

5.5 Management Plan for Handling Emergencies

The major objective of the disaster management plan is to minimize the impact of any disaster and increase the capacity of the administration to have coordinated effort to reduce the impact of any disaster and minimize the human and capital loss. An important element of mitigation is the emergency planning i.e. recognizing that accidents are possible, assessing the consequences of such accidents and deciding on the emergency procedure both onsite and offsite, which are to be implemented in the event of an emergency. Emergency planning is just one aspect of safety and can not be considered in isolation. In particular, it is not a substitute for maintaining good standards within plant operations. Before starting to prepare the plan, plant management should ensure that the necessary standards and safety precautions are in place. Hence, the overall objectives of a Disaster Management Plan would be

- ◆ To localize the emergency and if possible, eliminate it.
- ◆ To minimize the effects of the accident on people and property.

5.5.1 Fire Fighting Measures

In order to ensure effectiveness in management of fire hazard, housing societies, project proponent and other stakeholders could envisage following instructions.

- ◆ Inform fire brigade in the event of major fire.
- ◆ Evacuate area and fight fire from a safe distance or protected location.
- ◆ Approach fire from upwind to avoid toxic decomposition products.
- ◆ Stop leak before attempting to stop the fire. If the leak cannot be stopped, and if there is no risk to the surrounding area, let the fire burn itself out.
- ◆ If the flames are extinguished without stopping the leak, vapors could form explosive mixtures with air and re-ignite.

Water can extinguish the fire if used under favorable conditions and when hose streams are applied by experienced firefighters trained in fighting all types of flammable liquid fires.

- ◆ If possible, isolate materials not yet involved in the fire, move these from fire area if this can be done without risk, and protect personnel.
- ◆ Fire-exposed material should be cooled by application of hose streams and this should begin as soon as possible (within the first several minutes).
- ◆ Water sprinklers can be used to dilute spills to nonflammable mixtures and flush spills away from ignition sources.

Do not enter in the area of fire without wearing specialized protective equipment suitable for the situation. Firefighter's normal protective equipment (Bunker Gear) may not provide adequate protection. Chemical resistant clothing (e.g. chemical splash suit) and positive pressure self-contained breathing apparatus (OSHA/NIOSH approved or equivalent) may be necessary.

The Project proponent should provide the following facilities

- ◆ The treated wastewater recirculation system is going to provide water for fire control. The fire hydrants are going to be installed in whole industrial estate at 100-200 meters intervals. These fire hydrants run by the treated wastewater.
- ◆ Smoke detectors for automatic fire detector alarm as per IS 11360 in each individual industries coming up in this industrial estate.

- ◆ Heat sensitive automatic fire detector alarm as per IS 2175 in each individual industries coming up in this industrial estate.
- ◆ Industries will follow the guideline IS 1646 for electric installation in industrial building.
- ◆ HSIIDC will establish the team of fire safety specialists who can regularly monitor the installed equipments and take care of its maintenance and different areas of assemblies, open area.
- ◆ HSIIDC display the fire rescue plane, evacuation plan in every 500-1000 meters in industrial estate.
- ◆ The responsibility of the fire safety in IE lies with Municipal Corporation of that area.
- ◆ Industries will install all types of fire extinguisher for different classes of fire, details given below :

Table- 5.5 (a): - Types of fire extinguisher for different classes of fire

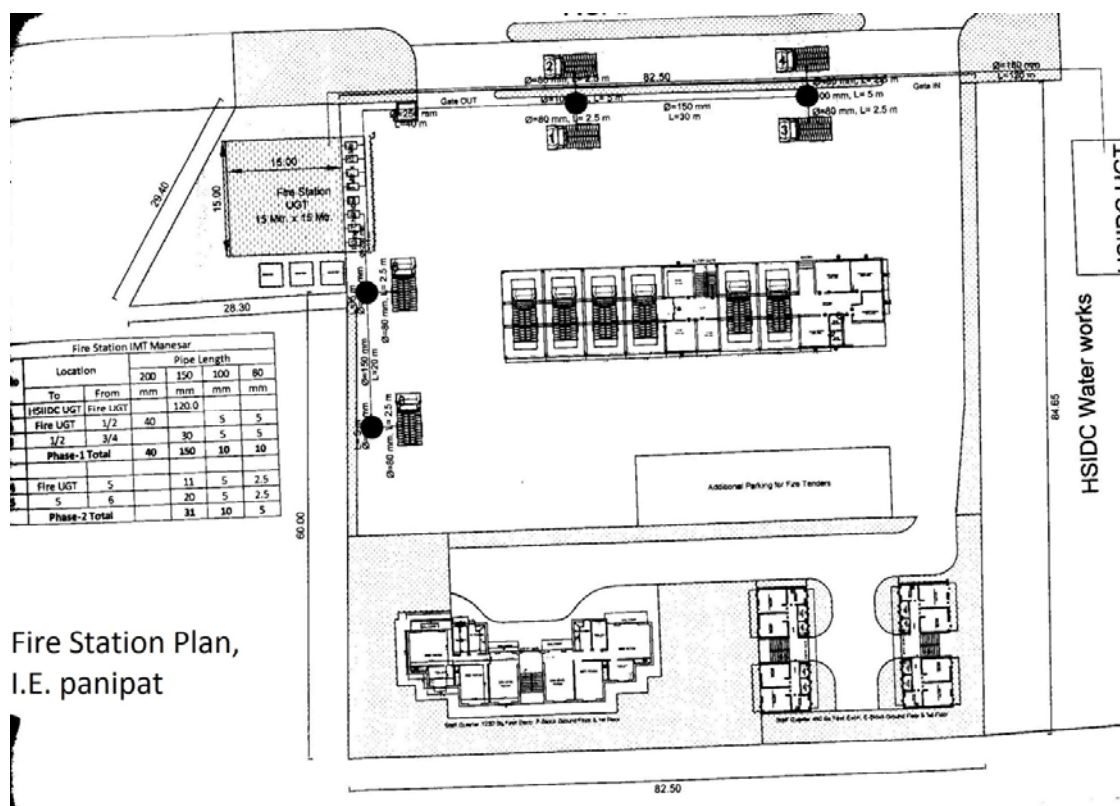
Type of Fires	Suitable Type of Appliance
A- Fire in ordinary combustible (wood, vegetable, fibers, paper and the like)	Chemical extinguishers of Soda-acid gas/expelled water and anti-freeze types, and water buckets
B- Fires in flammable liquids, paints, grease, solvents and the like	Chemical extinguisher of foam, carbon dioxide and dry powder
C- Fires in gaseous substance under pressure	Chemical extinguisher of dry powder and carbon dioxide types
D- Fires in reactive chemical, active metals etc	Special type of dry powder extinguishers and sand buckets
E- Fires in Electric Equipments	Chemical Extinguisher of Carbon dioxide and dry chemical powder sand buckets.

- ◆ HSIIDC will request to Municipal Corporation will inspects fire extinguisher regularly.
- ◆ The Municipal Corporation will regularly remove all the waste accumulation, Separate metal containers for oil rags, paint rags, paint scrapings, waste flammable liquids, and wood warnings and off cuts provided for preventing the fire spread.
- ◆ HSIIDC and coming industries will follow National Building Code Part 4 for fire and life safety.
- ◆ HSIIDC and allotted industries will follow IS:12349 for safety signs and it will be indicated in every party of industrial estate and help in fire fighting.
- ◆ Every industry will have first aid facilities.
- ◆ There is no any industry who deals with explosive chemical and materials.
- ◆ Fire safety drill is going to be done on regular interval by Municipal Corporation in the IE.

Following details of Fire fighting station will be provided to the industry by the HSIIDC

LOCATION OF FIRE STATION

- Land for Fire Station is reserved at Industrial Area, panipat.



Fire Station Plan,
I.E. panipat

- Proposal - 7870 Sq. m. (1.96 Acres). Land is available in Industrial Area, panipat.

Main Features of Fire Station

Apparatus Bay Area

- Fire Tenders, Rescue Units and other fire response vehicles are parked in Fire Station Apparatus bay.
- Space to be provided for cleaning & servicing of vehicles with basic maintenance checks in Apparatus bay support area.

Administrative & Training Area

- Administrative & Training Zone for every day running of department.

Eco Friendly Civic Amity Area

- Construction of Fire Station should be incorporate Eco Friendly features,
- Sufficient storage of Municipal Water or water from tube well for filling, cleaning fire Tenders,
- The effluent waste water to be given primary treatment before disposal in Municipal Sewer.
- Recharge wells to be provided in open area.

Residential Area

- Residential Section for officers & staff

SUITABILITY OF SITE

- The Breadth and Width of site shown above is suitable for smooth maneuvering of Fire Tenders.
- All the 6 garage have been proposed in one row.
- Filling Stations can also be accommodated easily.
- Staff Quarters of 1220 & 440 Sq. ft. can also be accommodated in the rear area easily.

RECOMMENDATION

- This Site is suitable in all Respects.
- Consent of Fire Department may be obtained before accepting the proposal.

Land use in Fire Station Area

- It is essential to conduct Needs assessment to determine the requirement for work spaces and fire department operations.

Apparatus Area

- a) 6 No. Garage are located in in Pocket A (Ground Floor)
- b) Watch room & Mechanical room are located in Pocket B (G)
- c) Hose Tower & Stairs are located in Pocket C (Ground Floor+3)

Office & Training Area

- d) Office & Training Area is planned in Pocket D (Ground Floor).
- e) Dormitory are provided in Pocket D (First Floor)

Residential Area

- f) 8 No.staff Quarters are proposed for Middle level management staff.
In Pocket E (Ground Floor +First Floor).
- g) 4 no. Residences are proposed for senior level officers. In Pocket F (Ground Floor +First Floor)

SALIENT FEATURES ADOPTED IN DESIGN OF FIRE STATION

1. Fire station floors must be planned for Rough use, Constant Occupation.
2. 2. At present Hydraulic Plate form for 48 tonne load & lifting capacity 90 m is in use.
3. The estimated capacity of Hydraulic plate form is likely to increase to 75 T with 104 m lifting capacity.
4. Concrete pavement 30 cm thick is recommended in floor design.
5. Clear height of Garage is kept 5 m as per requirement of Fire department.
6. Hydraulically operated doors are proposed to be provided in front & back of Garages.
7. Two way type filling station has been proposed on front boundary to facilitate double filling one inside of station& other outside on service Road.
8. Pumps have been designed to fill one truck of 10000 litre capacity in 10 minutes.
9. Hose Tower has been proposed for drying Hose pipes.
10. Boundary wall in front of Garage is not proposed for efficient movement of Fire vehicles.
11. Space design has been done to achieve free flow from one area to another without disruption.

