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Fire Prevention and Protection, Fixed and Portable Fire Fighting System, Safety Work Permit, Drills, Personal Protective Equipment, First Aid

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I. SCOPE

Fire that way is friend of mankind if it is handle with care and caution but it also can turn to be a greatest enemy handled carelessly and negligently. Thus it is an attitude of man as how he deals with fire. It has been our observation that there are numerous reaction which has influenced the man's behavior towards the fire safety. Developed country are more concerned and serious with on going higher hazard and have also advanced to considerable extent in fire & safety whereas developing country people are more optimistic and less concerned towards it.

With immensely growing population and migration from rural area to urban cities have taken uncontrolled shapes bulging by for its dimension. With this number of fire accident are also increase and it has become a matter of serious concern for fire services and other emergency services. Whatever the major have been adopted till now seems to be quite inadequate and out of date and it needs a serious review to ensure better safety.

With the advancement of science and technology there has been a lot of changes in the industrial setup in the recent past their use to be limitation in production and types of production now a days many different types of industries are dealing with lot of hazardous product the majority of industries are using hydrocarbons product as their raw material this includes liquid gases, fuels the transportation storage processing of this highly inflammable materials obviously increase the fire and explosion risk industries may be petroleum industries chemical industries, steel industries, fertilizer industries and power plant etc.

II. AIM

Today's modern world has increase the potential fire hazards and explosion possibilities due to use of huge quantity of flammable gases and liquids uses of hazardous material are also increasing in various industry the hug pipelines are laid across the country to carry flammable gases and liquids to tackle the need of human beings .this fast developing urbanization and industrialization of cities has given rise to high potential fire and explosion hazards .this has increase the responsibility of fire services to cater the service to protect precious lives and national properties involved in this modern potential hazards .it is high time for fire services to update there equipment's skills and techniques to tackle this modern hazards .

These all hazards should be identified and proper training facilities should be developed in the fire service. This can be achieved by framing various capsules courses for various industries .the expert from the field can be invited to share their experience with their training which will be helpful for trainee in their future service.

Creation of hot firefighting ground with various types of hazard associated with handling storage and transportation, processing of liquid and gases hydrocarbons and hazardous material at training center is very essential. This will help the fire fighters to improve the confidence level and to develop skills to tackle emergencies .this will also lead to perfection to come back fires, spillages, leakages, of flammable and hazardous gases and liquids.

III.RCF AT GLANCE

Rashtriya Chemicals and Fertilizers Limited (RCFL) is a leading fertilizers and chemicals manufacturing company with about 75% of its equity held by the government of India. Company has been accorded the coveted "NAVRATNA" status in august 2023.

It has two operating units, one at Trombay in Mumbai and the other at Thal, Raigad District, about 100 km from Mumbai.

RCF manufactures urea, complex fertilizers, bio-fertilizers, micro-nutrients, 100 per cent water soluble fertilizers, soil conditioners and a wide range of industrial chemicals.

The "Ujjwala" (Urea) And "Suphala" (Complex Fertilizer) brands of fertilizers manufactured by RCF carry high brand equity and are recognized brands all over the country. These products are taken to the farthest corner of the country by extensive RCF dealers network spread throughout the country.
Besides fertilizer products, RCF also produces a large number of industrial chemicals that are important for the manufacture of dyes, solvents, leather, pharmaceuticals and a host of other industrial products.

Both the manufacturing units of RCF are accredited with ISO 9001 (quality management system), ISO 14001 (environmental management system), ISO 45001 (occupational health and safety), ISO 50001: 2011 (energy management system) and ISO 27001 (information security management).

RCF has been performing well for the last several years and in one of the few PSU's which have been posting profits consistently.

Sustainability is at the heart of RCF, and we have continuously endeavoured to incorporate sustainability in every aspect of our functioning. RCF presently is self- reliant in meeting its requirement of the precious resources of water and electricity.

RCF is operating a two sewage treatment plants (STP) at trombay unit. Both plants put together has a capacity to treat of 45.50 MLD (million litres per day) of municipal sewage and produce 30 MLD (million litres per day) of treated water for our industrial use. RCF and BPCL have entered into MOU to supply around 40% of the treated water to BPCL. The plant serves a dual purpose. Firstly, it solves the issue of treatment and disposal of sewage. Secondly, it relieves bmc's from the obligation of supply of 30 MLD of drinking water, thereby making equivalent amount of water available for the community.

RCF has set up GT HRSG (gas turbine with heat recovery steam generation) plants both at trombay and at Thal units. With this process, RCF generates power required to meet its captive requirement.

In its bid towards india's vision of achieving ecologically sustainable growth, RCF has already forayed into solar power generation including ground mounted and rooftop facilities. RCF has an aggregate capacity of 4.01 MWP of solar power generation resulting into generation of more than 5000 mwh per annum of green power. The green power generated by solar plants replaces the conventional power generated through burning of fossil fuels thereby leading to reduction in overall greenhouse gas emissions.

RCF has always striven for upkeep of the plants through modernizing and upgrading technology. Revamping and de-bottlenecking is the secret that has kept the company thriving for more than five decades. This has facilitated plants to sustain operations and meet technological challenges of improved efficiency, lower energy consumption and meet the environment norms. It has also resulted in company achieving the highest standards of safety and product quality.

RCF is active on all the popular social platforms such as Facebook, Twitter, Youtube and Instagram, with handle @rcfkisanmanch, to facilitate easy interaction with stakeholders and for creating awareness about activities undertaken by RCF.

Our customer base comprises of farmers and dealers. RCF has undertaken several agriculture extension activities so as to educate the farmers on efficient use of agro-inputs and provide know-how on improved and scientific methods of cultivation contributing to increase in their farm yield. These include soil sample analysis through static as well as mobile testing labs, establishing Kisan Suvidha Kendras, dedicated farmer training centres at Thal and Nagpur, field demonstrations, exhibitions, RCF Sheti Patrika, a monthly magazine etc. RCF also runs a kisan care toll free number 1800 22 3044. "Kisan Manch" mobile app is providing information on various subject to farmers. A self-service mobile app and web portal "RCF dealer Parivar" deployed to provide transactions details to dealers.

RCF has a well-developed R&D set up primarily focused on innovation studies to develop new,

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efficient & safer processes, value added products, technology development, agronomical research to evaluate the efficiency of different fertilizers and development and implementation of agro-input products to cater the need of integrated plant nutrient system (IPNS). RCF laboratories are NABL accredited for analysis of urea, NPK fertilizers, soil, and micronutrients.

In order to augment the domestic urea capacity and achieve self-sufficiency in line with the 'Make in India' mission, GOI has undertaken revival of five closed urea plants. RCF has been nominated by goi as a partner in two revival projects, Viz, Fcil Talcher and Bvfcl Namrup. At FCIL TALCHER, RCF in association with GAIL, CIL AND FCIL is setting up urea plant of 1.27 million MT per annum capacity based on coal gasification route. In order to utilize country's huge coal reserves, Talcher fertilizers project will be a game changer for india in terms of opening a new avenue in coal gasification and shall reduce dependency on natural gas for urea manufacturing. At BVFCL NAMRUP, RCF along with NFL, OIL, and GOVT. OF ASSAM AND BVFCL is exploring the viability of setting a urea plant with an annual capacity of 1.27 million MT.

RCF also strongly believes in discharging its corporate social responsibility diligently with an objective to benefit the needy and for general good of the society. A host of CSR activities is undertaken by the company towards sustenance of the environment, education and welfare of the community, propagation of sports and cultural activities, directly and indirectly, helping the community in bettering the life and environment around.

