Protection suits	2	-
21	Asbestos mats	8	-
22	Rope ladders	9	4
23	Aluminium Ladder	1	-
24	Dust respirator	1000	1000
25	Boiler suits	100	40
26	Dust mask cloth type	1500	500

Sl. No	Safety Instruments	Quantities available (Nos.)	
		at UD/PD	at CD
1.	Explosive meter (Reiken Keiki-Japan)	6	1
2	Explosive meter (Gascope-MSA)	3	3
3	Sound Level Meter	3	1
4	(a) Kitgawa precision gas detector for measuring even the lowest concentration of gas (i.e in PPM level) (b) Drager Pumps for measuring the concentration of gas Detector tubes for all chemicals handled in FACT are available	2 4	--
5	Sound level meter (Node type-1 Japan, and type-2, Denmark)	3	-
6	Oxygen measuring instrument	2	-
7	Digital portable Temperature indicator	1	-
8	Bauer Breathing Air compressor (working pressure-200Bar, 100 litres/minute capacity)	2	1
9	Dragon Search light	3	-

Fire Fighting Appliances Available at Udyogamandal

Sl No	Particulars	Water, Capacity	Foam compound, Capacity	Carbon dioxide, Capacity	Dry chemical powder, Capacity
1	FireTender Reg No: KL7/Z-4331	2500 litres	2500 litres	22.Kg, 6 Nos	75Kg, 2 Nos
2	Fire Tender (Reg No: KL7/J-5840)	2500 litres	2500 litres	22.Kg, 2 Nos	68Kg, 1 No
	KL-7-N 6889	4500 litres	800 litres	133 Kg	150 Kg
3	Fire Water Pumps: 3 Nos Diesel pumps and 4 Jockey pumps (electrically driven)				
3	Emergency Vehicle Tatamobile-207 (Reg No: KL7/G-2912)- 1 No.				
4	Portable Pump (capacity 275 litres /minute)- 1 No Portable Pump (capacity 350 litres /minute)- 1 No				
5	Trolley mounted Water Foam monitor (foam compound capacity-600 litres)-1 No.				
6	Different types of Fire Extinguishers like Carbon Dioxide (various capacities) Dry chemical Powder (various capacities), chemical Foam, Mechanical foam, Halon etc.				
7	Foam compound Stock reserve: (a) Protein based foam compound : 6,000 litres (b) Aqueous film foaming foam compound : 7,000 litres				

Fire Fighting Appliances Available at FACT Cochin Division

Sl. No.	Fire Fighting Equipments	Quantity
1.	Fire Tenders a) Water Tender b) DCP Tender c) Foam Tender d) Traylor Pump e) Portable Pump	2 Nos.(Capacity 2250 and 2800 ltr.) 1 No. (Capacity – 2000 Kg) 1 No. 1 No. 2 Nos.
2.	Fire Water Pump Phase-I Phase- II Phase- I	2 Elec. Pumps. Capacity of 1000 GPM 1 Ele. 625 GPM for Sprinkler 2 Elec. 1000 GPM. 1 Elec. 625 GPM for Sprinkler. 3 Diesel Pumps – 410 m3/hr each.
3.	Total fire hydrants	188 Nos.
4.	Total monitors	12 Nos.
5.	Fixed fire fighting installations	Sprinkler system, Foam Pourer, Auto Smoke Detectors.
6.	Foam Compound a) Protein Based b) AFFF c) Water Type	3355 Ltr. 4500 Ltr. 25 Ltr.
7.	Extinguishers a) Soda Acid b) Foam c) Foam	103 (9 Ltr. Capacity) 95 (9 Ltr. Capacity) 10 (45 Ltr. Capacity)

Sl. No.	Fire Fighting Equipments	Quantity
	d) DCP e) CO ₂	57 (3.5 Kg Capacity) 52 (5 Kg Capacity) 125 (10 Kg Capacity) 03(22.5 Kg Capacity) 04 (75 Kg Capacity) 22 (50 Kg Capacity) 80 (6.8 Kg Capacity) 30 (3 Kg Capacity) 25 (2 Kg Capacity)
8.	DCP Powder for Refilling	4250 Kg.
9.	Fire Hoses 2½ “	120 Nos.
10.	Branch Pipe	130 Nos.
11.	Fog Nozzle	03 Nos.
12.	F.M. Branch	01 No.
13.	Breathing Apparatus	20 Nos.
14.	Canister with Mask	25 Nos.
15.	Ambulance	01 No.