Design of Pumping Machinery

- Pumping Arrangement has been divided in two groups
- Each group will fill 3 no Fire Vehicles.

- One no. stand by pump has been provided in each group

Design of Pumping Arrangements

Capacity of Each Fire Truck	16000 L
No. of Tanks	12 Nos
Total Capacity	120000 L
Time taken to fill one tank	15 Minutes
Required Capacity of Pump	20 Litre/Second
Capacity of Pump Provided	20 Litre/Second
Head of Pump Provided	20 M
BHP of Pump Required	9 BHP
BHP of Pump Provided	10 BHP

Provide 6 No. pumps 20 lps with 20 M Head, 10 HP Motor for filling 6 No Fire Tenders

Provide 2No. pumps 20 ips with 20 M Head, 10 HP Motor as stand bye arrangement

Power Backup for running 2 No Pumps(Required) 37 kVA

Power Backup for running 2 No Pumps(Provided) 50 kVA

- Provide 6 No. pumps 20 lps with 20 M Head, 10 HP Motor for filling 6 No. Fire Tenders
- Provide 2 No. pumps 20 lps with 20 M Head, 10 HP Motor as stand bye arrangement.
- Provide Power Backup for running 2 No Pumps,50 Kva Capacity, 2 Nos

Abstract of Cost

Sr. no.	Description of work	Total Amount
1	Apparatus Area + Administrative & Training Area	25247563
2	External Electrification	678576
3	Head Works & Works for filling the fire trucks	8723543
4	Residential Area	12813997
	Sub Total	47463679
	Add 3% Contingency charges	1423910
	Add 2% planning & designing charges	949274
	Add 1% quality assurance & quality control charges	474637
	Total Project Cost	50311500
	Say	5.03 Cr.

Fire Stations in Haryana

Road Distance between Fire Stations

Fire Station	Distance from one Fire Stations to another	Distance of IE
Fire Force Headquarters		
District Fire Station		
Total Number of Fire Stations		

Position of Fire Appliance in a Industry (this chart has to be displayed at a prominent place near the entrance to unit)

Fire Station	WT	HWT	CRT	EMT	MFT/MSB	BDV	IFT	FOAM/T	HYD/PF	RES/T	MPU	MC	AMB	Total

Note:

WT= Water Tender, HWT= Heavy Water Tender, CRT= Crash Tender, EMT= Emergency Tender, MFT= Multipurpose Fire tender, BDV= Break Down Van, HPL= Hydraulic Platform, RV= Rescue Van, MUP= Motor Pump Unit, AMB = Ambulance, FOAM/T= Foam Tender, MC= Motor Cycle

Telephone Number of Fire Stations in Panipat district

Sr. no	Location of Fire Station	Contact No.	Name of the nodal Officer and Contact No.	No. of Other Staff (Fireman leading Fireman)	Contract Fire Staff	Type of Vehicle	Total No. of Vehicle	Contact person name & No.
1.	Head Office Hali Park, Panipat	0180-2650458, 101	Shri Satyawar-II Fireman,	Sh. Krishan lal. LFM Sh. Satnarayan, FM Sh. Satyawar-II FM	Fireman-27 Nos Drivers-12 Nos	Water Bouzer-3 Nos Capacity 12000 Ltr. Water Tender-3	07	Sh S.S Narwal, Fire Station

			9416096618	Sh. Rajbir, FM Sh. Somdutt, FM Sh. Balbir , FM Sh. Ajit Singh, FM Sh. RandhirSingh,FM Sh. Sunil Kumar, FM Sh. Vinod Kuamr,FM Sh. Jitender, FM Sh. Azad Singh, FM Sh. Ramdhari, FM Sh. Gordhan, FM Sh. Sandeep, FM Sh. Nafe Singh, D/o Sh. SureshKumar,D/o Sh. Krishan , D/o Sh. Soran Singh, D/o Sh. Shiv Charan, D/o Sh Dharamvir, D/o		Capacity 5000 Ltr. Small water Tender-2 Capacity 2000 Ltr. Rescue tender-1		Officer, Panipat 9416564224
2.	Sub-Fire Station Sec-25 HUDA, Panipat	0180-2660101, 2670458						Sh.Charanjeet Singh,SFO, Panipat 9416413053
3.	NFL, Panipat	2652876						
4	Panipat Thermal	2586750						

Important Telephone Numbers As per table no 5.5(a) to 5.5(j)

Fire Station	Water Supply	Electric Dept	Health Services	Ambulance Trust	LPG Eg., Cell	Collector	Police Station

Water Resources (to be filled at operational stage)

Fire Station	FH	OHR	CAP	GLR	CAP	WELL	CAP	OWS	CAP

Where

FH= Fire Hydrants, OHR= Over Head Reservoir, CLR= Ground Level Reservoir, OWS= Other Water Resource, CAP = Capacity

Details of Fire Control Room in HSIIDC(to be filled at operational stage):

Fire Control Room	Person to be Contacted		Telephone Number			
	Name	Designation	Telephone	Mobile	Fax	Residence

The facilities for firefighting would comprise of fire hydrant network, fire fighting pumping units, hydrant valves, monitors, fire detection alarm, fire-extinguishing system and above ground firewater storage tanks. Codes and Standards to be used as a part of Fire Safety Measures would include:

- IS 1641:1988 Code of practice for fire safety of buildings (general): General principles of fire grading and classification.
- IS 1646:1997 Code of practice for fire safety of buildings(general) electrical installations
- IS 1642:1989 Code of practice for fire safety of buildings (general): Details of construction

IS 1644:1988	Code of practice for fire safety of buildings (general): Exit requirements and personal hazard
IS 1649:1962	Code of practice for design and construction of flues chimneys for domestic heating appliances
IS 2175:1988	Specification for heat sensitive fire detectors for use in automatic fire alarm system
IS 2189:1988	Code of practice for selection, installation and maintenance of automatic fire detection and alarm system
IS 2190:1992	Code of practice for selection, installation and maintenance of portable first-aid fire extinguishers
IS 2309:1989	Code of practice for the protection of buildings and allied structures against lighting
IS 1360:1985	Specification for smoke detectors for use in automatic electrical fire alarm system
SP 7:1983	National building code of India: Part IV Fire protection

(g) Fire rescue plan

The hazardous environments created during emergencies, a group of dedicated and well-trained professional emergency responders and medical service personnel are tasked with containing and mitigating these incidents, rescuing individuals at-risk, and providing medical assistance to the injured.

If there is a large employer, handling hazardous materials and processes or have employees regularly working in hazardous situations, It is advisable to rely on resources available in the unit itself for these specialized services. However if external departments or agencies, such as the local fire and police departments, medical clinics or hospitals, and ambulance services, make sure they are prepared to respond as outlined in your plan. For example:

- ◆ Have members of the local fire department conduct a walk-through of your workplace so they are familiar with the layout and any potential hazards.
- ◆ Establish a relationship with a local ambulance service so transportation is readily available for emergencies.
- ◆ Make arrangements with nearby medical clinics or other facilities to handle emergency cases and to provide medical and first aid services to employees.
- ◆ If a PHC, clinic, or hospital is not close to your workplace, ensure that onsite person(s) have adequate first-aid training. It is advisable to take help of local safety councils, fire departments, or other sources that may be able to provide this training.
- ◆ Treatment of a serious injury should begin within three to four minutes of the accident. Consult with a physician or other professional to order appropriate first-aid supplies for emergencies.

5.5.2. Emergency Preparedness Plan

Project proponent is suggested to envisage the Onsite Emergency Plan for the proposed Industrial Estate at Panipat, to maintain the Environmental Health & Safety, to the best conditions with following salient features:

- ◆ Designation & responsibility for contingency management as well as emergency response system to be made known to each industry in the Industrial Estate and their employees.
- ◆ Standard operating procedure for handling for specific accident and emergency to be circulated among industries and individual industry will also make their own SOP in this regard.

- ◆ Effective co-ordination should be made with the outside agencies, such as fire Brigade, Civil and Defense Hospitals etc.
- ◆ Every person directly or indirectly to be involved with the proposed industrial estate should be made known about the safety procedures.
- ◆ Safety Checklist should be made by individual industries of various emergencies and safety of equipment, to ensure effectiveness of the system in place.
- ◆ Full utilization of available resources, internal as well as external should be ensured for handling emergencies.
- ◆ A multi-disciplinary team should be formed to handle emergencies. Adequate protective equipment should be kept in the unit.
- ◆ Communication meeting dealing with safety would be held regularly among member industries.

(a) Emergency Organization

Project Proponent is suggested to set up Emergency Organization for management of disaster, if any occurred, during the operational phase of the proposed project. There will be the Crisis Coordinators from the members industries. A Chief Coordinator will ensure the functioning of organization structure during emergency. The Chief Coordinator will organize a team responsible for controlling the incidence with the personnel under his control. Emergency Coordinators would be appointed who would undertake the responsibilities like fire fighting, rescue, rehabilitation, transport and provide essential support services. For these purposes, Security In-charge, Personnel Department, Essential services personnel would be engaged.

(b) Emergency Communication

Communication is a significant factor in handling an emergency. Communication includes physical and administrative means by which information with respect to emergency can be rapidly disseminated for offsite emergency response. These also include emergency response actions, which must be taken to protect health and safety of the personnel and the public. Without adequate communication, successful emergency planning cannot be exercised.

(c) On- site Plan

The on-site protective actions include.

- ◆ Notification of emergency to all the personnel within the industrial estate by siren or alarm or public address system
- ◆ Notification for evacuation of personnel by based on the extent of emergency.
- ◆ Examination of evacuees for injuries and / or exposure to hazardous material..
- ◆ Manage a team for searching and rescue operation

(d) Off-site Areas

In the event of a significant emergency condition potentially affecting off-site population, off-site authorities should be immediately notified in accordance with the emergency response procedures.

Prompt off-site notification is essential for mitigating the emergency condition and minimization of any impact on personnel off-site, particularly in case of an emergency occurring along the pipeline corridor outside the pumping station

5.5.3 ELECTRICAL SAFETY

Electricity is good servant but bad master. It can prove to be very dangerous if circuits are not properly protected. The major fault that appears in electrical network or equipment is termed as short circuit. In short circuit, the supply phase and neutral or earth is short circuited accidentally due to foreign metallic substance coming in contact with phase & neutral or earth or due to overload thereby damaging the insulation resulting in short circuit i.e. directly connected resulting in heavy current flow called "short circuit current". This high current heats up the terminations, switches, plugs & cable due to which temperature rises to such a high degree that it is sufficient to generate sparking which further leads to fire.