RCF through its R&D and horticulture department is engaged to help in maintaining biodiversity & conserving biodiversity in & around the RCF complex. Several nurseries have been established & tree plantation programs have been undertaken.

RCF efforts has been recognized through various awards and has been consistent recipient of various awards in field of the production performance, energy conservation, water management, industrial safety, corporate fair business practices, and CSR activities etc.

PLANTS AT RCF THALUNIT

PLANT CAPACITY	
AMMONIA	3800 MTPD
UREA	6200MTPD
SGP	3 X 275 MTPH
TURBO GENERATOR	2 X 15 MW
GTG/HRSG	2 X 25 MW 2 X 100 TPH
DMF *	2500 MTPY
METHYL AMINES PLANT	11400 MTPY
DMAC	5000 MTPY
FORMIC ACID	10000 MTPY
ARGON	45 MTPD

THAL UNIT PROFILE

TOTAL FACTORY AREA: 775 ACRES GREEN BELT AREA : 30 %

TOWNSHIPS (KURUL + KIHIM): 223 ACRES

NUMBER OF EMPLOYEES AT THAL: 1313 (OFFICERS: 549 + WORKERS: 764)

NUMBER OF CONTRACT WORKERS: 587 & NUMBER OF MATHADI WORKERS: 721

OTHER FACILITIES AT THAL

Two urea storage silos with 2 x 45,000 MT capacity. Two ammonia storage tanks having 20000 MT & 5000 MT capacity. Ammonia & industrial chemicals dispatch facility.

Effluent treatment and disposal system. Pollution monitoring and control facilities. Agricultural research centre

ADDITIONAL EFFORTS

Implementation of GTG/HRSG scheme in march-

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2018 Construction of new water reservoir of 40000 m3 capacity Installation of solar power plant of 1228 KWP

Revamping of CO2 compressors in urea plant: all three units

Installation of VAM for suction air chilling in ammonia PAC & suction CO_2 chilling in urea compressors.

Installation of HVLR water monitors at ammonia storage HSE index evaluation system

Process Safety Management (PSM)

System of safety commissioner of the month. Night rounds by senior managers.

Nomination of electrical safety officer on rotation basis. Safety awareness training to the people of nearby villages.

Quality systems – QUALITY CIRCLE, LEAN QC, KAIZEN, 5S, SUGGESTION SCHEME, SIX SIGMA.

IV.FIRE FIGHTING SYSTEM AT RCF THAL UNIT

SR.NO	FIRE EQUIPMENTS	PERIODICITY OF INSPECTION/ TESTING, D,W,Q & A	TOTAL NOS.
1	FIRE EXTINGUISHERS DCP(10KG) = 834 ● DCP UNIT (50 KG) = 70 ● DCP UNIT (150 KG) = 09 ● AUTO DCP (10 KG) = 58 ● CO2 (6.8KG) = 577 ● FOAM UNIT (50 LIT) = 33 ● CO2 TROLLEY = 29	Q	1647
2	AUTO DCP ON TRANSFORMER (CGP-6, HWP-12, AMM- 10, UREA-6,SGP-12, PHP- 2, ETP- 2, F&S 10)	Q	75
3	FIRE HYDRANT POST & MONITORS.	Q	869
4	WATER SPRINKLERS ON TRANSFORMERS. (SGP-15, UREA- 3, HWP-4, AMMONIA -10)	Q	27
5	STORAGE TANK WATER SPRAY & FOAM POURERS SYSTEMS & CR WATER SPRINKLER /CARTONSYSTEMS.	Q	18
6	CO2 FLOODING SYSTEMS AT ADM, TELE. EXCHANGE, TG & AIR MONITORING STATION.	Q/A	04
7	BA SETS. & ELBA	Q/A	104
8	FIRE PUMP HOUSE	D/W	4
	ELECTRIC	GENERAL TEST	
	PUMP		
	DIESEL PUMP	BATTERY TEST	W
	JOCKEY	PUMP TEST	D/W
9	FIRE ENGINES		
	4 IN 1 TENDER MH06J-9464	GENERAL TEST	D
	3 IN 1 TENDER MH06 J-9641	BATTERY TEST	W

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	MFT TENDER MH06 BW8380	PUMP TEST	Q
10	TRAILER PUMPS	GENERAL TEST BATTERY TEST PUMP TEST	-D -W -M
11	SAFETY SHOWERS & DECONTAMINATION UNITS		Q
12	HIGH VOLUME LONG RANGE (HVLR) MONITORS AT AMMONIA STORAGE.		BIMONTHLY

V.RCF THAL UNIT DEPARTMENTAL FUNCTIONS

REVIEW OF SAFETY RELATED ISSUES BY REPORTS/ MEETINGS:

S.NO	REPORT/ MEETING	FREQUENCY
01	DAILY SAFETY SURVEILLANCE REPORT TO TOP MANAGEMENT	DAILY
02	WORK PLACE SAFETY INCLUDING COMPLIANCE TO SWP, JHA, PEP TALKS ETC.	DAILY
03	PLANT SAFETY SURVEILLANCE/ WORK PLACE MONITORING BY SAFETY COMMITTEE	WEEKLY
04	SAFETY PERFORMANCE REPORT OF THAL UNIT TO TOP MANAGEMENT AND CORPORATE	MONTHLY
05	PLANT LEVEL SAFETY COMMITTEE MEETINGS CHAIRED BY PLANT OM/DGM	BI MONTHLY
06	UNIT LEVEL CENTRAL SAFETY COMMITTEE MEETING CHAIRED BY ED (THAL)	BI MONTHLY
07	PUBLISHING ANNUAL SAFETY STATUS REPORT OF THAL UNIT	ANNUAL

VI.ENSURING AVAILABILITY OF EMERGENCY SERVICES

S.NO	EQUIPMENT/ SYSTEM	FREQUENCY
01	FIRE TENDERS, PUMPS, RESERVOIR LEVEL ETC. ROUTINE CHECK	EVERY SHIFT
02	COMMUNICATION EXERCISE WITH MARG	FORT NIGHTLY
03	INSPECTION & PREVENTIVE MAINTENANCE OF FIRE EQUIPMENT	MONTHLY

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04	INSPECTION OF ACTIVE FIRE PROTECTION SYSTEMS	QUARTERLY
05	INSPECTION OF FIRST AID FIREFIGHTING EQUIPMENT	QUARTERLY
06	INSPECTION OF AUTOMATIC CO_2 FLOODING SYSTEM	QUARTERLY
07	HYDRO TEST OF BA SET AND EXTINGUISHERS	ONCE IN 5 YEARS

VII.FIRE & SAFETY EQUIPMENT PROCUREMENT

- Ensuring budget allocation for new and latest generation equipment
- Ensuring adequate stock of PPE and other gadgets
- Arranging new PPE & equipment demonstrations and workshops
- New and periodic review of technical specification & sap codification
- Lining up, monitoring & execution of various arc for F&S department in the procurement
- Ensuring adequate stock of safety forms like permit books, training, TEC, IBOTREM etc.

VIII.TRAINING AND AWARENESS

- Arranging training for employees, contractors and interested parties for safety related events
- Arranging demonstration of fire equipment like Ba Set, Extinguishers, Rescue Equipment etc. For Plant Personnel
- Managing the e-learning management system for safety trainings
- Coordination of the E-Near Miss System
- Display of safety posters, boards, mannequin, media content etc. In plant areas to enhance safety awareness
- Height pass evaluation for contractor employees
- Emergency plan training to nearby communities, district officials, police department etc.

