

RISK ASSESSMENT & DISASTER MANAGEMENT

GENERAL INFORMATION ABOUT THE FACTORY:

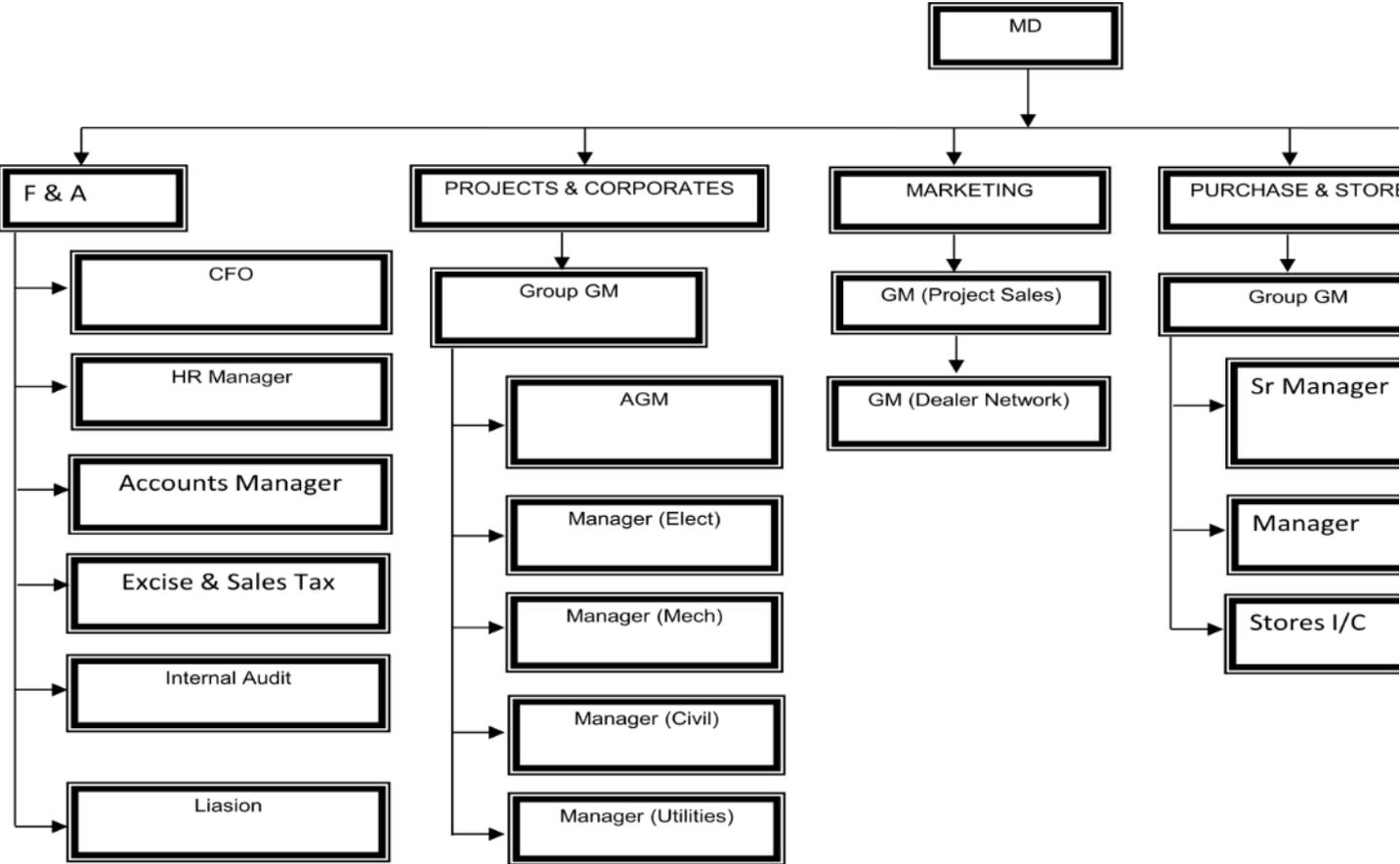
M/s. Bravo Sponge Iron Private Limited (BSIPL) Ltd. was originally incorporated on 14th February 1997 and started making sponge iron since 2003. In June 2015 it has been taken over by Shakambhari Ispat Group who are having a vast experience in the line of steel manufacturing. Presently, the company is making 62,400 TPA sponge iron for sale.

M/s. Bravo Ltd. now proposes to expand its existing unit with following additional configuration.

- 2X100TPD DRI kilns
- 4X15 T IFs with matching CCM
- 600 TPD rolling mill
- 18 MW CPP (8 MW WHRB+ 10 MW CFBC/AFBC).