Protection of Circuits

In order to restrict the short circuit currents and also to cut off or isolate the faulty circuit from electric supply so that high short circuit current is interrupted before fire starts, appropriate protective devices need to be used as given below:

Rewirable Fuses

It is strongly recommended that fuse wires of correct current rating should be used. Do not increase the fuse capacity for preventing or eliminating frequency fuse blow-ups.

It is essential to locate the causes and eliminate the same. Replacing fuse wires of higher capacity may invite troubles in the form of fire & damage to supply system and surroundings.

HRC Fuses

High Rupturing Capacity (HRC) fuses are capable of clearing short circuit & arcs. However, they are much more costlier and hence, application is mostly restricted to commercial & industrial wiring or higher capacity loads.

MCBs:

Miniature Circuit Breakers are gaining increasing prominence in household and distribution wiring in shops & commercial establishments as it effectively forms combination of switch & fuse with specified level of fault clearing capacity. It can be used to protect individual circuits. It has an advantage since no replacement is required and it can be reset on elimination of fault and switched on again.

Electrical accidents are caused mainly by careless use of electricity, such as:

- 1) Lack of knowledge about functioning of equipment.
- 2) Using faulty electrical cords/sockets.
- 3) Use of extension cords without taking proper precautions.
- 4) Improper earthing of the device.
- 5) Faulty designs/inter-locks.

The major factor, which plays a vital role in severity of electric shock, is amplitude of current, and part of human body through which it passes. For accident to happen, current of sufficient magnitude must flow through vital organ thus impairing its function. When a person accidentally touches a live wire, the severity depends upon the skin resistance of that person, which varies from 1 K Ohm to 11 M Ohms. Generally, current amplitude more than 30 milli Amps is sufficient to give shock, which can be fatal.

Methods of Accident Prevention

(i) Grounding

- It has been observed that in many industrial, domestic and commercial premises, grounding system has become unreliable. It is essential that earth resistance should be as low as possible. It is specified that for protective purpose, the same should not exceed 0.2 Ohms.
- Under no circumstances, earthing wire in the house/flats should be connected to water pipes. This not only gives shock in your premises but to someone else also. Water pipes are coming down from terrace and are not earthed.

(ii) Isolation transformers

- ♦ Use of isolation transformers reduces the amount of leakage current considerably. Electrical supply is available at the tip of the finger. As a source of power in some ways, it is less hazardous than steam or other prime movers. Failure to take proper precautions in its use creates conditions which can result in injury, fatality or damage to property. Elimination of most of these hazards is neither difficult nor expensive. However, ignoring those leads to serious accidents.

The hazards can be classified as

1. Electric shock
2. Fire

Causes leading to fire are as under:

- a) Overloading of conductors/cables and equipment.
- b) Electrical heat source close to flammable materials.
- c) Short circuits in wiring/cables.
- d) Poor or loose connections giving rise to sparking.
- e) Use of inferior grade materials/equipment.
- f) Frequent blowing of fuses leading to heavy sparking.
- g) Generation of static electricity.

Electrical fires could be avoided by taking, following precautions

- 1) Use good quality (ISI) wires/cables.
- 2) Avoid joints in wiring - soldering and proper mechanical joints should be made if the same cannot be avoided.
- 3) All wiring should be renewed after ageing.
- 4) Fuses used for protection should be of adequate capacity. The ratings should not be increased without ascertaining reason of fuse blowing.
- 5) Fuse boards should be away from combustible materials like paper, oil, curtains etc.

Electrical Accidents reporting top Government Authorities

Electrical accidents are required to be intimated to the Electrical Inspector by persons on whose premises/electrical installation the accident takes place. The relevant provision of intimation of accidents is prescribed under rule 44A of Indian Electricity Rules 1956. As stated in the rules, a telegraphic / telephonic report should be submitted to Electrical Inspector within 24 hours of knowledge of occurrence of fatal accident and a written report within 48 hours in prescribed format.

General Safety Precautions

Accidents do not just happen - they are results of unsafe conditions or unsafe acts or combination of both! In order that we prevent accidents, it is necessary to follow the guidelines given below:

1. Haste causes many accidents, be sure of what you are doing.
2. Immediately report to person in-charge any dangerous condition or practice you have observed.
3. Before working on motors or other rotating machines, make sure that it cannot be set in motion without your permission by removing fuses & installing danger board on controlling switch.
4. Thoroughly discharge all cables to earth before starting the work.
5. Place rubber mats in front of switchboards.
6. Do not close any switch unless you are familiar with the circuit which it controls and know the reasons for it being open.
7. Do not work on live circuits. Make sure that all safety precautions have been taken.
8. Do not close or open switch hesitantly. - do it quickly and positively.
9. Do not throw water on live electrical apparatus in case of fire. Use proper extinguisher.

Preventions while working on High Voltage Installations

1. All voltages shall be considered dangerous even though voltage may not be high enough to produce severe shock (80V onwards).
2. All electrical circuits are to be treated as live and no work i.e. maintenance repairs, cleaning etc is to be carried out on any part of the apparatus unless-
 - Such parts are dead i.e. totally de-energized.
 - Isolated and all steps taken to lock off from live conductors.
 - Effectively earthed.
 - Released to work by issuing work permit by authorized person.
 - Confirmation for de-energisation is received.
3. Visitors & unauthorized persons should not be allowed to touch or handle electrical apparatus or come in danger zone of high voltage equipment.
4. Loose clothing, metal (straps) watch, rings, chains etc. should be avoided.

Electric Shock

It can be defined as sudden & accidental stimulation of body's nervous system by electric current.

Electric Shock can be felt due to following:

When body becomes part of the circuit and current enters at one point and leaves from the other point; which can happen - With both wires of the electric circuit; With one wire of the energized circuit and the ground; With metallic part that has become hot by itself in contact with energized wire.

Electric Shock Severity:

The severity of electric shock depends on -

- ◆ The rate of flow of current through the body.
- ◆ The path of the current through the body.
- ◆ The length of time the body is in circuit.
- ◆ Frequency of current.
- ◆ Phase of heart cycle when shock occurs.
- ◆ Physical and psychological condition of the person.

Human resistance:

Body area	Resistance to Current
1. Dry Skin	100K. Ohms to 660 K. Ohms
2. Wet skin	1K. Ohm
3. Hand to Foot	400 Ohms to 600 Ohms
4. Ear-to-Ear	100 Ohms

Reason for Electric Shock:

- ◆ Touching bare live conductor touching poorly insulated conductor
- ◆ Open/short circuit due to equipment failure
- ◆ Static electricity
- ◆ Lightning
- ◆ Touching body of an equipment which has become live.

Earth Leakage Circuit Break (ELCB)

Indian Electricity Rules 1956 was amended in 1985 to include use of ELCB a mandatory requirement for more than 5 KW of electrical load to take care of electrical current leakages that may result into shock. The salient features of this ELCB are -

- ◆ Current operated
- ◆ Operates on core balance current transformer principle.
- ◆ Operates even in case neutral failure.
- ◆ Trips within 30 milli seconds.
- ◆ Trip free mechanism - i.e. during fault resetting is impossible and trips even if held forcibly in "ON" position.
- ◆ Operational life - more than 20,000 operations upto 63 A and more than 10,000 operations for 80 A & 100Amps.
- ◆ 10 KA short circuits withstand capacity.
- ◆ Available upto 100A, 2 poles & 4 pole for sensitivities from 30 milli amps onwards. (100 A & 300 A sensitivities are also available depending upon requirements.)

Static Electricity

Static electricity is the energy flowing in circuits that are generally considered nonconductors of electricity. It is considered as nuisance hazard. However can cause fire & explosions when fuel, oxygen & heat are present in the vicinity. Static electricity hazard exists only under the following conditions in combination:

- a. Electric charge must be generated.
- b. The charge must be accumulated in a liquid or solid causing an electric field to be formed in an accompanying gas mixture.
- c. The electric field must cause spark with intensity sufficient to ignite gas mixture.
- d. The gas mixture must be flammable.
- e. Static electricity is also generated from frictional or rolling contact between bodies i.e. belts, agitation and mixing.

Prevention of Static Electricity

- a. Prevent charge generation.
- b. Prevent charge accumulation
- c. Prevent discharge from being dangerous.
- d. Take measures to render gas mixture non-flammable.

The bodies which are well insulated from each other and ground can only accumulate electrostatic charge - otherwise, charges leak away and recombine with their counterparts as fast as they are formed. Earthing is necessary to prevent accumulation of electric charge on equipment.

Lightning

Lightning is a huge spark caused by electrical discharge taking place between clouds, within the same cloud and between clouds and the earth. Lightning is one of the most serious causes of over voltages. Lightning apart from damaging power equipment due to failure of insulation, can also cause damage to buildings, farms etc. However, damage to human beings is comparatively less. The phenomenon of accumulating positive or negative charge on clouds is a result of some atmospheric processes during thunderstorms. Thus, the cloud gets charged either positively or negatively and when it passes over the earth, it induces opposite charge on earth. When the charge acquired by the cloud increases, it results into increased potential between earth and cloud. The lightning starts when the potential is of the order of 5-20 million volts. The lightning propagates through air in jerks at a speed approximately equal to speed of light and carries current in the vicinity of 100 amps. The lightning stroke, which appears to eye as a single flash, is in reality made of number of separate strokes that travel down. Whenever there is a thunderstorm, it is advisable that one should not -

- ◆ Sit under the tree
- ◆ Swim in open water
- ◆ Fly Kites.

The protection to the power lines and power equipment against lightning is provided as under:

- ◆ Ground potential wires with sufficient mechanical strength are provided along with transmission lines to shield the live conductors from direct strokes.

- ◆ Lightning arresters of different types are provided on outdoor switches/ transformers for protection.
- ◆ The lightning stroke can also affect high rise buildings hence to ensure safety of building & persons inside, the lightning conductor with spikes are provided at the tallest point of the building and this spike along with conductor is directly connected to earth pit in ground. Any charged cloud in the vicinity of the spiked conductor is discharged. Generally, any charge coming in the periphery of 120 degrees of this conductor placed at highest point of building is taken care by this type of lightning conductor.