IX.COORDINATION OF SAFETY EVENTS

- Enhancing safety awareness by conducting the following events:
  - NATIONAL SAFETY WEEK
  - ROAD SAFETY WEEK
  - NATIONAL FIRE SERVICE WEEK
  - INTER UNIT SAFETY MEET
  - TRANSPORTER'S SAFETY MEET

X.LEGAL AND OTHER REQUIREMENTS

- Correspondence with legal authorities like DISH, CCOE, DMO, DMFS etc. And ensuring strict compliance to all legal requirements related to safety
- Coordination of MARG activities in Raigad-Alibag circle
- Ensuring coordination and compliance to management systems like
  - Integrated management systems
  - Process safety management
  - Protect and sustain protocol
- Coordination in conducting internal and external safety audit

XI.EMERGENCY PREPAREDNESS

- Preparation and review of emergency preparedness plan
- Ensuring availability of all emergency services i.e. FIRE PERSONNEL, FIRE WATER, PUMPING EQUIPMENT, TENDERS, EXTINGUISHERS, and BA SETS etc. Round the clock
  - Coordination for mock drills in plants
- Emergency preparedness and mitigation training to all plant personnel, contractor employees, CISF, nearby communities, District Officials, Police And Traffic Departments etc.
- Coordinating for external mock drill with all MARG and district officials
- Responding to actual emergencies inside and outside factories

XII.REACTIVE SAFETY MANAGEMENT

- Reporting of all safety related incidents like injuries, fire, gas leak etc. To top management

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- Coordinating for incident investigation and ensuring compliance of recommendations
- Arranging for circulation of incident reports along with root cause analysis to prevent recurrence
- Coordinate with legal authorities in case of incidents (if reportable)

XIII.DOCUMENTS AND PUBLISHING

- The following documents for all employees are published by fire & safety department
  - GENERAL SAFETY MANUAL
  - ELECTRICAL SAFETY MANUAL
  - FIRE SAFETY MANUAL
  - EMERGENCY PREPAREDNESS PLAN
  - ANNUAL SAFETY STATUS REPORT

XIV.DRILLS THREE MAN HYDRANT DRILL

EQUTIPMENTS: - TWO HYDRANTS,
HYDRANT KEY AND BAR, FOUR HOSE, TWO BRANCHS, ONE COLLECTING BREACHING, ONEDIVIDING BREACHING, MANPOWER 3 MAN
SCOTT ATTENTION
FROM THE RIGHT NUMBER FROM THE IN THREES NUMBER
ALL NUMBER ONE LEFT HAND UP BI CREW'S NUMBER
CREW STAND AT EASY NO 1 CREW ATTENTION
FOR THREE MEN HAD RENT DRILL THREE PIECES BEHIND HYDRANT NUMBER 1 CREW FALL IN
CREW ATTENTION FROM THE RIGHT NUMBER
FOR THREE MEN HYDRANT DRILL NUMBER 1 CREW GET TO WORK FIRST HOSE LAYOUT NUMBER 3 HE IS HYDRANT OPERATOR
SECOND HOSE LAYOUT NUMBER 2 HE IS MESSENGER
THIRD HOSE LAYOUT NUMBER 1 NUMBER 1 BRANCH MAN AND CREW LEADER NO 1 GIVE SIGNEL TO NO 2 NO2 GIVE SIGNAL TO NO3 REPET 3-2-1
NO2 WATER ON-INCREASE PRESSURE – DECREASE PRESSURE –WATER OFF – KNOCK UP AND MAKE UP
HYDRAN SIDE HOSE ROLLED BY NO3 MIDDLE ROLLED BY2 BRANCH SIDE ROLLED BY NO1 WITH BRANCH
KEPT HOSE AT PREVIOUS POSITION AND CREW LEADER ORDER THEN CREW THREE PACES BEHIND THE HOSE FALL IN POSITION ATTENTION THREE MAN HYDRANT DRILL COMPLETED ALL EQUIPMENTS CORRECT SIR

NUMBER ONE TAKE POST
THEN DOBBLE MARCH AND JOIN LEFT SIDE LINE
IN THIS HYDRANT DRILL COMMAND USE BI CREW LEADER DIVIDE ONE LINE INTO TWO LINE USING DIVIDING BREACHING
COLLECT TWO LINE INTO ONE LINE USING COLLECTING BREACHING REPLACE BRUSH HOSE AT MIDDLE
ADD ONE LENGTH OF HOSE AT BRANCH
REMOVE ONE LENGTH OF HOSE AT BRANCH

FOUR MAN HYDRANT DRILL

SCOTT ATTENTION
FROM THE RIGHT NUMBER FROM THE IN FOUR NUMBER
ALL NUMBER ONE LEFT HAND UP BI CREW'S NUMBER
CREW STAND AT EASY NO 1 CREW ATTENTION
FOR FOUR MEN HYDRONT DRILL THREE PACES BEHIND THE HYDRANT NUMBER 1 CREW FALL IN
CREW ATTENTION
FROM THE RIGHT NUMBER
FOR FOUR MEN HYDRANT DRILL NUMBER 1 CREW GET TO WORK NUMBER 4 IS HYDRANT OPERATOR
NUMBER 3 LAYING FIRST HOSE HE IS A MESSENGER NUMBER 2 LAYING SECOND HOSE HELPER OF NUMBER 1
NUMBER 1 LAYING 3RD HOSE WITH BRANCH HE IS THE BRANCH MAN AND CREW LEADER
NO 1 GIVE SIGNEL TO NO 2 NO2 GIVE SIGNAL TO NO3 REPEAT 3-2-1

NO2 WATER ON-INCREASE PRESSURE – DECREASE PRESSURE –WATER OFF – KNOK UP AND MAKE UP
HYDRAN SIDE HOSE ROLLED BY NO3 MIDDDLE ROLLED BY2 BRANCH SIDE ROLLED BY NO1 WITH BRANCH
KEPT HOSE AT PREVIOUS POSITION AND CREW LEADER ORDER THEN CREW THREE

PACES BEHIND THE HOSE FALL IN POSITION
ATTENTION FOUR MAN HYDRANT DRILL
COMPLETED ALL EQUIPMENTS CORRECT
SIR
NUMBER ONE TAKE POST
THEN DOBBLE MARCH AND JOIN LEFT SIDE LINE
IN THIS DRILL NUMBER 4 TAKE COLLECTING AND DIVIDING REACHING AND TAKE HIS PLACE NUMBER 3 TAKE HOSE WITH BRANCH LAY HOSE AND TAKE POSITION BRANCH HOLD

FOUR MEN EXTENSION LADDER DRILL

SCOTT ATTENTION
FROM THE RIGHT NUMBER FROM THE IN FOUR NUMBER
ALL NUMBER ONE LEFT HAND UP BI CREW'S NUMBER
CREW STAND AT EASY NO 1 CREW ATTENSION
FOR FOUR MEN EXTENSION LADDER DRILL THREE PACES BEHIND THE LADDER
NUMBER ONE CREW FALL IN
CREW ATTENTION FROM THE LEFT NUMBER
NUMBER ONE CREW CLOSE UP
CREW NUMBER
PITCH EXTENSION LADDER TO THE FIRST FLOOR NUMBER ONE CREW GET TO WORK