B. Support Services

Deputy Director, Home guards, Chief Engineer, KSEB, Chief Engineer, KWA, General Manager BSNL, RTO, DTO, KSRTC

Area Manager, Railways, Doordarshan, AIR etc.

To provide necessary support services are required by other service agencies.

DISASTER PLANNING SHEET

A review of the various stages of operation in the case of disaster shall definitely help in containing the disaster of the same nature In future. For this purpose Disaster Planning sheet shall be prepared for each disaster grouped according to the nature of disaster. The following details may be Included in the Disaster Planning Sheet,

1. Nature of Disaster/Chemicals involved.
2. Name of the factory.
3. Date and time of occurrence.
4. Area affected.
5. Brief description of the procedure followed to contain the situation including details of equipment used, evacuation and other allied operations.
6. Whether the situation was contained successfully, if not the reason there of.
7. If evacuation was done, was It done successfully, if not why?
8. Whether medicines were readily available, if not, note the Items for which there was shortage.
9. Whether all the services could be mobilized in time, if not, the reasons thereof.
10. Whether on-site emergency controller informed the control room in time.
11. Whether the operator was available, If so whether District Emergency Controller and District Emergency Coordinators were informed in time, if not, why?
12. Suggestions.

UPDATING OFF-SITE EMERGENCY PLANS

The offsite emergency plan requires updating under the following conditions.

1. Commissioning of new Industries which manufacture, store and handle hazardous chemicals In quantity equal to or more than the threshold quantity prescribed in the Rules.
2. Change of manufacturing processes and capacity increase.
3. Development of new information and technology in the safely systems and the consequent major changes in the emergency plan of the individual units.
4. Amendment in the Statutes.

*** Annexure-6 is the copy of chapter 1.0 taken from OFF-SITE EMERGENCY PLAN FOR ERNAKULAM DISTRICT which was updated in October,2002. More details can be obtained from www.ekmcrisismgt.com.

ANNEXURE – 8

SAFETY DATA SHEET – AMMONIA



SAFETY DATA SHEET- AMMONIA

PRODUCT NAME/ TRADE NAME		ANHYDROUS AMMONIA
SYNONYM	Anhydrous ammonia	MSDS NUMBER: 14002
CHEMICAL NAME	Ammonia	REVISION NUMBER 2.0
CHEMICAL FAMILY	Alkali	MSDS DATE 02/16/2001.
CHEMICAL FORMULA	NH3	
MATERIAL USES	Industrial applications: Manufacture of chemicals. Manufacture of synthetic fibers. Refrigerant. Cleaning solutions. Metals refining. Fertilizer manufacturing.	

Hazardous Ingredients		Exposure Limits						
NAME	Cas #	TLV-TWA mg/m3	TLV-TWA ppm	STEL mg/m3	STEL ppm	CEIL mg/m3	CEIL ppm	% by Weight
Ammonia	7664-41-7	17	25	24	35			varius
TOXICOLOGICAL DATA ON INGREDIENTS	Anhydrous Ammonia: ORAL (LD50): Acute: 3500 mg/kg (Rat.). GAS (LC50): Acute: 5040 ppm (Mouse.) (1 hour(s)). 7650 ppm (Rat) (1 hour).							