Housewarming

Electricity Boards or Supply Companies generally give single phase supply upto 5 KW connected load and 3 phase supply to consumers having load more than 5KW. It is suggested that following precautions should be taken while carrying out wiring:

1. Always use copper wires/cables of adequate size or one size above the load requirement. Increase in size of the conductor reduces resistance thereby heat generation and fire hazard is minimized. This also reduces the energy loss in wiring.
2. Electrical power circuits and communication circuits e.g. telephone should run in separate conduits/casing copings.
3. The wiring for high power consuming equipment viz. air-conditioner, geyser etc. should be run separately with separate neutral brought from supply terminal. This reduces voltage fluctuation in other loads.
4. Normally, in house wiring single pole switches are used which ensure that switches are in the "live" or "phase" wire of the circuit connected to appliance. If the switch is connected in "neutral" wire, the equipment/circuit can give shock even though switch is in "off" position.
5. Proper earthing is must in house wiring. Only proper earthing will guarantee safety to you and your family (hence, earthing must be checked periodically).
6. All appliances are provided with three pin plugs. Please ensure that earthing wire is connected to all such plugs.
7. Always ensure that connections to sockets are made by 3 pin plugs and not by inserting loose wires or 2 pin plugs.
8. To prevent shocks & protection against fault in appliances, Earth Leakage Circuit Breaker (ELCB) needs to be installed.
9. In case of repeated tripping of ELCB, locate the fault and eliminate the same instead of bypassing ELCB.
10. Before adding heavy power consuming equipment viz. geyser, window AC etc. ensure that wiring is of adequate capacity to take this additional load.
11. Earthing wire should never be used as a return wire of any electrical circuit and it's use should be restricted only for the purpose of equipment body earthing.
- 12.

Safety Precautions in Domestic Installations

1. Do not touch an electric switch or appliance when hands are wet.
2. Be alert while replacing fuse/inserting plugs.
3. Do not use copper wire as a substitute for fuse wire.
4. Do not use wires with poor insulation.

5. Do not replace fuse unless cause is detected.
6. Do not hang wet clothes on electrical fittings/conducts.
7. Use 3 pin plugs and ensure that earth connection is proper.
8. Take help of qualified electrician for any alterations / modifications in wiring.
9. Do not replace bulb or any appliance with switch in "ON" condition.
10. Do not shift any appliance with switch in "ON" condition.
11. Check earthing frequently for physical damage, if any.
12. In case minor shock is felt anywhere, do not neglect it - contact licensed electrician.
13. Check the electrical specifications of equipment before it is switched "ON" viz. 110V, 230V, 110V, 440V etc.

GENERAL

Following safety requirements shall be complied with before the contractor uses the power supply.

1. The contractor shall submit a list of licensed electrical staff to be posted at Site.
2. It shall be the responsibility of the contractor to provide and maintain complete installation on the load side of the supply point with regard to the safety requirements at Site. All cabling and installation shall comply with the appropriate latest statutory requirements given below and shall be subject to approval of the Engineer-in-Charge:

- ◆ Indian Electricity Act.
- ◆ Electricity (Supply) Act.
- ◆ Indian Electricity Rules.
- ◆ National Electricity Code.
- ◆ Other relevant rules of Local Bodies and Electricity Boards.

The power supply shall be regulated as per the terms and conditions of the supply of the respective electricity boards.

- ◆ Where distribution boards are located at different places the contractor shall submit schematic drawing indicating all details like size of wires, overhead and Cable feeders, earthing etc. The position and location of all equipment and switches shall be given.
- ◆ The contractor shall make his own arrangement for main earth electrode and tapings thereof. The existing earth points available at site can be used at the discretion of Client with prior permission. Method of earthing, installation and earth testing results shall conform to relevant I.S. Specifications (IS: 3043).
- ◆ All three phases' equipment shall be provided with double earthing. All light fixtures and portable equipment shall be effectively earthed to main earthing.

- ◆ All earth terminals shall be visible. No gas pipes and water pipes shall be used for earth connection. Neutral conductor shall not be treated as earth wire.
- ◆ The contractor shall not connect any additional load without prior permission of Client.
- ◆ Joints in earthing conductors shall be avoided. Loop earthing of equipment shall not be allowed. However, tapings from an earth bus may be done.
- ◆ The entire installation shall be subjected to the following tests before energisation of installation including portable equipment:
 - Insulation resistance test.
 - Polarity test of switches.
 - Earth continuity test.
 - Earth electrode resistance.

The test procedures and their results shall conform to relevant standards.

(a) Lightning arrestors

The plan for the installation of lightning/surge arresters to protect buildings, utilities and houses is a part of feasibility report and hence to be submitted by PP. The details about the lightning arrester are given below:

Electrical and electronic equipment, irrespective of whether they are inside a safe building or not, can go bad due to lightning energy entering their circuit directly or by some other path. These equipments can be protected to a considerable extent from damage by installing a Lightning Arrestor. Lightning Arresters provide a means by which lightning currents may enter or leave the earth without passing through the circuitry to be protected. Lightning Arresters installed in equipment behave as if it is absent so that the normal operation of the equipment is not at all affected. During a lightning event if the voltage in the installed circuit goes up beyond a value due to lightning energy the arrester becomes active due to the high voltage leading to a short circuit of the lightning energy to earth. The time taken for the arresters to become active is of the order of $1/10^9$ second. Hence, the arrester prevents the lightning energy from entering the equipment.

The Lightning Conductor

The Lightning Conductor, which is, also known as Lightning Rod or Air Terminal is one of the best-known forms of shielding device and has been in use in protecting buildings and facilities where protection is mandatory such as, storage tanks for petroleum products, warehouses for explosives etc. The main purpose of the lightning rod is to provide a point well above the structure to be protected with a very good, earthed connection so that the lightning energy gets diverted into ground without damaging the structure. Lightning Conductors must be exposed and should be placed at the highest levels. They may be painted for protection against corrosion. There is a code of practice on Lightning Conductor and its installation published by the Bureau of Indian Standards. Conformance to this will make the Lightning Conductor effective.

Earthing

The earthing done for domestic power supply is not at all sufficient for lightning conductor earth. This is evident from the magnitude of currents involved in lightning, which is more than two orders of magnitude higher than the domestic supply currents. However, because of the high voltage involved, proportionally heavy earthing is not needed, as the voltage itself will drive it into ground.

Cone of Protection

This is a term used to describe the volume of protection offered and it provides a simple graphical tool for installing a Lightning Conductor protection system.

Electrical Shock

Flow of electric current through human body is the cause of electrical shock. On receiving electrical shock a person may be bodily injured being thrown away on the same level or due to fall from height as he lose his balance when working at height. If electrical path is through heart, the accident can be fatal

Burns

- ◆ Burns are caused by electrical flashes if a body part comes within flashing distance of high voltage current.
- ◆ Burns may be caused due to short circuit also.
- ◆ Short circuit may lead to electrical flashes causing burns.

It is therefore important to adhere to all safety measures for prevention of Electrical hazards.

- ◆ Only authorized and qualified persons should undertake electrical repairs and other electrical works.
- ◆ Treat all circuits as live unless ensured after testing to be DEAD
- ◆ Use Standard switches sockets and other fittings of adequate rating required for the operation
- ◆ Use double insulated 3 core cables and ensure cables are free from insulation failure
- ◆ All electrical supply is controlled through circuit breakers and competent person for its effective operation periodically checks the same.
- ◆ Ensure all electrical appliances and Electrical portable tools are effectively earthed.
- ◆ Do not allow unsafe temporary connections, naked joints/wiring
- ◆ Don't work on electrical equipments in wet environment /on wet floors
- ◆ Don't over load electrical point/equipment
- ◆ Don't crowd things near electrical mains /switches and keep access free from obstructions.
- ◆ Don't make trail & errors and short cuts. Follow safe procedures

Installation

Following guidelines are provided for general observations: -

- ◆ Only persons having valid wireman's license/competency certificate shall be employed for carrying out electrical work and repair of electrical equipment, installation and maintenance at site. A qualified licensed Supervisor shall supervise the job.
- ◆ Electrical equipment and installations shall be installed and maintained as to prevent danger from contact with live conductors and to prevent fires originating from electrical causes like

short circuits, overheating etc. Installation shall not cause any hindrance to movement of men and materials.

- ◆ Materials for all electrical equipment shall be selected with regard to working voltage, load and working environment. Such equipment shall conform to the relevant standards. Minimum clearance to be maintained for all overhead lines along roads and across roads shall be as per the statutory requirements.
- ◆ Grounding conductor of wiring system shall be of copper or other corrosion resistant material. An extra grounding connection shall be made in appliances/equipment where chances of electric shock are high.
- ◆ Electric fuses and/or circuit breakers installed in equipment circuits for short circuit protection shall be of proper rating. It is also recommended that high rupturing capacity (HRC) fuses be used in all circuits. For load of 5 kW or more earth, leakage circuit breaker shall be provided in the circuits.
- ◆ Wherever cables or wires are laid on poles, a guard wire of adequate size shall be run along the cables/wires and earthen effectively. Metallic poles as a rule, shall be avoided and if used shall be earthen individually. Anti climbing guards and danger, notices shall be provided on poles. Each equipment shall be an individual isolating switch.
- ◆ Wires and cables shall be properly supported and an approved method of fixing shall be adopted. Loose hanging of wires and cables shall be avoided. Lighting and power circuits shall be kept distinct and separate.
- ◆ Reinforcement rods or any metallic part of structure shall not be used for supporting wires and cables, fixtures, equipment, earthing etc.
- ◆ All cables and wires shall be adequately protected mechanically against damages. In case the cable is required to be laid underground, it shall be adequately protected by covering the same with bricks, Plain Cement Concrete (PCC) tile or any other approved means.
- ◆ Using suitable cable glands shall properly terminate all armored cables. Using cable lugs/sockets shall connect multi stranded conductor cables. Cable lugs shall preferably be crimped. They shall be of proper size and shall correspond to the current rating and size of the cable. Twisted connections will not be allowed.
- ◆ All cable glands, armoring and sheathing of electric cable, metal circuits and their fittings, metallic fittings and other non current carrying parts of electrical equipment and apparatus shall be effectively grounded.
- ◆ All the Distribution Boards, Switch Fuse Units, Bus bar chambers, ducts, cubicles etc. shall have MS enclosures and shall be dust, vermin and waterproof. The Distribution Boards, switches etc. shall be so fixed that they shall be easily accessible. Changes shall be done only after the approval of the Project Manager.
- ◆ The contractor shall provide proper enclosures/covers for protection of the entire switchboard, equipment etc. against rain. Exposed live parts of all electrical circuits and equipment shall be enclosed permanently. Crane trolley wires and other conductor which cannot be completely insulated shall be placed such that they are inaccessible under normal working conditions.
- ◆ Ironclad industrial type plug outlets are preferred for additional safety.
- ◆ Open type distribution boards shall be placed only in dry and ventilated rooms; they shall not be placed in the vicinity of storage batteries or otherwise exposed to chemical fumes.
- ◆ Isolating switches shall be provided close to equipment for easy disconnection of electrical equipment or conductors from the source of supply when repair or maintenance work has to be done on them.