1- --4 INVERT TURN
2- --3 INVERT TURN

1-4 UNDER RUNNING FROM ROWS AND PITCH LADDER
2-3 HOLD LADEER WITH HAND WITH SUPPORT LEG AT LADDER BOTTOM WHEN STAND UP LADDER NO1 AND NO 4 HOLD LADDER BY SIDE
NO 3 HOLD LADDER FRROM BACK SIDE
NO 2 PUULLED THE ROPE AND EXTEND LADDER SIX ROWS ABOVE TOP LEVEL
ON COMMAND NUMBER ONE UP NO1 FIST CLIMB THE LADDER THEN 2-3-4 ROTATE POSSITION
APPLY LEG LOCK WITH ARMHOLD REMOVE ARM HOLD WITH LEG LOCK CREW MAKE UP THEN CREW THREE PACES BEHIND THE LADDER FALL IN POSITION ATTENTION FOR MEN EXTENSION LADDER DRILL
COMPLETED NUMBER ONE TAKE POST
THEN DOUBLE MARCH AND JOIN LEFT SIDE LINE

IN FIRE SERVICE SIGNALS ARE SEVEN TYPES:-

1- WATER ON: -RIGHT HNAD ONE TIME UP ALL FINGER TOUCH
2- INCREASE THE PRESSURE: -RIGHT HAND UP TWO TIMES
3- DECREASE PRESSURE: - RIGHT HAND UP LEFT HAND SHOULDER LEVEL
4 WATER OFF: -RIGHT HAND SHOULDER LEVEL AND THEN BEND ON UP TO CHEST
5- KNOCK UP AND MAKE UP: -BOTH HAND SHOULDER LEVEL UP THEN CHEST UP AND CUT
6- ASSEMBLE: - RIGHT HAND TURN OVER ON HEAD THREE TIMES
7- CANCELED: -MESSAGE-BOTH HAND UP TO SHOULDER LEVEL AND CROSS HAND THEN CUT

XV.RESCUE DRILL METHOD OF RESCUE DRILL

1- PICK UP CASUALTY
2- TWO HAND SIT
3- THREE HAND SIT
4- FOUR HAND SIT
5- TOE DRAG
6- BOWLINE DRAG
7- BLANKET DRAG
8- PICK UP BACK
9- BACK-TO-BACK
10- FRIENDS METHOD
11- HUMAN CRUNCH

XVI.PUMP DRILL

SCOTT ATTENTION
FROM THE RIGHT NUMBER FROM THE IN 6 NUMBER
ALL NUMBER ONE LEFT HAND UP BI CREW'S NUMBER
FOR 6 MAN PUMP DRILL THREE PACES BEHIND THE PUMP NUMBER ONE CREW FALL IN
CREW ATTENTION FROM THE LEFT NUMBER 6-5-4-3-2-1
CREW CLOSE UP CREW NUMBER
1:6 PUMP DELIVERY SIDE

2:5
3:4
2 AND 3 ONE STEP BACK AND DUBBLE UP FOR DILIVER HOSE WORK
WORKING FROM OPEN WATER DOUBLE SUCTION DOUBLE DELIVERY THREE LENGTH OF HOSE EACH NUMBER ONE CREW GET TO WORK
INVERT TURN FACE TO FACE
SECOND AND THIRD NUMBER ONE STEP BACK AND DOUBLE UP SECOND HOSE
FIRST NO 1 AND 6 FIRST SUCTION HOSE WORK 5 AND 4 SECOND SUCTION HOSE WORK
FIRST DELIVERY LAYING PUMP SIDE3-----MIDDLE HOSE2 1WITH BRANCH
SECOND DELIVERY LAYING4PUMP SIDE-----MIDDLE HOSE34 BRANCH SIDE-
NO 3 IS BRANCHMAN
NUMBER 6 INLET SUCTION HOSE ATTACHED
NUMBER 4 STAINER AND ROPE BRING
NUMBER 4 ATTACH STRAINER AND MAKE CLOW HITCH TO STRAINER
NO5 TIE HALF HITCH TO SUCTION MIDDLE JOINT AND THEN NUMBER 5 GIVE ROUND TURN TO HALF HITCH TO HARD OBJECTS
NUMBER 1 IS BRANCH MAN
NUMBER 2 IS MESSENGER AND HELPER OF NUMBER 1 ONE NUMBER 3 SECOND DELIVERY BRANCHMAN
NUMBER 4 MESSENGER AND HELPER OF NUMBER 3. NO 5 IS HELPER OF NUMBER 6
NUMBER 6 IS PUMP OPERATOR
ON COMMAND KNOK UP AND MAKE UP
NO 1 AN 3 DISSCONEECT THE BRANCH MIDDLE BOTH DILLEVER JOINT
DISSCONNECT BY NO2 AND NO 4
PUMP SIDE DILIVER DISSCONNECT BY NO 5
PUMP MAKE UP BY NO 6
NO 4 AND NO 5 LIFT UP 2ND SUCTION HOSE
NO 5 OPEN MIDDLE JOINT OF SUCTION HOSE

NO 4 WIND UP ROPE AND OPEN STANER
NO 6 DISSCONNECT SUCTION HOSE FORM PUMP
HOSE ROLLED: - SECOND DELIVER FIREST HOSE ROLLED BY NO 4 WITH BRANCH
SECOND DELIVER SECOND HOSE ROLLED BY NO 5
SECOND DELIVER THIRD PUMP SIDE HOSE ROLLED BY NO 6
FIRST DELIVER FIRST HOSE ROLLED BY NO 1WITH BRANCH FIRST DELIVER SECOND HOSE ROLLED BY NO 2
FIRST DELIVER THIRD PUMP SIDE HOSE ROLLED BY NO 3
KEPT HOSE AND EQUIPMENT ON AT PREVIOUS POSITION AND THEN CREW THREE PACES BEHIND THE PUMP POSITION
CREW LEADER ORDER ATTENTION
SIX MAN PUMP DRILL COMPLETED ALL EQUIPMENTS CORRECT SIR NUMBER ONE TAKE POST
THEN DOUBLE MARCH AND JOIN LEFT SIDE LINE

XVII.SAFETY WORK PERMIT

- WHAT IS SWP?

A safety work permit (SWP) is a document which sets out,

- The work to be done,
- Precautions to be taken for all foreseeable hazards involved &
- Records the state of equipment when handed over while it does not itself make the job safe.

- WHY IS SWP NEEDED?
- Jobs done in work sites could be dangerous and require a systematic procedure to be followed while equipment or pipelines are being handed over for jobs
- SWP is a formal checklist or all conditions to be fulfilled before hand over with a list of competent and responsible persons approving the job before its commencement and while its execution.
- It is a legal requirement as per MAHARASHTRA FACTORY RULES 1963, CEA REGULATIONS 2010 AND FACTORIES ACT 1948

- WHEN IS SWP NEEDED?
- SWP is required when job involved has one or more of the following conditions:

- Hot work (chipping, grinding, welding , cutting, working with open flames)

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- Working on pipeline/ equipment handling hazardous chemicals
- Excavation
- Areas with oxygen deficient atmosphere
- Areas where ambient air is contaminated by hazardous chemicals
- Working at height
- Working on electrical equipment/ distribution network
- Areas with restricted access/ exit
- Working in extreme conditions of temperature or pressure
- WHO IS SWP ISSUED TO
- Maintenance engineers/ officer of plant who is primarily supervising the job
- Mechanical
- Electrical
- Instrument
- In case of departments, it is issued to the personnel who is in charge of the job
- WHO ISSUES SWP?
- Shift in charge of the plant
- HOD in case of departments
- WHICH PERMIT IS TO BE GIVEN?
- Depending on the nature of work, the permit system is divided into 4 types. The details are tabulated as follows:

SR.NO	PERMIT TYPE	JOBS INVOLVED	PERSONNEL INVOLVED
01	CLASS I	HIGH RISK JOBS • HOT WORK • HEIGHT WORK (> 3M) • EXCAVATION (> 1.5M) • HANDLING OF HAZARDOUS CHEMICALS	INITIATED BY LINE IN CHARGE ISSUED BY SHIFT IN CHARGE APPROVED BY: AREA MANAGER & SAFETY OFFICER ISSUED TO: PERMITTEE (MAINTENANCE SUPERVISOR)
02	CLASS II	LOW RISK JOBS • GENERAL MAINTENANCE WORK • NON HOT JOBS • ALL JOBS OUT OF PURVIEW OF CLASS I	INITIATED BY LINE IN CHARGE APPROVED AND ISSUED BY SHIFT IN CHARGE ISSUED TO: PERMITTEE (MAINTENANCE SUPERVISOR)
03	CONFINED SPACE ENTRY	ENTRY INTO PROCESS VESSELS, EXCAVATED PITS, OXYGEN DEFICIENT ATMOSPHERE, CHEMICAL CONTAMINATED AREAS	INITIATED BY LINE IN CHARGE ISSUED BY SHIFT IN CHARGE AIR QUALITY REPORT BY LAB APPROVED BY: AREA MANAGER &

			SAFETY OFFICER ISSUED TO: PERMITTEE (MAINTENANCE SUPERVISOR)
04	PTW ON EDS	LINE ON ELECTRICAL EQUIPMENT > 440 V, ELECTRICAL DISTRIBUTION NETWORK	APPROVED AND ISSUED BY: ELECTRICAL HOD ISSUED TO: ELECTRICAL ENGINEER

- HOW IS SWP ISSUED/ RETURNED?

- Job initiated and communicated to maintenance dept
- Permit request raised by maintenance dept.
- Depending on nature of job, job site is prepared
- Job site inspected by approving authorities/submitted
- For renewal/no
- Lacuna communicated for rectification./no
- Are all needs met?/yes
- Permit is issued/ renewed
- Is job over same day/yes
- Permit is returned and job is closed after site inspection

Importance of SWP System

- Systematic approach to work
- Written communication and Checklist for Job inspection
- Third Party view regarding Safety of the job
- Compliance to Legal Requirement
- Accountability and Traceability
- Enhancement of Safety Culture

XVIII.FIRE PREVENTION AND PROTECTION

Introduction:

"It is easy to prevent a fire, difficult to fight one". A fire safety programme, therefore, should aim at preventing a fire before it starts. However, measures should be available to control fire at initial stage itself. Suitable fire detection methods, availability of fire-fighting equipment and training are the requirements for the above. Once a fire gets out of hand it is difficult to fight and extinguish it.

Fire Prevention:

i. The use of combustible building materials like wood etc., is almost avoided in the main plant as well as in other buildings where hazardous chemicals are handled.

ii. Smoking is strictly prohibited in places where highly inflammable liquids and explosive gases are processed.

iii. No smoking signs are also displayed at strategic points.

iv. Open flames and other sparks are prohibited in such areas.

v. Even vehicles with IC engines are permitted to enter this area only after careful checks and fitted with spark arresters.

vi. No accumulation of combustible materials like cotton waste, rags, etc. are allowed in these areas.

vii. Cutting, welding and grinding works are allowed only under Class-I S.W.P.

viii. All the electrical fittings and devices in the hazardous areas including the lighting circuit are made as per area classification and hazards involved.

ix. Local control panels and cable boxes of motors are pressurized with air to prevent explosive mixtures sweeping through them.

x. All metal parts of machineries/ equipment which may produce static electricity are bonded and grounded properly.

xi. Cables from substation to battery limit valves Em V103 and EmV 104 are laid underground and at raiser taken through sealed GI pipe for prevention of damage due to exigency of fire.

xii. The cover flanges of purifiers, towers and converter are provided with nitrogen blanketing and purging to dilute any flammable gas leaking from the same.

xiii. In order to avoid fire / explosion in the stack and effluent header the following preventive measures are adopted.

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a. Water seal is provided in the effluent header by constructing a weir in the inspection pit of main plant to avoid oxygen entry into the stacks. Similarly, all the bleeders on the vent lines connected to stack are also provided with water.

b. Continuous nitrogen and steam purging is provided to the effluent headers and stacks to avoid formation of explosive mixture.

c. Continuous nitrogen purging and water circulation is provided to effluent header

xiv. While sampling ammonia / amide solution at higher elevation in the plant, sand trays provided to avoid fire & injury hazard at lower elevations in the plant.

xv. All the leaky lubricating oils from different machineries are collected and disposed.

xvi. Non-sparking tools are used in hazardous areas.

xvii. Leakage monitoring of plant is carried out at regular interval to identify the leaky points and to start immediate remedial measures.

Fire Protection:

The various fire protection arrangements existing in HWP (Thal) can be grouped under the following heads:

1. First aid firefighting appliances.
2. Fire hydrant system.
3. Fire water monitors.
4. Automatic fire detection and extinction.
5. Fire service station.
6. Mutual aid scheme.

First-aid Fire Fighting Equipment:

Generally fire starts in a small scale. Taking into consideration the different types of fire hazards, the following types of first aid firefighting appliances, mostly chemical fire extinguishers are installed at vulnerable places in the main plant and other sections in HWP (Thal) to deal with fires in initial stages.

List of Portable Fire Extinguishers:

Sr No.	Portable Fire Extinguisher	Quantity available
i	Foam type fire extinguishers (9 liter.)	10 Nos.
ii	Foam units (100 Liters.)	04 Nos.
iii	CO_2 fire extinguishers (6.8 Kg)	50 Nos.
iv	DCP type fire extinguisher (10 kg)	150 Nos.
v	DCP units	50 kg.

Classification of fires and suitability of portable fire extinguishers:-

Classification & Marking	Materials	Suitable Portable Appliances
	Fire involving ordinary combustible materials (such as wood, cloth, rubber, plastic etc.) where cooling effect of water is essential	Soda Acid fire Extinguisher
	Fire involving flammable liquids (such as wood, cloth, rubber, plastic etc.) where blanketing effect is essential or interrupting the combustion chain reaction	Fire Extinguishers discharging foam, DCP or CO_2
	Fire involving gaseous substances under pressure where it is necessary to dilute the burning gas at fast rate with an inert gas or powder, Fire involving electrical equipment where nonconductive extinguishing agent is required.	Fire Extinguishers discharging DCP or CO_2
	Fire involving ordinary combustible metals (such as Potassium, titanium, zirconium, & manganese etc.) requiringthe heat absorbing extinguishing media not reactive with burning metal.	Fire Extinguishers discharging Sand or special DCP.

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Note:-

- Never use water in case of electrical fire.
- Never use water in case of potassium fire.
- In case of fire due to potassium amide, continuous flow of large amount of water can be used with adequate care of the spurt in, due to the reaction.

Fire water storage arrangement:

The water supply is from MIDC through 1350 mm diameter mains. Inflow from MIDC is 7 million gallons per day (1325 m^3/hr) however provision is made for inflow of 20 million gallons per day. The reservoir details are as:

Compartment	Compartment size	Net Capacity
I	61 x 61 x 5.2	19,000 m^3
II	11.5 x 61 x 5	3,600 m^3
III	11.5 x 61 x 5	3,600 m^3
	Total capacity of reservoir	26,200 m^3

Each of the compartment is fed by MIDC line ø and also interconnected by 12 " pipeline on east of the above reservoir. Water from each of the compartments is fed by 700 mm dia common suction header of fire water pumps. A sluice valve is provided in the suction header isolating each compartment.