Hazards Identification

POTENTIAL HEALTH EFFECTS	<p>Anhydrous ammonia gas or liquid is very corrosive to body tissues, reacting with body moisture on contact. ACUTE</p> <p>The odour threshold for ammonia is on average 17 PPM although the range of sensitivity ranges from 0.7 PPM to 50 PPM for acclimatized individuals. Generally, concentrations of up to 25 PPM are tolerated although unpleasant and pungent. Above this concentration, irritation of the eyes, nose and throat may begin. The extent of irritation increases with increasing ammonia concentration.</p> <p>Eye and throat irritation is more pronounced between 100 and 400 PPM. Above 400 PPM, skin irritation is noticeable and immediate throat irritation and coughing will result. NIOSH has established 500 PPM as the concentration immediately dangerous to life and health (IDLH), which is defined as the concentration above which self-rescue may be difficult or impossible due to physiological effects. At concentrations between 1000 and 2500 PPM increasing chest tightness, brochospasm and severe eye and skin irritation will result. Delayed effects such as chemical pneumonitis and pulmonary edema may develop several hours after exposure. At concentrations above 2500 PPM, laryngeal spasm may occur resulting in rapid asphyxia. Effects may be more pronounced at lower concentrations in children, the elderly, and persons with impaired lung function.</p>
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	<p>Eyes: Eye irritant. May cause severe eye irritation with corneal injury and permanent vision impairment.</p> <p>Skin: Skin irritant. Contact may cause severe skin irritation, chemical burns, and blistering. Contact with vaporizing liquid may cause frostbite due to rapid evaporative cooling. Cooling effect may mask the extent of corrosive injury received.</p> <p>Inhalation: Irritating to entire respiratory tract. Excessive overexposure may cause severe irritation to the upper respiratory tract and potential lung damage.</p> <p>Ingestion: Ingestion is not likely route of exposure due to the physical state of the substance (a compressed, liquefied gas).</p>
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POTENTIAL CHRONIC HEALTH EFFECTS	CARCINOGENIC EFFECTS: NONE by ACGIH, EPA, IARC, OSHA. MUTAGENIC EFFECTS: NONE by ACGIH, EPA, IARC, OSHA. TERATOGENIC EFFECTS: NONE by ACGIH, EPA, IARC, OSHA. The substance is harmful to the lungs and mucous membranes. Repeated or prolonged exposure to the substance can produce target organ damage.
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First Aid Measures

EYE CONTACT	IMMEDIATELY FLUSH EYES WITH WATER for at least 30 minutes, keeping eyelids open. SEND FOR MEDICAL ATTENTION IMMEDIATELY.
MINOR SKIN CONTACT	Dermal contact may freeze tissue and cause severe skin irritation. FLUSH IMMEDIATELY WITH RUNNING WATER FOR AT LEAST 30 MINUTES. SEEK MEDICAL ATTENTION.
EXTENSIVE SKIN CONTACT	No additional information.
MINOR INHALATION	Loosen tight clothing. Allow the victim to rest in a well ventilated area. Give artificial respiration if breathing has stopped. Get immediate medical attention.
SEVERE INHALATION	If gases or vapors are present, rescuers must WEAR SELF-CONTAINED BREATHING APPARATUS and an impervious suit or full bunker gear. Evacuate the victim to a safe area as soon as possible. Loosen tight clothing around the victim's neck and waist. If the victim is not breathing, perform artificial respiration. If breathing is difficult, administer oxygen. Maintain an open airway. Seek immediate medical attention. Observation may be warranted. Pulmonary edema may occur several hours after exposure.
SLIGHT INGESTION	Product is a liquefied compressed gas. If liquid anhydrous ammonia has entered the mouth and throat, roll victim onto stomach and begin artificial respiration. Continue until victim is breathing. Seek immediate medical attention.

Fire and Explosion Data

THE PRODUCT IS	Combustible.
AUTO-IGNITION TEMPERATURE	651.1°C (1204°F)
FLASH POINT	Not applicable. Material exists as a gas unless confined under pressure.
FLAMMABILITY LIMITS	LOWER: 16% UPPER: 25%
PRODUCTS OF COMBUSTION	Nitrogen oxides (NO, NO ₂ ...).
FIRE HAZARD IN PRESENCE OF VARIOUS SUBSTANCES	Slightly flammable in the presence of open flames and sparks. Narrow lower to upper flammability limits (16-25%) makes ignition difficult.
EXPLOSION HAZARD IN PRESENCE OF VARIOUS SUBSTANCES	Slightly explosive in presence of reducing materials (hypochlorites or other halogenated compounds). Non-explosive in presence of open flames and sparks, of shocks, of heat, of oxidizing materials, of combustible materials, of organic materials, of metals, of acids, of alkalis, of moisture.
FIRE FIGHTING MEDIA AND INSTRUCTIONS	Corrosive gas. Fire fighters should wear SELF-CONTAINED BREATHING APPARATUS and full bunker gear. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion. Move containing vessels from fire if without risk. If anhydrous ammonia catches fire, stop flow of gas or liquid if it may be done safely. Use water spray or fog to extinguish flames and suppress vapors. Contain run-off water.
SPECIAL REMARKS ON FIRE HAZARDS	When heated to decomposition it emits toxic fumes. Hazardous Combustion Products: Nitrogen oxides.
SPECIAL REMARKS ON EXPLOSION HAZARDS	Explosive when mixed with chlorinated materials such as hypochlorites. Forms nitrogen trichloride which explodes spontaneously in air. Reacts similarly with other halogenated materials.