- ◆ In front of distribution boards a clear space of 90 cm shall be maintained in order to have easy access during an emergency.
- ◆ Adequate working space shall be provided around electrical equipment, which requires adjustment or examination during operation.
- ◆ As far as possible electrical switches shall be excluded from a place where there is danger of explosion. All electrical equipment such as motors, switches and lighting fittings installed in workroom where there is possibility of explosion hazard shall be explosion proof.
- ◆ All connections to lighting fixtures, starters or other power supplies shall be provided with PVC insulate, PVC sheathed twin/three/four core wires to have better mechanical protection for preventing possible damage to equipment or injury to personnel. Taped joints shall not be allowed and the connections may be made in looping system. Electric starter of motors, Switches shall not be mounted on wooden boards. Only sheet steel mounting or iron framework shall be used.
- ◆ All the lighting fixtures and lap holders shall be of good quality and in good condition. Badly repaired or broken holders, etc. shall not be used.
- ◆ Only PVC insulated and PVC sheathed wires or armored PVC insulated and sheathed cables shall be used for external power supply connections of temporary nature. Weatherproof rubber wires shall not be used for any temporary power supply connections. Taped joints in
- ◆ the wires shall not be used.
- ◆ The bulbs/lamps used for illumination and testing purpose shall have cover or guard to protect them from accidental breakage. Only 24 V supply system shall be used for hand lamps etc. while working inside metallic tanks or conducting vessels.

5.5.4 Handling Earthquake Emergencies:

The District Administration is Responsible for the implementation of Panipat Disaster Management Plan. DDMA act as district Planning, coordinating & implementing body for DM in the Panipat district. The deputy Commissioner is overall incharge and he will monitor all activities taken in respect of disaster management in the District. The seismic zones are drawn on the following figure no. 5.5 (a).

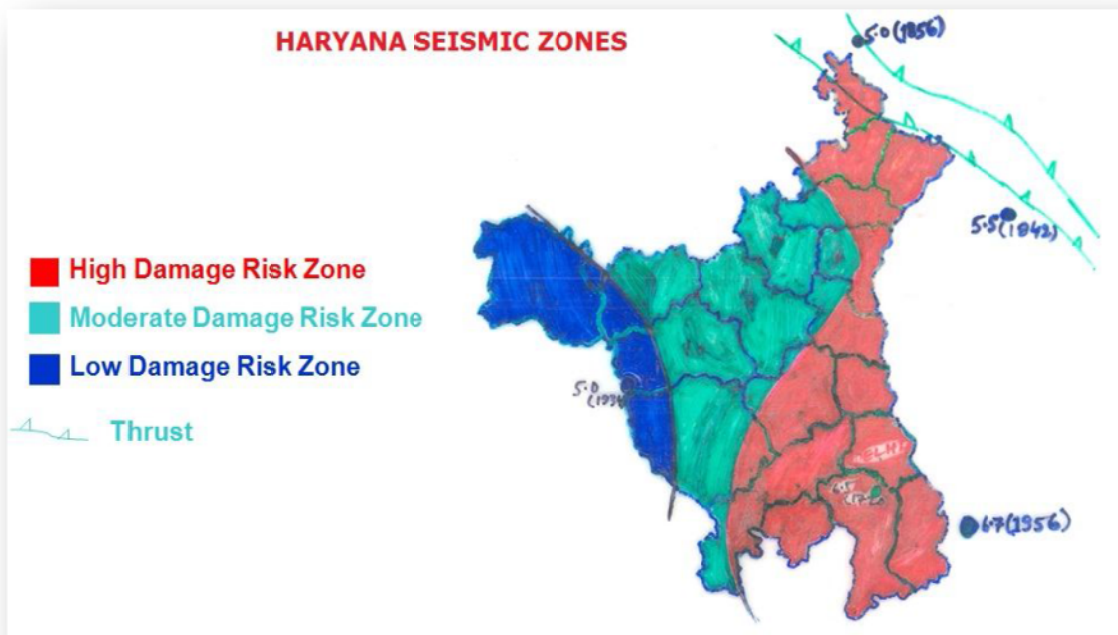


Figure: 5.5(a) – seismic zones of Haryana

Earthquake can cause damage not only on account of the shaking which from them but also due to other chain effect like and slides, floods, fire, explosion, toxic release, poisoning and disruption to communication, power, water etc. The instant severity damage effect of earthquake will be occurred in the Panipat district, subsequent possible effect on chemical factories, pipelines, highway, roads, railways etc.

- The building, houses, structures, must be constructed as per IS code for earthquake.
- Old building, house, structures must be checked by structural engineer and as per advice of them, they demolished or properly repair to withstand against earthquake.
- Industries must constructed hazard prone area and essential area such as chemical storages tanks & their foundations, fire facility buildings, occupational health centre, hospital, chemical manufacturing building / structures, power generation plan buildings, transformer rooms, water storage tanks, DG set rooms etc. as per IS code earthquake.

5.5.5 DEPARTMENT DETAILS AND INVENTORY OF RESOURCES FOR PANIPAT

Following are the table for various departments and resources handling emergencies in Panipat district.

Table-5.5(b): Department details and inventory of resources

Sr. No	Officer Name/Designation S/Sh.	Telephone(s) No.		
		Office	Residence	Mobile
1.	Mona Sreeniwas, IAS, DC	2651502/ 2655800Fax	2652800/ 2653800	
2.	Sunita Verma, HCS, ADC	2650152 / 2658048 2650881-Fax		
3.	K.K. Rao , IPS, SSP	2699100	2699101	9729999901/ 9729900700
4.	S.K. Jain ,HCS, SDM ,Panipat	2651303	2653053	9812800600
5.	Shiv Parsad Sharma,HCS SDM, SMK.	2571100	2571111	9215944416
6.	Manjit Singh, HCS, M. D. Sugar Mills, Panipat.	2651269	2652751	9466110101

7.	Manoj Khatri , HCS , City Magistrate	2651801		097179-95783 9468359966
8.	Ram Kumar, GM Roadways	2648804 / 2646544		9467015222
9.	Surender Singh , HCS, Secretary RTA, Panipat	2668668		9729277260
10.	Surender Kumar, D.D.P.O., Panipat	2653012		9416282128
11.	P.D. Sharma DRO, Panipat	2653850		9467055555
12.	Satish Jain HCS, EO, HUDA	2577018		9812800600
13.	Sanjay Hooda, District Attorney	2651553		9416054242
14.	Rajbir Singh , HPS ,DSP(HQ)	2669102	2699103	9729999903
15.	Virender Vij, HPS,DSP(City)	2699104		9729999904
16.	Shyam Lal ,HPS,DSP, SMK	2699107		9729999906
17.	Pardeep Sheokand, HPS, DSP Traffic		9215401105	9729999905
18.	Rajni Gupta,Protection Officer	9729022757	9229022757	
19.	Sanjay, DIO	2653308/2681243		9812765428
20.	Parmila Kadian Chairman, ZP	2650384	2575537	9813200159
21.	K.S. Jakhar XEN, PR.	2655402		9991115897
22.	Ashok Chhikara, BD&PO, Panipat.	2652908		9896052477
23.	Balraj Malik, BD& PO, Israna	2579542		9468315225
24.	Om Parkash, BD&PO, Samalkha	2572159		9355551745
25.	Sumit Chaudhary, B.D&P.O, Bapoli	2587223		9896265290
26.	Ajit Singh, BD&PO, Madlauda.	2584238		9416316677
27.	Ashwani Gambhir, Tahsildar Panipat			9466112512
28.	Ghyani Ram Tahsildar, Samalkha			9466722100
29.	Tehsildar, Israna			
30.	Ved Pal, Naib Tahsildar, Israna			9416312039
31.	Narender Dalal , N.Tehsildar ,Panipat.			9729080408
32.	Mewa Singh, N.Tehsildar, Bapoli			9812030101
33.	Raj Singh, N.Tehsildar,Samalkha			9466159800
34.	Anil Kumar , N.Tehsildar, Madlauda			9467476131
35.	S.S.Arora, XEN, Marketing Board	2661236		9896138000
36.	Azad Singh, XEN, Irrigation	2650036	2652026	9416160051
37.	S.S.Raheja , XEN, Public Health	2654923/2650003	2680644	9416112807
38.	Bipnesh Sharma , PD, NHAI, Kundli	2374331/2219831		09814636282
39.	S.N.Singla , XEN, P.W.D. B&R	2638652	2643103	9416009118
40.	S.P.Rathi XEN, Pollution Control Board.	2664951		9468100860
41.	Ramesh Kumar, XEN, YAP	2634587		9466164700
42.	A. K. Mittal , XEN, HUDA, Panipat	2660068		9812379475
43.	Jai Kuwar, DFO (Forestry)	2650135		9466119119
44.	Romil Kumar, Dy. C.E., BBMB, Siwah	2662992	2663171	9416017711
45.	DVS Dhankhar, S.E. Operation Circle, Panipat	2651903 2650839 (FAX)	2652602	9354726268
46.	P.K.Goel, XEN, City Panipat.	2652352	2652850	9354918980
47.	J.C.Sharma, XEN, Sub Urban	3252500		9354726267
48.	S. L. Rai XEN, UHBVN, SMK	2003655	9896060892	9354918993
49.	Sudhir Sharma, DETC, Excise, Panipat	2650170		9416119511
50.	Pawan Kumar, DETC(S.T) ,PNP	2660290	2650716	9729290222
51.	Atul, Div. Forest Officer	2650331	2656111	9416158158
52.	Dr.H.S.Randhawa, Civil Surgeon, PNP	2630275		9215156183
53.	Anil Kumar, DFSC, Panipat	2638863		8901488344
54.	K.L.Saini, Inspector, Weight & Measures	2638863PP		9812185005
55.	Bhagmal Jt Director, D.I.C.Panipat	2651222 /2652222		9812091844
56.	Dr. Madhuri Gupta, Mining Officer	2651222PP		9215907055
57.	Narender Solanki, DTP(Planning)	2668499		9466322107
58.	Dhirender Singh, DTP (Enforcement)	2660999		9416730043
59.	R.K.Saini, Deputy Labour Commissioner	2652433		9468310246
60.	Sunil Khurana, Deputy Director, .Indl Health & Safety	2651724		9896677104
61.	Sameer Kumar,Addl.Commr.,Income Tax	2636791/2634445		9468300354
62.	Udayvir Singh, Labour Officer, Panipat	2649363		9896392291
63.	N.K. Singhal , Labour Officer, Panipat	2649481	2577060	9416369833
64.	R.C.Chopra , DM ,Warehousing	2658062		9728197978
65.	B.S.Chaudhary, DM, Hafed	2664802	2664902	9354224153
66.	Ramesh Mehra, DM, Confed	2630569	-	9315019534
67.	Afjal Gafoor, EO, Wakf Board			9416172148
68.	Shivpal Rathee, CEO, FFDA	2651349		9416479940
69.	Yogesh Juneja, AR, Coop. Society (Addl)	2650921		9466074955
70.	Sh K.P. Tomar , Manager, HLRDC	2650375		9466159115
71.	R. P Jain, Manager, Br. Manager, HFC	2663713-714	2248217(SPT)	9896126551
72.	Rajender Sangwan (Addl.), District Welfare Officer	2658065		9416223532