Fire water pumps:

Sn	Types of Pump	No Pump	Pump Capacity	Total Pumping Capacity
1	Electrical Pumps They are automatic CPK-GB-200-500 type KSB make fire pumps. These are driven by / coupled with direct-on-line starting type 170 KW at 1450 rpm, 415 V, 4 pole NGES make TEFC electric motors.	4	410 M^3 /Hr. at 88 meter head	1610M^3/Hr
2	Diesel Pumps They are automatic CPK-GB-200-500 type KSB make fire pumps coupled to Kirloskar Cummins make diesel engine.	2	410 M^3/Hr. at 88 meter head	0820 M^3/Hr
3	Diesel Pumps	2	615 M^3/Hr. at 88 meter head	1230 M^3/Hr
4	Jockey Pump Make Beacon coupled to 75 KW, Siemens motor	1	150 M^3/Hr. at 88 meter head	0150 M^3/Hr
	Total Pumps	9	Total Pumping Capacity	3810 M^3/Hr

– Air compressor driven by 10 KW, 415 V, 4 pole motor maintaining 8 Kg/cm pressure in hydro pneumatic tank.

– Hydro pneumatic tank to keep the hydrant system pressurized.

– Pressure switches PS1 through PS10 are utilized to sense hydrant system conditions at various stages of operation.

– Level switches WLH1 and WLH2 for controlling water level in hydro pneumatic tank.

– Control panel for auto-control of annunciation.

– The suction and delivery header is of 700 ø and 600 ø respectively.

Operation and starting sequence of FWP:

– The entire fire hydrant system is kept pressurized at 8.8 Kg/cm^2 by 150 m^3 /hr. jockey pump running continuously.

– The hydro-pneumatic tank will have filled up to approximately 2/3 level and balance 1/3 volume will be occupied by compressed air. Slight water leak in hydrant system is unavoidable due to misuse of water, leakage at non-return valves of main pumps, glands of sluice valves etc. This will result in drop in level of water in hydro pneumatic tank. On reaching low level, level switch WLH2 will operate and start the jockey pump, making the level normal.

– Due to leakage of water, pressure in tank will also fall down, pressure switch PS7 contact will change over and air compressor will start raising the pressure to its normal value. This operation continues all the time. Frequency of operation of these motors will depend on the leakage and / or misuse of hydrant water in system.

– Air compressor is inter-locked with jockey pump motor, so that only one works at a time. Also, if water level is low in the hydro pneumatic tank, compressor will not work. In the event of fire, opening of hydrant valve and/or monitors will result in dropping the hydrant pressure suddenly. Jockey pump will try to feed water, but will not have capacity to feed hose/monitor requirements. This will result in dropping the hydrant pressure and at the junction the pressure switches PS1 to PS5 will pick-up.

– These pressure switches will give closing signal to circuit breakers. Starting the electric pumps through respective timers. To avoid heavy in rush starting current, these motors are started one after another. In case, starting of pumps No.1 resumes normal pressure maintaining desired flow and pressure at hydrant valves. Pressure switches and corresponding timers get automatically reset, preventing un-necessary starting of the other pumps. Stopping of main hydrant pumps is manual only.

Electrical supply for FWP:

A) Electric supply from the MSEB:

Electric supply from the MSEB is received at 100 KV by two independent lines. This supply is fed to RCF 100 KV bus with an arrangement to parallel two lines. 100 KV supply is stepped down to 11 KV supply by means of 2 nos. of 1500/2500 KVA `ONAF' type Hackbridge Easun make outdoor transformers located in the 100 KV supply is protected by OCBs. Baffle wall is constructed between these two 100 KV transformers. 11 KV power cable from transformers is running underground upto the east of the urea plant-21, whereas 11 KV cable from the urea plant upto 11KV switch-gear room situated in the steam generation plant is running on cable rack trans. Total length of 11KV cable is around 800 M. KV switch-gear situated in the S.G. Plant is off Fuji make (Japan).

B) In-house generation:

Two generator of 15 MW each are driven by two back pressure type steam turbines. Output of these generators is coupled to 100/11 KV supply from the MSEB. 11 KV bus bar arrangement is made in such a way that any of the following combinations are possible.

C) Power to the Utility Sub-station:

11 KV supply from the 11Kv switch gear room situated in the S.G. Plant is taken to the utility sub-station situated near the fire pump room by two underground cables. 11 KV supply is stepped down to 433 V by means of two Nos. of 2.5 MVA `OBNAN' type Heckbridge Easun make indoor transformer located in the separate cubicles. 433 V supply is feed the Easun make power control center.

Fire pump circuit breaker forms a part of this power control center. Cable from the air circuit breaker in this power controls centers to the fire pump motors is running along with the cable trays. Bus-coupler in the above PCC adds to the flexibility by power supply. Each of the two transformers are rated for 100% capacity of the load connected to entire PCC supply to the jockey pump and air compressor required for the hydro pneumatic plant is tapped from L & T make MCC, again having two bus section with bus coupler arrangement fed from two bus sections of the PCC.

D) Reliability:

This power supply system is Duplicate Fed System and takes full care of any one of the two links in the system giving high reliability of supply. In house generation in the plant further assures availability of supply and probability of non-availability of electric power can be concluded to be remote.

E) Protection:

Jockey pump and air compressor are protected by thermal overload relay. Main hydrants pumps are protected by CTMM type "English Electric" make relays which cover overload, earth fault, single phasing and short circuit. ACBs for main motor do not have under-voltage trip.

11 KV / 433 V sub-station transformers are protected for over current, short circuit, gas collection, high temperature and low oil level.

100 / 11 KV transformers are additionally protected with differential and reverse power protection. Diesel engines are protected against high speed, high water temperature and low lube oil pressure. For starting diesel engine, two sets of batteries are maintained and three attempts are made at an interval of 5 seconds to start. In case engine do not start, "failure to start" alarm appears and the set is locked for further starts. Subsequently engine can be started on manual battery.

Fire Hydrant system:

The plant is protected by a fire hydrant system consisting of 40 nos. of single head hydrants. The whole plant area is divided into hazardous and nonhazardous areas as per IS: 5572 and accordingly fire hydrant layout is made.

While designing the fire hydrant system following stipulations were made:

i. Ring main is laid for good distribution of water and higher reliabilities. The mains consists of 300, 250, 200, 150 and 100 mm

ii. A maximum distance of 30 m. is kept between two hydrants in all the plant areas.

iii. Hydrant locations are easily accessible.

iv. Fire pumps and piping are designed in such a way that sufficient pressure shall be available at remotest points.

v. The underground mains are coated and warped to avoid soil erosion.

The complete fire hydrant system is approved by Tariff Advisory committee.

Fixed water monitors:

Six number water monitors are installed at certain selected points around operating units. These monitors can be put into operation quickly by one person. Once the monitor is properly set, it can be locked in that position and can be laid unmanned. The monitor can continue to deliver the extinguishing media even if it is exposed to heat, gas and smoke punishment. The main purpose of installing monitors to check the spread of fire / gas leaks.

Wet risers:

For protection of main plant, compressor house, etc. tall structures and more number of working platforms, wet risers with landing valves at each landing of staircase are provided. For instant use of the same, hose boxes with hoses and branch are also installed by the side of landing valves. Wet risers ensure sufficient quantity of water at requisite pressure for firefighting at heights.