Accidental Release Measures

SMALL SPILL	Warn personnel to move away. Keep unprotected personnel upwind of spill area. DO NOT APPROACH LIQUID OR VAPOR CLOUD WITHOUT ENCAPSULATING SUIT AND SCBA. If possible to do so without hazard, isolate leak by shutting off supply of ammonia from containing vessel. Use water fog to suppress airborne vapors from leak or spill. DO NOT DIRECT WATER INTO SPILED LIQUID! ANHYDROUS AMMONIA WILL AUTOREFRIGERATE REDUCING VAPOR RELEASE. ADDITION OF WATER WILL WARM CRYOGENIC LIQUID RESULTING IN GREATER GASIFICATION. Contain run-off water for later recovery and treatment. Call emergency number on this MSDS sheet for assistance.
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LARGE SPILL	<p>Corrosive gas. Material will auto refrigerate under accidental release presenting a cold dense heavier than air vapour cloud or fog. Warn personnel to move away. Keep unprotected personnel upwind of spill area. Evacuate any unprotected personnel who are downwind of spills. Consider an exclusion zone of 1500 metres around incident area. Incident Commander may adjust size of exclusion zone based on the circumstances of the emergency and analysis of the threat presented by the release. See Exposure Limits Section for Evacuation Guidelines.</p> <p>Community Emergency Response Instructions:</p> <ul style="list-style-type: none"> • Stay indoors (unless evacuation has been called) • Close all windows and doors • Shut off furnace, exhaust fans, and air conditioners • Wait for and follow advice from local police or authorities • If smell is very strong, breath through a wet cloth <p>Eliminate all sources of ignition. DO NOT APPROACH LIQUID OR VAPOR CLOUD WITHOUT ENCAPSULATING SUIT AND SCBA. If possible, and personnel are protected by appropriate personal protective equipment, turn leaking container so that gas escapes rather than liquid, or isolate leak by shutting off supply of ammonia from containing vessel. If possible, apply patch or otherwise restrict size of leak. Use water fog to suppress airborne vapors from leak or spill. DO NOT DIRECT WATER INTO SPILLED LIQUID! ANHYDROUS AMMONIA WILL AUTOREFRIGERATE REDUCING VAPOR RELEASE. ADDITION OF WATER WILL WARM CRYOGENIC LIQUID RESULTING IN GREATER GASIFICATION. Contain run-off water for later recovery and treatment. Call Emergency Number for assistance.</p>
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Exposure Controls/Personal Protection

ENGINEERING CONTROLS	Workers must be trained in the safe handling and use of ammonia. Adequate, well engineered systems must be provided for storage, transfer and use. Process block valves, equipment enclosures and other isolation facilities may be necessary. Provide adequate general or local exhaust systems to maintain concentrations within exposure guidelines.
PERSONAL PROTECTION	<p>The selection of personal protective equipment varies, depending upon conditions of use.</p> <p>Respiratory Protection: Use a NIOSH approved chemical cartridge respirator with full facepiece for ammonia concentrations up to 300 PPM. Use a positive pressure (pressure demand) SCBA for concentrations above 300 PPM, for emergency response, or for entry into unknown concentrations.</p> <p>Eye Protection: Contact lenses should not be worn when handling anhydrous ammonia. Use chemical goggles and a face shield or full facepiece air purifying or air supplied respirator.</p> <p>Skin Protection: Where chemical contact is unlikely, wear butyl rubber, nitrile, or polyvinyl chloride boots, gloves, rain jacket and pants.</p>