73.	Ravinder Hooda, DSWO	2651844	(9416133088Jain, S.O.)	8901195796/
74.	R.P.Sangwan, Distt. Sports Officer	2650702	01263-257161	9416000611
75.	V.K.Gupta, Asstt Manager, FCI	2650824	9255953272	9215332520
76.	Om Parkash, Secy., Zila Sainik Board	2650311		9896228276
77.	Darshan Lal Kamboj Head Post Master	2651403 / 2650933	-	9466620363
78.	Sh. Vijender Kumar, Distt. Commandant Home Guard	2651077		9416487802
79.	Anil Singhal, Distt. Statistical Officer	2636930		9466229192
80.	Billu Yadav, Distt. Hort. Officer	2654808	9996788004	9467180500
81.	Surjit Jangra , DM, PLD Bank	4016853		
82.	Mehar Singh Bhanwala, DM,Khadi & Vill. Ind.	2633011		9416743262
83.	R. K. Saini, Manager, NITRA	2668854	2500185 (SPT)	9416411867
84.	Parkash Vaidia , Nehru Yuva Kendra	2664785	No. 73, Ward No. 19.	09868417866
85.	A. S. Dahiya, Krishi Vigyan Kendra	2669330	2650830	9416101631
86.	Improvement Trust, Panipat.	2638501		
87.	Municipal Council Panipat.	2639810		
88.	Partap Singh, E.O., Municipal Council, Panipat	2649381	2652623	8950400013/9813200015
89.	Devender Kumar, Secy. Mpl Committee, SMK	2572481		9896912066
90.	S.S.Narwal, Fire Officer PNP	101/ 2650458		9416564224
91.	Ram Singh Fire Officer, Samalkha	2570101/2570890		9416220529
92.	R.K.Bhatia, Executive Director NFL	2652676	2666404/266550 8	9996599002
93.	Ashwani Sharma, ED, Refinery	2578804 / 2522001	2585016	9416206003
94.	K.C. Garg, CE, Thermal	2566806	2566012	9354516202
95.	J.P.Aggarwal, CE (O & M) Thermal	2566859	2561810	9355084605
96.	Sudip Kumar, GM, BSNL	2635021	2635022	9416210100
97.	D.P.Gupta, D. M. Skylark	2641051 / 2633925		9896072204
98.	Satyawan, Treasury Officer	2642749		9416254204
99.	Mahesh Sardana , DPRO	2650388		9466513554
100.	Smt. Vijay Chaudhary, Secy. Red Cross	4008357	4008356 / 9254300931	9355098525
101.	Pardeep Malik, DCWO	2652527		9416194736
102.	Smt Usha Arora , PO, ICDS	2653574		9896179209
103.	Tirlochan Singh, M.D Coop. Bank	2650138 / 2651920		9466237985
104.	M.K.Gautam, DM, Agro (Addl)	2649408		9315895472
105.	Asha Munihal District Education Officer	2638875		9996829684
106.	Santosh Kumari, Distt.Employment Officer	2646110		9896046227
107.	Saroj Bala Gur DEEO Panipat	2645622		9354901117
108.	Chander Parkash , Secy Mkt. Committee PNP	2664496		9466201515
109.	Satpal Sandhu, Secy, Mkt Comm. SMK	2572128		9991912000
110.	Chander Parkash,Secy,Mkt. Comm. MLD	2584243		9466201515
111.	Ramesh Goel, Secy, Mkt Comm.Israna.	2598668		
112.	Asha Devi, Secy, Mkt Committee Bapoli.	2587267		9996036476
113.	Ravi Shankran, AGM, NABARD	6499503		9896348571
114.	Mahesh Chand, LDM, Panipat	2631992		9728942233
115.	Atul Narang, XEN, CADA, Binjhol			9812321288
116.	Daya Nand, D.M, SC F& Dev.Corpn	2635406		9416721329
117.	B.B.Gupta, D.M, WDC, Panipat(Addl.)	2656156		9896042469
118.	Kuldeep Sahgal, D.M, Backward Classes	2635406 (PP)		
119.	Dr. Arvind Sharma, MP Karnal	011-23782279	0184-2269999	9896180695
120.	Balbir Pal Shah, MLA Panipat	2652607	2650903	9896173232
121.	O.P. Jain, MLA Panipat Ru ral	2654647		9671969853
122.	Dharam Singh C hhokar, MLA Samalkha		9416010363	09811566843
123.	Krishan Panwar, MLA Israna	2584236		9896929101
124.	Suresh Kumar.S.H.O City	2699110		9729999918
125.	Yogesh Kanwar, S.H.O M.T.	2699122		9729999924
126.	Krishan Kumar S.H.O.Sadar	2699127		9729999937
127.	Vishal Kumar S.H.O.Smalkha	2699129		9729999943
128.	Vikram Man S.H.O.Madlounda	2699131		9729999952
129.	Jitender Kumar S.H.O.Israna	2699136		9729999949
130.	Ajiab Singh, SHO Bapoli	2699138		9729999947
131.	Virender Dalal SHO Chandni Bagh	2699116		9729999931

Health:

(a) List of Hospitals

Table-5.5(c) : List of Hospitals

Human Resources	Infrastructure
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					Specialist Doctors and Total No.	No. of Paramedics	Other Staff	ICU/No. of Beds	Operation Theater	ICU Facility	Lab Facilities	Mortuary	Air Ambulance Y/N	Triage facility	Psychosocial Care	Any other Facilities such as CT Scan, X-Ray, MRI Etc.
1	B.S.S.G.Hospital panipat	G.T Road Near bus stand,Panipat	G	Dr. Bhupesh Chaudhary 0180- 2697101	36	55	45	100 0	1	No	yes	yes	No	yes	No	X-ray only
2.	E.S.I Hospital Panipat	G.T Road near bus stand	G	Dr. Anil Malik0180-2697953	9	29	34	75 0	1	No	Yes	No	NO	Yes	NO	X-Ray only
3.	Hyderabadi Hospital	Saloni road Panipat	P	Dr. Naveen9316094160	32	80	15	100 25	2	yes	yes	NO	NO	NO	NO	X-Ray only
4.	Prem hospital	Bishan SarupColony	P	Dr. Pankaj 9896347776	15	50	15	75 15	1	yes	yes	NO	NO	yes	NO	All facilities
5	Maharaja Aggaesain Hospital Panipat	Devi Mandir Road Panipat	p	Dr. JP Saluja 9812275285	12	20	15	10 8	1	yes	yes	NO	NO	yes	NO	X- Ray only
6	Jindal Hospital	Devi Mandir Road Panipat	P	Dr. RP Jindal9416002847	4	12	4	16	1	Yes	Yes	NO	NO	Yes	NO	X-Ray Only
7.	Madaan Hospital	Assandh Road Panipat	P	Dr. T.R Madaan 99969235607	14	8	20	40 10	2	Yes	Yes	NO	NO	Yes	Yes	X-Ray Only
8.	Ravindera Hospital	Model Town	p	Dr. Ravindera 0180-2650380	7	18	20	35 05	1	Yes	Yes	NO	NO	Yes	NO	X-Ray Only
9.	Ahuja Hospital	Sanoli Road	p	Dr. Jagjit Ahuja	6	4	6	30 06	1	Yes	Yes	NO	NO	Yes	NO	X-Ray ONLY

(b) Ambulance Services

Table-5.5(d) : List of ambulance services

Sr. No	Name of the Hospital/ Agency	Full Address	Govt./Private	Total No. of Ambulance	Attendant Y/N	Contact Person	Contact No.
1.	B.S.S.G Hospital, Panipat	G.T Road, Near Bus Stand, Panipat	G	16	Driver	Mr. Rishipal Sharma	01802630102 99967-86557
2.	E.S.I Hospital, Panipat	G.T Road, Near Bus Stand, Panipat	G	1	Driver with Cleaner	Dr. Ravindra Bhatti	94675-17355
3.	Jan seva Dal	Civil Hospital Panipat	Semi Govt	6	Driver	Kailash	98130-66879
4.	Hyderabadi Hospital	Sanoli Road, Panipat	P	1	Yes	Shaym lal	85293-68776
5.	Prem Hospital	Bishan Sarup Colony	P	3	Yes	Dr. Ranju	0180-4090700
6.	Chaabra Hospital	Assandh Road Panipat	P	1	Yes	Dr. Ramesh Chhabra	0180 2651777
7.	Maharaja Aggersain, Hospital	Devi mandir Road, Panipat	P	1	Yes	Mr. K.L Verma	0180-2697018
8.	Jindal Hospital	Devi mandir Road, Panipat	P	2	Driver	Mr. Sahabuddin	9255130791
9.	Madaan Hospital	Assandh Road Panipat	P	1	Yes	Dr. T.R Madaan	9354923560

Blood Banks:

Table-5.5(e) : List of Blood Bank

Sr. No	Name of the agency	Full Address	Govt/Private	Capacity	Blood Component Y/N	Contact Person	Contact No.
1.	Panipat Blood Bank	Dr. B.K Gupta, Hospital,	P	300 Blood Unit	N	Dr. B.K Gupta	0180-2697887
2.	Bharat Blood Bank	Sukhdev Nagar, Panipat	P	200 Blood Unit	N	Shashi Chandra	9802200035
3.	Prem Blood Bank	Bishan Sarup Colony	P	250 Blood Unit	Y	Dr. Pankaj, Dr. Neelima	98120-30191, 9050577569
4.	Red Cross Blood bank	G.T Road, Panipat	Semi-Govt	300 Blood Unit	N	Om Prakash	0180-4008357, 9216835189