Automatic fire detection and extinction:

10 nos. automatic DCP extinguishers are installed to protect the electrical transformers. In the event of fire, it works automatically and extinguishes the fires. This extinguisher mainly consists of gas welded MS body & DCP is charged with nitrogen at a pressure of 10 kg/cm2. Nozzle is provided along with sprinkler head having temperature range 50 to 60 ° C and it gives more than 90 % discharge.

Performance data:

Size	Area of protection	Hanging height above risk	Operation time
10 kg	7 to 8 m^2	1 meter	15 - 20sec

Fire Service station:

The service of a full-fledged fire service station equipped with three fire tenders and manned in round the clock shift, is available for giving fire protection to plant and its premises. The fire service station takes care of the proper upkeep of all firefighting appliances and equipment. Fire Fighting facilities available at RCF Thal:

Sn	Type of Fire Engine	Facility	Capacity
1	Crash Tender TATA LPT 1516 MODEL	DCP Tank	1000 Kg. TEC
		Foam Tank	1000 liter, 3% AFFF
		Water Tank	3000 liter.
		Centrifugal Pump capacity	3200lpm
2	Water tender TATA LPT 1516 MODEL	Water Tank	6000 liter.
		Centrifugal Pump capacity	3200 lpm

		Long range water Monitor	30 m
3	Foam Tender TATA LPT 2516TC MODEL	Foam Tank	3000 liter.
		Water Tank	5000 liter.
		Centrifugal Pump	3200 lpm
		Rosenberg High pressure Pump	40kg/10Kg
		Water Jet	35 m
4	Fire jeep	With siren & towing arrangements	
5	Firefighting equipment	All types of jet, spray nozzles, branches, rescue lines, BA sets, water gel, asbestos blankets, hoses & portable monitors.	

XIX.MUTUAL AID SCHEME

District of Raigad is known for concentration of Chemical industries. In this district, Chemicals, Petrochemicals, Fertilizers and other industries are engaged in production of hazardous chemicals. More than 100 types of hazardous chemicals are used in the district. Bulk of these chemicals are transported by tankers on the roads. The mode of transportation of these chemicals by pipelines is also used in the district.

It is therefore, possible that while engaged in the business of hazardous chemicals, chemical emergencies out of these cannot be ruled out. Chemical emergencies may be due to fire, fire / explosion or release of toxic and corrosive chemicals. These events may occur in industrial units or even on the road while transporting these chemicals. Industries at unit level are expected to tackle accidents involving hazardous chemicals. Sometimes it may be beyond the resources of a single unit to tackle a chemical emergency. Sharing of the resources / information between the units can overcome these limitations through MUTUAL AID SCHEME.

Aim & Objectives of the scheme:

Aims and objectives of the scheme are as follows:

i. The units should offer help to other unit on request or call, in the event of fire, explosion or release of toxic gases in that unit. The response shall be without lapse of time and should aim at :

- Save life and property;
- Minimize the damage.

ii. Mutual help may be from areas like :

- Firefighting equipment;
- Trained / Technical expertise;
- Transport and communication;
- Personnel protection / Special Equipment;
- Medical and Health;

iii. Interacting with local agencies like Police, Fire Brigade, Local Council

iv. Co-operate with District Authorities in implementation of Off-site Disaster Management Plan.

v. The Scheme envisages efforts in the direction of imparting safety knowledge and awareness to general public and persons likely to be involved in such activities.

Groups:

To minimize the response time the Units are grouped in sub-schemes. A distance of 20 / 45 kms radius are considered.

Group I Panvel, Taloja and Uran.
Group II Rasayani, Patalganga and Khopoli. Group III Nagothane and Thal.
Group IV Roha.
Group V Mahad.

Exchange of information:

To understand the gravity of Chemical Emergency, the Units concerned should inform each other in writing all the following details so that they are familiar with each other.

- Location and Accessibility,
- Preliminary Hazard Information,
- Likely onsite / off-site Emergencies,
- Emergency Procedures at Site,
- Method of Communication, Procedures for requesting help, Cost and Compensation aspect.

Meetings:

Members shall meet at least once a month to exchange information with each other. Meetings may

be held in the premises of individual members by rotation. Secretary ship of meetings should be by rotation till such time permanent office / secretariat is established. Minutes of each meetings shall be recorded and circulated amongst members. Group Co-coordinator may be nominated to interact with Dist. convener.

Statutory bodies:

For efficient and successful operation of the scheme, statutory agencies listed below may be actively involved for guidance and help, whenever required.

- Local Fire Brigade
- Police Authorities
- District Health Authorities
- Insurance / TAC Authorities
- Directorate of Industrial Safety and Health
- Atomic Energy Regulatory Board
- Collect orate / Revenue Officials

XX.PERSONAL PROTECTIVE EQUIPMENTS

Adequate quantity of Personal Protective Equipment are available with the Safety and Fire department and are also kept at various locations in the plant.

Responsibility:
Plant Manager / Engineers and Sectional Heads should ensure that, the required PPE are maintained in good working condition, stored in proper place and available as and when required. Also they should ensure that their supervisors and workers are thoroughly trained in the use of various PPE. When PPE are issued to workers, it is the responsibility of the supervisors who issued the equipment to ensure that the equipment are of right type and in good condition.

Types of Personal Protective Equipment:
There are two types of PPE which are used in our factory.

a. Respiratory protective equipment:

These types of PPE provide protection to the breathing system of the wearer against toxic and poisonous substances while working in a contaminated or oxygen deficient environment.

b. Non-respiratory protective equipment :

These types of PPE are available to protect the body from head to toe against physical injuries.

Respiratory Protective Equipment:
The following protective equipment is available in our plant for respiratory protection against harmful and toxic environments.

Gas masks (Canister type):

i. The canister contains certain chemicals that they, absorb or neutralize the contaminants and allow only fresh air to pass through to the face piece.

ii. The canister type gas masks are for emergency protection in a contaminated environment. They do not provide protection in oxygen deficient atmospheres. Their effectiveness is limited to use in the atmosphere containing at least 18% by volume of oxygen and not more than 2% by volume of the gas for which it is designed except for ammonia for which the limit is 3%.

iii. The period of protection depends upon the following

- Type and size of canister.
- concentration of the gas or vapor
- activity, health and breathing efforts of the users
- Duration of use at each time.

iv. The following types of canisters for protection against various harmful and toxic gases are available in our plants for use.

SN	Type	Protection against
1	Ammonia	5% by volume of ammonia
2	Chlorine	2% by volume of chlorine
3	Universal	2% by volume of Ammonia, chlorine, Co etc.

Dust Respirator:

i. The dust respirator is a simple device for protecting the respiratory tract and lungs from dust of materials such as catalyst dust, urea dust etc. it consists of a mouth piece, filter, exhalation valve and head band.

ii. While breathing, the dust particles in the atmosphere are filtered and collected on the filter and only free air is allowed to be inhaled. The exhaled air goes out through the exhalation valve.

Compressed air hose mask (Airline hose mask)
It consists of full vision face mask with a corrugated tube and belt with an air flow control valve. A high pressure tube is connected to the instruments air supply by means of male / female coupling. Male coupling is provided with high pressure tube and

female coupling is fixed on instrument air header provided at various places in the plant. Commercial cylinder may also be used for supply of the air.

Use of air line with hose mask:

Choose the right length of high pressure tube required for the given situation (either 100 feet or 50 feet).

For checking air tightness close the air intake by closing cylinder valve. Breathe deeply until the face piece remains collapsed on face. If correctly adjusted the face piece remains collapsed until the air intake is opened. Open the valve before entering in the contaminated area.