PERSONAL PROTECTION IN CASE OF LARGE RELEASE	Under emergency conditions, where contact with liquid anhydrous ammonia or high concentration gas is probable, chemically resistant, gastight totally encapsulating suits with 60 minute positive pressure SCBA are required.
EXPOSURE LIMITS	<p>TLV-TWA 25 ppm from ACGIH. Consult local authorities for acceptable exposure limits.</p> <p>AIHA Emergency Response Planning Guidelines:</p> <ul style="list-style-type: none"> • ERPG-1: <25 PPM for 1 hour. Objectionable odor. • ERPG-2: 25-200 PPM for 1 hour. Strong objectionable odor, some eye, nose and throat irritation. • ERPG-3: 200-1000 PPM for 1 hour. Severe eye and respiratory irritation, without development of life threatening health effects. <p>National Academy of Sciences 1987 Emergency Exposure Guidance Levels: Up to 24 hour continuous exposure: 100 PPM</p>

Physical and Chemical Properties

PHYSICAL STATE AND APPEARANCE	Colorless cryogenic liquid or gas.		
MOLECULAR WEIGHT	17.03	COLOR	Colorless.
PH (10% SOLN/WATER)	12	ODOR	Ammoniacal. (Strong.)
BOILING POINT	-33.35°C (-28°F)	ODOR THRESHOLD	
MELTING POINT	-77.7°C (-107.9°F)	TASTE	Burning. (Strong.)
CRITICAL TEMPERATURE	Not applicable.	IONICITY (in Water)	Not available.
SPECIFIC GRAVITY g/cc	0.63 (Water = 1)	SOLUBILITY	Easily soluble in cold water. Soluble in hot water. Partially soluble in methanol. Very slightly soluble in diethyl ether, n-octanol, acetone.
BULK DENSITY kg/m ³		DISPERSION PROPERTIES	See solubility in water, methanol.
VAPOR PRESSURE	6610mm of Hg (@ 20°C)	WATER/OIL DIST. COEFF.	Between 50 and 5000.
VAPOR DENSITY	0.6 (Air = 1)		
VOLATILITY	100% (w/w).		
Stability and Reactivity Data			
STABILITY	The product is stable.		

INCOMPATIBILITY WITH VARIOUS SUBSTANCES	Extremely reactive or incompatible with acids. Highly reactive with oxidizing agents and reducing agents. Do not use copper, brass, bronze, or galvanized steel in contact with ammonia. Do not use brazed joints in ammonia service. Forms explosive compounds with many heavy metals such as mercury or silver. Reacts explosively with chlorine, hypochlorites (such as bleach or dry chlorinating chemicals) and other halogens (bromine, iodine, fluorine).
CORROSIVITY	Highly corrosive in presence of copper and its alloys. Slightly corrosive to corrosive in presence of aluminum and zinc. Very slightly corrosive in presence of mild steel. Non-corrosive in presence of glass, or stainless steel (304 or 316).
SPECIAL REMARKS ON REACTIVITY	Incompatible with halogens, aluminum, copper, brass and zinc. Incompatible with strong acids.
SPECIAL REMARKS ON CORROSIVITY	Corrosive to brass. Incompatible with copper alloys (stress cracking). Will corrode a wide variety of metals.

Toxicological Information

ROUTES OF ENTRY	Inhalation. Eye contact. Skin contact.
TOXICITY TO ANIMALS	Acute oral toxicity (LD50): 350 mg/kg (Rat). Acute toxicity of the gas (LC50): 2520 ppm (Mouse.).
SPECIAL REMARKS ON TOXICITY TO ANIMALS	Hazardous for humans or animal life. Corrosive to skin and eyes on contact. Severe over- exposure can produce lung damage, choking, unconsciousness or death. May cause severe eye irritation.
OTHER EFFECTS ON HUMANS	Slightly dangerous to very dangerous in case of skin contact, of eye contact, of inhalation. Material may be irritating or corrosive.
SPECIAL REMARKS ON CHRONIC EFFECTS ON HUMANS	Exposure can cause coughing, chest pains, difficulty in breathing. Repeated significant overexposure can cause permanent lung function damage, edema and chemical pneumonitis. May cause serious damage to the eyes.