Nursing Institutes:

Table-5.5(f) : List of Nursing Institutes

Sr. No	Name of the Nursing institutes/College	Full Address & Contact No.	Govt/Private	Strength of Nurses	Infrastructure Available	Contact Person	Contact No.
1.	Ved Nursing Institute	VPO Baroli, Panipat	P	430	Yes	N.N Pandey	92552-35609

Medical Laboratory:

Table-5.5(g) : List of Medical Laboratory

Sr. No	Name of the agency	Full Address	Govt/Private	Type	Contact Person	Contact No.
1.	B.S.S.G Hospital, Panipat	G.T Road, Near Bus Stand, Panipat	G	Public Health lab	Dr. Shyam lal	9896155221
2.	E.S.I Hospital, Panipat	G.T Road, Near Bus Stand, Panipat	G		Kamal Ahuja	9034686625
3.	Hyderabadi Hospital	Sanoli Road, Panipat	P		Anil Sharma	0180-2638031
4.	Prem Hospital	Bishan sarup Colony	P		Dr. Ranju	0180-2490700
5.	Maharaja Aggersain, Hospital	Devi mandir Road, Panipat	P	Advanced lab	Dr. Swagat Bhardwaj	9354656700
6.	Jindal Hospital	Devi mandir Road, Panipat	P		Dr. R.P Jindal	9416002847
7.	Madaan Hospital	Assandh Road. Panipat	P	Advanced lab	Dr. Sushma Madaan	9813900514
8.	Ravindra Hospital	Model Town, Panipat	P		Dr. Ravinder	0180-2650380
9.	Chhabra Hospital	Assandh Road, Panipat	P		Dr. Padmini chhabra	0180-2651777
10.	Kashyap Diagnostic	Tehsil Road Panipat	P		Dr. Roshan kashyap	9416011288

Medical store:

Table-5.5(h) : List of Medical store

Sr. No	Name of the Medical store	Full Address	Distributor/Wholesaler	Contact Person	Contact No.
1.	Geeta Medical Store	Sanoli Road, Panipat	Retailer	Ramesh Kumar	9416101717
2.	Chaudhary Medical Hall	Rajguru Market, Panipat	Wholesaler & Retailer	Sudhir Khurana	9812990786
3.	Atwill Trading Company	Rajguru Market, Panipat	Wholesaler & Retailer	Jitender	9812412233
4.	Punjab Medical Hall	Assandh Road, Panipat	Wholesaler	Sahil gabba	9812127442
5.	Hans Medical Hall	Ram lal Chowk, Model Town, Panipat	Retailer	Hansraj Batla	9812324880
6.	Rudolf life Science	Ludhiana Market, near Red Light, Panipat	Distributor	Manoj Khurana	9812290786
7.	Chemist Corner	Prem Hospital, Panipat	Retailer	Sanjay Bhatia	9812332038
8.	Ahuja Medical Store	Rajguru Market, Panipat	Wholesaler	Gulshan Ahuja	9812330214
9.	Saini Medical Hall	Model Town, Near Ravindra Hospital	Retailer	Inder Singh saini	9812122605
10.	Medicine House	Rajguru Market, panipat	Wholesaler	J.B kataria	9812530705

Table-5.5(i) : List of Fire and Emergency Department details

Fire and Emergency Department Details of Fire Stations Sr. no	Location of Fire Station	Contact No.	Name of the nodal Officer and Contact No.	No. of Other Staff (Fireman leading Fireman)	Contract Fire Staff	Type of Vehicle	Total No. of Vehicle	Contact person name & No.
1.	Head Office Hali Park, Panipat	0180-2650458, 101	Shri Satyawan-II Fireman, 9416096618	Sh. Krishan lal. LFM Sh. Satnarayan, FM Sh. Satyawan-II FM Sh. Rajbir, FM Sh. Somdutt, FM Sh. Balbir , FM Sh. Ajit Singh, FM Sh. Randhir Singh, FM Sh. Sunil Kumar, FM Sh. Vinod Kuamr, FM Sh. Jitender, FM Sh. Azad Singh, FM Sh. Ramdhari,	Fireman-27 Nos Drivers-12 Nos	Water Bouzer-3 Nos Capacity 12000 Ltr. Water Tender-3 Capacity 5000 Ltr. Small water Tender-2	07	Sh S.S Narwal, Fire Station Officer, Panipat 9416564224

				FM Sh. Gordhan, FM Sh. Sandeep, FM Sh. Nafe Singh, D/o Sh. Suresh Kumar, D/o Sh. Krishan , D/o Sh. Soran Singh, D/o Sh. Shiv Charan, D/o Sh Dharamvir, D/o		Capacity 2000 Ltr. Rescue tender-1		
	Sub Fire Station, Sec-25, HUDA, Panipat	0180 2660101, 2670458	Sh. Charanjeet Singh, SFO, Panipat					9416413053

FIRE STATIONS	OFFICE
Fire Station City	101,2650458 (R)-2639518
Fire Station Refinery	2578727
Fire Station N.F.L.	2652876
Fire Station Thermal	2586750

Industrial Health and Safety:

Table-5.5(j) : Industrial Health and Safety

Sr. No	Name of the Agency/ Organization	Govt./Private	Equipment	Address of Item stored/ Kept	Contact Person Name & Ph. No.	Quantity /No.	Item Description
1.	O/o Deputy Director IS & H, Panipat	Govt	Aluminum Extended ladder	Room No. 505, 5th Floor Mini Secretariat,	2.	-do	Face mask with ammonia screw-in-canister
2.	-do	-do-	Face mask with ammonia screw-in-canister	-do	-do	4	-
3	-do	-do-	Face mask with Chlorine screw-in-canister	-do	-do	4	-
4	-do	-do-	Self contained breathing apparatus	-do	-do	2	-
5	-do	-do-	Chemical spill absorbing sorbets	-do	-do	40	-
6	-do	-do-	Folder Stretcher	-do	-do	19	-
7	-do	-do-	Safety Helmets	-do	-do	12	-
8	-do	-do-	Safety Belts	-do	-do	08	-
9	-do	-do-	Ear Plugs	-do	-do	50	-
10	-do	-do-	Dust masks	-do	-do	50	-

Police Stations:

Table- 5.5(k) : List of Police Station

Sr. No	Name of Police Station/Sub-station/Chowki/ Control Room	Name of the Nodal Officer and Contact No.	No. of Other Staff	Equipments	Quantity	Total No. of Vehicle	Type of Vehicle
1.	P.S City PPT	Sh. Virender Vij DSP/City 9729999904	139	Rifle SLR Sten+ Carb Lathi Halmet Danda Body. Pro	60 30 11 78 45 09 09	04 09 04	Gypsy Ridder M/Cycle
2.	P.S Sadar PPT	Sh. Rajbir singh DSP/HQ 9729999903	68	Rifle SLR Sten+ Carb Lathi Halmet Danda Body. Pro	26 10 08 25 29 -36	02 04 01	Gipsy Ridder Bolero
3.	P.S M. Town	Sh. Pardeep Shayokand DSP/T 9729999905	96	Rifle SLR Sten+ Carb Lathi Halmet Danda Body. Pro	30 10 13 36 26 -09	02 06 03	Gipsy Ridder M/Cycle
4.	P.S Ch Bagh	Sh. Rajbir Singh DSP/HQ 9729999903	121	Rifle SLR Sten+ Carb Revolver Lathi Halmet	35 10 16 02 77 36	3 8 4 1 1	Gypsy Ridder M/Cycle Bolero Quallis
5.	P.S Samalkha	Sh. Shyam lal DSP/SMK 9729999906	86	Rifle SLR Sten+ Carb Lathi Halmet Danda Body. Pro	21 10 07 105 65 40 08	04 07	Gypsy Ridder
6.	P.S Israna	Sh. Virender Vij DSP/City 9729999904	42	Rifle SLR Sten+ Carb Lathi Halmet Danda Body. Pro	25 20 05 25 25 -35	02 02	Gypsy Ridder
7.	P.S Bapoli	Sh. Shyam Lal DSP/SMK 9729999906	23	Rifle SLR Sten+ Carb Lathi Halmet Danda Body. Pro	15 05 02 06 -06 01	01 01	Gypsy Ridder
8.	P.S Madlauda	Sh. Pardeep Shayokand DSP/T 9729999905	82	Rifle SLR Sten+ Carb Lathi Halmet Danda Body. Pro	41 15 11 34 30 34 38	1 5 2 1	Gypsy Ridder M/Cycle Sumo
9	Police Line	Sh. Jagat Singh Addl/SP 9729999902		Rifle SLR LMG	190 109 07		

Detail of Human Resource in the District:

Red Cross, Human Resource available in Panipat and nearby Districts

Table-5.5(l) : Details of human resource available in the districts

Sr. No	Name of the District	Contact Person	Phone No.
1.	Panipat	Smt. Vijay Choudhary	9355098525
2.	Delhi	Sh. Vikas Kumar	9812469292
3.	Panipat	Sh. Suresh Kr.	9466785515
4.	Kurukshetra	Sh. Satish Kr.	9416565708
5.	Panipat	Sh. Kadam Singh	9914418431
6.	Panipat	Sh. Vinod Kumar	9466619940
7.	Panipat	Sh. Lalchand	9416473559
8.	Panipat	Sh. Sandeep	9416412080
9.	Panipat	Sh. Kuldeep	7206300028
10.	Panipat	Sh. Jitender	7206500028
11.	Panipat	Sh. Balbir Singh	-
12.	Jind	Sh. Manoj Kr.	9416549557
13.	Panipat	Sh Ramesh Kr.	9416316361
14.	Panipat	Sh. Virender Singh	9991079999
15.	Karnal	Sh. Jasmer	9729910894
16.	Rohtak	Sh. Sunil	9354566668
17.	Rohtak	Sh. Vikas	9812223597
18.	Panipat	Sh. Ashok Kr.	9466366568
19.	Panipat	Sh. Mohinder Singh	9416572460
20.	Panipat	Sh. Bhoop Singh	9991225562
21.	Panipat	Sh. Surender Singh	9996460592

DEPARTMENT OF REVENUE AND DISASTER MANAGEMENT

Table-5.5(m): Details of Flood Relief Equipment department of revenue and disaster management