Self-Contained Compressed Air Breathing Apparatus:

1. The apparatus consists of a high pressure air cylinder, cylinder valve, demand regulator and a face piece with breathing tube and exhalation valve. The cylinder is mounted on back plate having harness for shoulder, chest and waist.
2. This apparatus can be used in an atmosphere that is immediately hazardous to life, and affords complete respiratory protection in any toxic, harmful or oxygen deficient atmosphere.
3. It allows complete freedom of movement with limiting factor of time which is 30 minutes in respect of the apparatus available in our factory.
4. The air is drawn from the cylinder through a high pressure hose to the demand regulator and passed over to face piece through corrugated breathing tune for inhalation. The exhaled air goes out through exhalation valve provided in the face piece.
5. The air cylinder, when fully charged has a pressure of approximately 200 bar and will last for 30 minutes. When the cylinder pressure, during the use of the apparatus, drops to about 60 bar, the warning device in the apparatus given an alarm which continues till the cylinder becomes empty.
6. Using the use of apparatus when the alarm is sounded, the user must come out to fresh air and change the cylinder with a full one.

Use of Breathing Apparatus:

1. Take out the apparatus from the case by holding the shoulder straps, swing cylinder on the back and insert both hands under the shoulder belt. Adjust the shoulder straps by pulling downwards back side with both hands. Open the main valve and ensure no leakage and cylinder pressure.
2. Put on the face piece and adjust the head harness until the face piece fits closely & comfortably.
3. Close the air intake. Breathe deeply until the face piece collapses on face. If correctly adjusted, the face piece will remain collapsed until the air intake is opened.

Non-respiratory Protective Equipment:

Non-respiratory protective equipment are meant for the protection of various parts of the body, such as head, face, eye, ears, hands, legs and other parts.

1. Head protection:

Different types of Safety helmet like metallic, plastic, fiber glass etc. are available. They protect head against falling objects, bumping against low pipe lines and structures, chemical splashes and electrical shock. Metal helmets are of no use where electric shock is a primary hazard.

2. Eye protection:

Different types of goggles and shields are available for the protection of eyes against flying particles, chemical splashes, different filters / lenses for goggles & welding shields are available to use against, harmful rays.

3. Ear protection:

Ear plugs and ear muffs are available for protection against high intensity sound (noise).

4. Face protection:

Face shields and welder's shields are available for protection against chemical splashes, electric sparks / flash, flying particles and harmful rays.

5. Hoods:

Different types of hoods of PVC, Asbestos, Fiber glass etc. are available. They protect the head including face, eyes and neck.

6. Body Protection:

Different types of aprons and suits such as PVC, rubber, leather, asbestos are available to protect against chemical splash, heat and sparks.

7. Hand protection:

Different types of gloves made of canvas, rubber, PVC, leather are available for protection hands against chemical handling, welding, abrasive material handling & electricity etc.

8. Feet and legs protection:

Leg guards of different materials like asbestos, leather and trousers of PVC, rubber are available for protection of legs from chemical splashes, heat, welding sparks etc. PVC / rubber gumboots and Safety shoes to protect feet and toes are also available.

9. General Safety :

a. Safety belt with life line gives protection against falls from elevation while working at heights

and working in confined spaces like tanks, bunkers etc.

b. Safety showers and eye wash fountain:

17 nos. of safety showers and eye wash fountains are provided at various locations in the plant.

XXI.SELF-CONTAINED BREATHING APPARATUS

Self-Contained Breathing Apparatus generally termed as SCBA is a lifesaving personal protective equipment (PPE) to be used with proper care and precaution in oxygen deficient or toxic gas contaminated atmosphere during an emergency situation, rescue operation or fire fighting operations.

Figure 03 - SCBA SET

Application of SCBA

The SCBA sets shall be used in the following situations for firefighting, rescue operation and maintenance activity.

- Oxygen deficient atmosphere
- Toxic gas contaminated area
- Vessel entry
- Sewers and Pits
- Smoke filled area
- Hydrocarbon enriched atmosphere
- Buildings/enclosures filled with smoke or fumes

Duration of Use

The Maximum duration for which SCBA set can provide safe breathing to a person depends on the type of SCBA set and the pressure in the cylinder. See table-1 for effective duration of SCBA for different pressure.

We have two types of SCBA sets in RCF.

30/45 minutes effective working duration sets for fire fighting, rescue and maintenance operation

10/15 minutes duration Escape sets for escaping safely from the toxic or contaminated atmosphere

The SCBA set shall be used for 30/45 minutes effective working duration with 10 minutes escape time for the wearer to come out of the dangerous atmosphere. Warning whistle shall start blowing at 60 bar. Wearer should come out immediately after hearing warning whistle as air for 10 minutes duration is left in the BA cylinder.

Wearing of BA set

BA set should be worn in a safe area before entering into the contaminated atmosphere. Keep all harness and straps in loose position i.e. full release condition

Put BA set back plate on back with cylinder valve facing downward

Pull the shoulder straps downwards with slight jerk so that BA set will rest comfortably on back of the wearer

Tighten waste belt

Connect demand valve to the facemask. Open cylinder valve fully with right hand and observe gauge pressure

Hang facemask neck strap in the neck. Wear face mask and tighten up by Pulling head straps backward direction. Take a deep breath to actuate demand valve.

Close the air supply by using reset valve in demand regulator and check for any leaks through facemask

Observe gauge pressure frequently, while working with BA set

Inspection and Maintenance

Inspection of BA set shall be carried out on quarterly basis as per the checklist. Check Back plate harness, shoulder straps, waste belt and face mask

Open cylinder valve fully and check for any leaks

Close cylinder valve and observe pressure gauge. Gauge pressure should not fall 10 bar in 1 minute

Release air through Demand valve and warning whistle should sound at 60 bar

Check the cylinder pressure. If pressure is less than 110 bar then replace the cylinder with full filled cylinder.

Check Back plate harness, shoulder straps, waste belt and face mask. If any defects observed then the same should be replaced and damaged or defective unit to be discarded.
Open cylinder valve fully and check for any leaks. If apparent leaks observed then close the cylinder valve and attend the leak. For minor leaks observe pressure gauge. Gauge pressure should not fall 10 bar in 1 minute.
Release air through Demand valve and warning whistle should sound at 60 bar.

Clean the facemask thoroughly with prescribed disinfectant and rinse with clean water. Wipe and dry in shade.
Keep the BA set back to its original position.

BA set cylinder should be hydro tested after every 5 years and test certificates should be kept for records.
If the SCBA set is not used for the period of 6 months then the set shall be discharged and refilled with fresh air.
The Escape set should be checked for pressure gauge .If the gauge needle is on red zone then replace the cylinder with new filled cylinder and sent empty cylinder for refilling.

XXII.CONCLUSION

The main objective of training institutions is to ensure pattern of systematic training for the fire services personnel to ensure that all those who are called upon to handle different type of fire and rescue operations are in a position to handle the task competently with full confidence
Training in fire technology requires a very careful planning and programming of the training requirement including the availability of the right type of men to work as instructor and right type of teaching add and intensive practical work for which the “hot ground operation “is of prime important to new comers so that each trainee can develop the requisite ability and confidence to do the work under the most complicated situation and odd circumstances
the need of hot fire fighting ground for new comer can be provided at fire service station to get live experience of different type of industrial firefighting such as fire in transformer, fire in electrical motor, fire in flanges fire in valves and different reacting or processing areas model of such industrial process can be built in the college and station to give live fire demonstration to trainees. This will help to learn the different skill and practice to deal with such types of fires.

REFERENCES

[1]. RCF DRILL MANUAL
[2]. RCF FIRE MANUAL
[3]. RCF SAFETY MANUAL