Ecological Information

ECOTOXICITY	Hazardous for humans or animal life. Ammonia is a toxic hazard to fish. In low concentrations in water and soil, ammonia acts as a fertilizer to promote plant growth. Under aerobic conditions ammonia will oxidize to nitrate and does not accumulate in the environment. Sub-lethal concentrations in water can have adverse physiological effects on marine species. Free ammonia concentrations of 2.5 mg per litre at pH 7.4 to 8.5 are considered harmful to marine life. In water, free NH ₃ is considered to be the primary toxic form while the much more prevalent NH ₄ OH form is much less harmful.
BOD and COD	Not available.
PRODUCTS OF BIODEGRADATION	Nitrogen oxides (NO, NO ₂ ...), nitrates.
TOXICITY OF THE PRODUCTS OF BIODEGRADATION	The products of biodegradation are less toxic than the original product.

Special Remarks On The Products Of Biodegradation	Product may degrade water quality and taste. Notify downstream water users. Will dissolve and disperse in water.
Other Information	OTHER SPECIAL CONSIDERATIONS: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). TSCA (Toxic Substance Control Act): This product is listed on the TSCA Inventory. CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA): This product is on the Domestic Substances List (DSL) and acceptable for use under the provisions of CEPA. CERCLA: If the reportable quantity of this product is accidentally spilled, the incident is subject to the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

ANNEXURE – 9

WIND DIRECTION WITH VELOCITY

WIND DIRECTION WITH VELOCITY

Following is the wind data (speed and direction) as observed at Cochin, throughout the year.

Month	Direction and speed		
	8 a.m.	5 p.m.	12 midnight
January	ENE 6 km/Hr	SWS 18 km/hr	ENE 3 km/hr
February	ENE 8 km/Hr	SWS 19 km/hr	ENE 5 km/hr
March	ENE 7 km/Hr	SWS 21 km/hr	NW 5 km/hr
April	ENE 5 km/Hr	WNW 21 km/hr	NE 5 km/hr
May	ENE 4 km/Hr	WNW 21 km/hr	NE 6 km/hr
June	ENE 8 km/Hr	SW 18 km/hr	NE 10 km/hr
July	W 10 km/Hr	SW 24 km/hr	NW 6 km/hr
August	NE 5km/Hr	NM 19 km/hr	NW 10 km/hr
September	ENE 5 km/Hr	NW 18 km/hr	NW 6 km/hr
October	ENE 9 km/Hr	W 17 km/hr	NW 6 km/hr
November	NE 5 km/Hr	SW 16 km/hr	NE 5 km/hr
December	NE 6 km/Hr	SW 16 km/hr	NE 6 km/hr

ANNEXURE – 10

EXPANSION OF ABBREVIATIONS

EXPANSION OF ABBREVIATIONS

CMD	Chairman and Managing Director (FACT)
FD	Director (Finance)
TD	Director (Technical)
MD	Director (Marketing)
HOD	Head of the Division
GM (UC)	General Manager(Udyogamandal complex)
GM (OP)	General Manager (Operations)
CISF	Central Industrial Security Force.
AC	Assistant Commandant.
CMS	Chief of Medical Services.
SMO (U)	Sr. Medical Officer (Udyogamandal)
DGM(P)	Deputy General Manager (Production)
SM (Safety)	Senior Manager (Safety) - (Udyogamandal Complex)
DGM (TS)	Deputy General Manager (Technical Services)
MSP	Manager Shift Production
GM (CD)	General Manager(Cochin Division)
AGM(P)(NP)	Assistant General Manager Production (NP)
DGM(M)	Deputy General Manager (Maintenance)
GM (Mat)	General Manager(Materials)
DGM(Mat)	Deputy General Manager (Materials)
SM(F&S)- CD	Senior Manager (Fire & Safety)- Cochin Division
MPC	Manager Production Coordination
CD	Cochin Division
PD	Petrochemical Division
UD	Udyogamandal Division
UC	Udyogamandal Complex