Sr. No	Name of the Office	Kind of Equipment	In working Order	Repairable	Total
1.	Tehsildar, Panipat	Aluminum Boats		02	02
2.	Tehsildar, Samalkha	-do	01	01	02
3.	N.T Bapoli	-do		02	02
4.	B.D & P.O , Panipat	-do	01	02	03
5.	B.D & P.O, Samalkha	-do	00	04	04
6.	B.D & P.O, Bapoli	-do			
7.	Tehsildar, Panipat	Oars	06	04	10
8.	Tehsildar Samalkha	-do	08	02	10
9.	N.T Bapoli	-do	04	0	04
10.	B.D & P.O. Panipat	-do	08	07	15
11.	B.D & P.O. Samalkha	-do	05	05	10
12.	B.D & P.O. Bapoli	-do			
13.	Tehsildar , Panipat	Life Jacket	10	0	10
14.	Tehsildar, Samalkha	-do	28		28
15.	N.T Bapoli	-do	05		05
16.	B.D & P.O Panipat	-do	12	10	22
17.	B.D & P.O Samalkha	-do	05	05	10
18.	Tehsildar Samalkha	Trailor	01		01
19.	B.D & P.O, Samalkha	-do		01	01
20.	Tehsildar, Panipat	OBM	02		02
21.	Tehsildar Samalkha	-do-	01	02	03

Trained personnel

Table-5.5(n) : Details of trained personnel's

Sr. No	Name	Office	Contact No.
1.	Sh. Mahabir Singh , DRA	D.C Office , Panipat	7206108800
2.	Sh. Ajmer Singh, Assist.	D.C Office, Panipat	9416572351
3.	Sh. Rajbir Singh, Asstt.	D.C Office, Panipat	9253287486
4.	Sh Khagesh Kant, patwari	Sub-Tehsil Madhlouda	
5.	Sh. Ranvir Singh, patwari	Sub-Tehsil Madhlouda	
6.	Sh. Ramesh Chander,	P.No 2172, C/o Commandant Home Guard, Panipat	
7.	Sh. Lakshman Singh	P.No 2055, C/o Commandant Home Guard, Panipat	
8.	Sh. Parkash Chand	Water Division, Panipat(Binjhol)	
9.	Sh. Prem Singh, mate	Water Division, Panipat(Binjhol)	9671012032
10.	Sh. Ram phal, ADO	C/o Deputy Dir agr. Panipat	
11.	Sh. Ramratan	Irrigation	
12.	Sh. Pritam Singh, Baildar		
13.	Sh. Balbir Singh, Baildar		
14.	Sh. Balbir Singh, Field man	Office of D.D.A Panipat	
15.	Sh. Manjeet Singh	C/o Water Service Division Panipat	08950979997
16.	Sh. Manjeet Singh Gautam	C/o Water Service Division Panipat	09728704091
17.	Sh. Suresh Kumar	C/o Water Service Division Panipat	9992154558
18.	Sh. Dharmbir Singh	C/o Water Service Division Panipat	9050884990
19.	Sh. Munish Kumar	C/o Water Service Division Panipat	9050502091

District Incident Response System (IRS):

Incident Response System (IRS) is a management system for reducing response time for effective management at the disaster site. It is a flexible mechanism which is adaptable for natural as well as man-made disaster.

Incident Response system organisation for Panipat District:

IRS organisation comprises Responsible Officer (RO) i.e. Deputy Commissioner of Panipat & Incident Commander (IC) i.e. is Additional Deputy Commissioner of Panipat and IRTs (Incident Response Team) of the district. Deputy Commissioner of Panipat is overall in-charge for the management of onsite response to any incident in the district. He may delegate his responsibilities to Additional deputy Commissioner of Panipat as IC. On the receipt of early warning, Deputy Commissioner as RO will activate all the IRTs and in case of disaster occurs without warning the local IRT will respond automatically and contact RO for further support if required. Panipat City magistrate has to be designated as Nodal Officer for proper coordination between the district, block and village level. Incident commander is responsible for overall management in the district in respect to incidents. He is appointed by RO. For his assistance and management of the incident there are two sets of staff.

A) Command Staff

B) General Staff

HSIIDC will setup its own DMP team for onsite management of Disaster. The DMP team organization of HSIIDC Panipa is as follows:

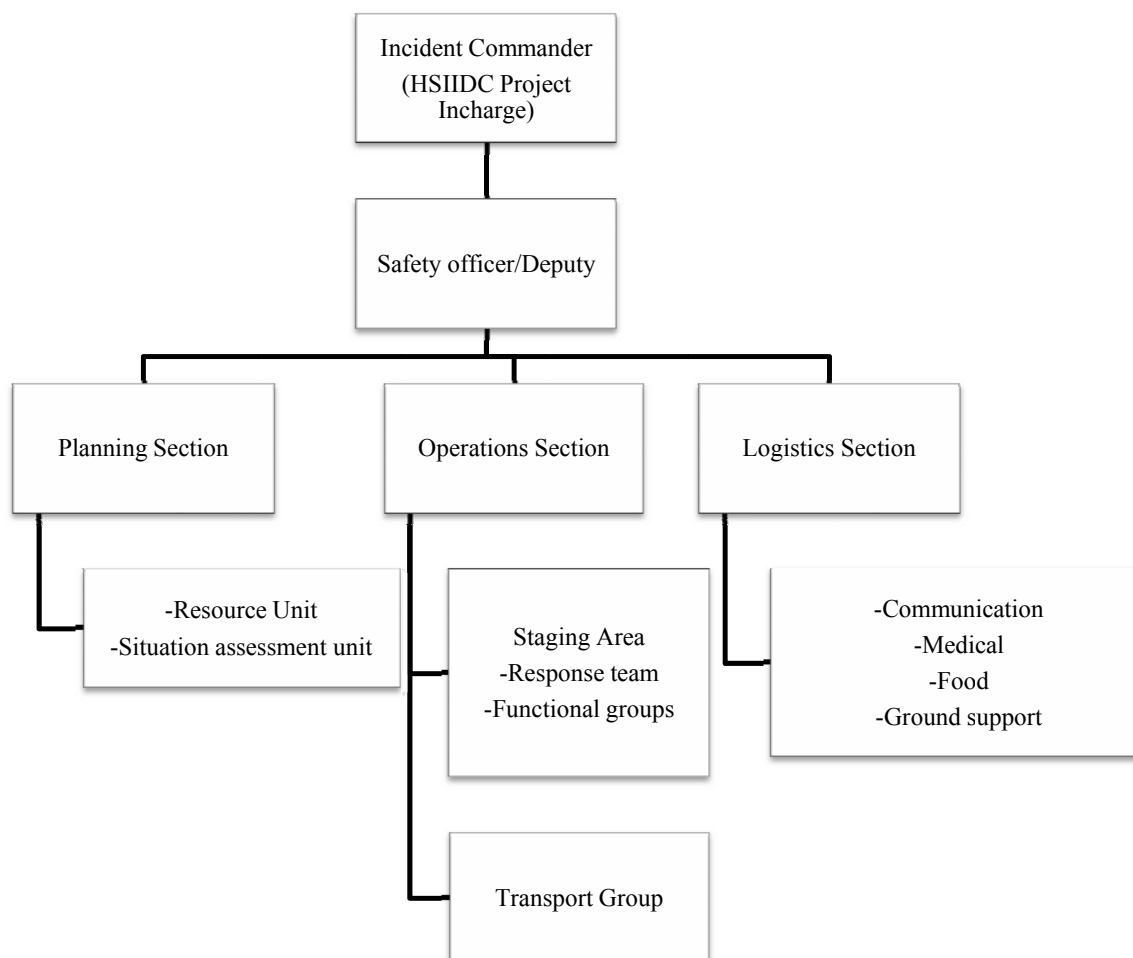


Figure: 5.5(b) – Organization structure of HSIIDC DMP team, Haryana

Table-5.5(o): Details of flood control room of Panipat

Sr. No	Place of Control Room	Phone no
1	Deputy Commissioner office, Panipat Distt. Revenue Officer, Panipat	9812450650
2	Tehsil Office, Panipat Ram Mehar, N.T , Panipat	966722100
3	Tehsil Office, Samalkha Gyani Ram Tehsildar, Samalkha	9991262699
4	Tehsil Office, Israna Darbara Singh Tehsildar, Israna	9896844785
5	B.D & P.O, Bapoli B.D & P.O, Bapoli	9254269606
6	Bapoli N.T Bapoli	9813025600

Vibration Management:

1. DGMS prescribed permissible limit of ground vibration (INDIA)

Type of structures	Dominant excitation frequency, Hz		
	< 8Hz	8-25Hz	>25Hz
(A) Buildings/structures not belong to the owner			
1. Domestic houses/structures (Kuchcha, bricks & Cement)	5	10	15
2. Industrial building	10	20	25
3. Objects of historical importance & sensitive Structures	2	5	10
(B) Buildings belonging to the owner with limited span of life			
1. Domestic houses/structures	10	15	20
2. Industrial buildings	15	25	50

2. Bureau of Indian Standard (1973)

a. Soil, weathered or soft conditions	70 mm/s
b. Hard rock conditions	100 mm/s

3. CMRI Standard (Dhar et al, 1993)

Type of structures	PPV(mm/s)	
	<24 Hz	>24 Hz
Domestic houses, dry well interior, construction Structures with plasters, bridge	5.0	10.0
Industrial buildings, steel or reinforced concrete structures	12.5	25.5
Object of historical importance, very sensitive Structures, more than 50 years old construction and Structures in poor state condition	2.0	5.0

Vibration classification ranges

For the valuation of machines and equipment in the ISO 2372 and VDI 2056, four different kinds of machine groups with four classification ranges and their limits for vibration severity (mm/s) are determined.

The classifications for each machine group are specified as follows:

Small machines, especially production electrical motors of up to 15 KW (Group K)	
Good	0 to 0.71 mm/s
Acceptable	0.72 to 1.80 mm/s
Still permissible	1.81 to 4.5 mm/s
Dangerous	>4.5 mm/s
Medium sized machines, especially electrical motors with 15 up to 75 KW output, without special foundations (Group M)	
Good	0 to 1.12 mm/s
Acceptable	1.13 to 2.80 mm/s
Still permissible	2.81 to 7.1 mm/s
Dangerous	>7.1 mm/s
Large machines on heavy foundations (Group G)	
Good	0 to 1.80 mm/s
Acceptable	1.81 to 4.50 mm/s
Still permissible	4.51 to 11.2 mm/s
Dangerous	>11.2 mm/s
Largest machines and turbo machines with a special foundations (Group T)	
Good	0 to 2.80 mm/s
Acceptable	2.81 to 7.10 mm/s
Still permissible	7.11 to 18.0 mm/s
Dangerous	>18 mm/s