6.1.1 Organizational Structure of BSI PL



Man Power

Maximum number of persons available in the plant at any point of time is as follows:

Table 6.1: Persons working under various shifts

SL. NO.	SHIFT	PERIOD	AVERAGE EMPLOYMENT/DAY
1.	A	0600-1400 Hrs	75
2.	B	1400-2200 Hrs	75
3.	C	2200-0600 Hrs	75
4.	R	-	75
5.	G	0900-1800 Hrs (Lunch Break: 1300-1400 Hrs)	50
Total			350

Depending on requirements employees are called in different shifts and few employees are called on duty in national/ festival holidays and off days. The licensed capacity of the unit is 350.

A steel industry is hazardous by its very nature. The nature of various hazards in Bravo Steel Plant is detailed below in Table (6.2):

Table 6.2: Nature of Hazards in BSI PL

Hazards	Source
Fire Hazard	Spillage of Fuel Oil,
Explosion due to spillage of hot metal coming in contact with water	Spillage/Transfer of hot metal, or liquid steel
Heat radiation due to hot metal handling	Spillage of liquid metal, liquid steel and hot slag
Accidents due to failure of Material Handling(lifting & carrying) Equipment	Connected with all Material Handling Equipments through EOT cranes
Accidents due to failure of high pressure steam ,water or oil lines	AFBC and WHRB

6.1.2 Onsite Emergency Plan

TOR-7(XIII) ONSITE AND OFFSITE DISASTER PREPAREDNESS AND EMERGENCY MANAGEMENT PLAN INCLUDING RISK ASSESSMENT AND DAMAGE CONTROL.

In a steel plant, the steel making process involves a number of hazardous processes starting from raw material handling, melting of iron ore, and converting iron into steel till the finished products. Also, the by-product plants, captive power plant, utilities & other auxiliary plants use considerable amount of combustible materials and these materials are stored in bulk storages like tanks, cylinders, drums, and gas holders etc., installed in the plant posing major risks.

Bursting of high pressure steam lines or BFW lines can also series of accidents and to prevent that periodic NDT and maintaining record timely action is necessary.

From the detailed HAZOP study, various possible hazards and their associated processes & equipments are identified. The list of these identified hazardous equipments in the plant is given in following pages. The potential hazards from the above identified equipments and from the various hazardous operations/processes in the plant have been analyzed and the possible causes for occurrence of such hazards, likely consequences and the remedial action required are suggested.

PROCESS DESCRIPTION (in brief)

DRI

Sponge iron is manufactured through the coal-based route in which iron ore is converted into Sponge Iron or directly reduced iron in a rotary kiln using coal both as reductant and fuel.

Rotary kiln unit comprises of raw materials storage bins, rotary kiln, rotary cooler, product screening and magnetic separation units, After Burning Chamber and in-plant dedusting system.

Iron ore and coal, after proper sizing in the respective crushing and screening stations as well as sized dolomites are fed to the raw material day bins for kiln.

With the rotation of the kiln, the charge moves down the slope and the surface of material is exposed to heat and reducing atmosphere. The reduction from iron oxide to iron occurs by a gradual removal of oxygen at various temperatures under the controlled reducing atmosphere giving rise to various intermediate oxides.

Hot sponge iron is discharged from the kiln-discharge end and taken into the rotary cooler. The sponge iron after cooling is discharged through the cooler discharge chute into a heat resistant belt conveyor and carried into the product processing building. The product (Magnetic in nature) is screened and separated from char, which is not magnetic.

The gas generated, during the process, contains fine carbon particles, carbon monoxide ash dust which are separated and waste heat associated with gas is recovered in WHRB from which power is generated.

STEEL MELTING SHOP (SMS):

In the SMS section scrap and Pig iron are charged in IF along with DRI and heated and melted by electrical eddy current. After achieving the desired composition and temperature, slag is scooped out from the top of hot metal and hot metal is poured into transfer ladle crucible and sent to CCM after addition of requisite amount of Ferro alloys.

In CCM liquid steel is casted to billets.

ROLLING MILL:-

Steel Billets from CCM are cut to desired sizes and fed to hot rolling mill for shaping to steel rods. The rods undergo short time quenching in water bath for sudden surface cooling while

core remaining red hot. By slowing cooling in air stress is relieved and thus TMT rods are produced and stored for bulk sale.

CIRCULATING FLUIDIZED BED COMBUSTION BOILER):

In AFBC/CFBC, coal is crushed to a size of 1 – 10 mm depending on the rank of coal, type of fuel feed and fed into the combustion chamber. The atmospheric air, which acts as both the fluidization air and combustion air, is delivered at a pressure and flows through the bed after being preheated by the exhaust flue gases. The velocity of fluidizing air is in the range of 1.2 to 3.7 m /sec. The rate at which air is blown through the bed determines the amount of fuel that can take part in reaction.

Almost in all AFBC bubbling bed boilers use in-bed evaporator tubes in the bed of limestone, sand and fuel for extracting the heat from the bed to maintain the bed temperature. The bed depth is usually 0.9 m to 1.5 m deep and the pressure drop averages about 10mm of water per cm of bed depth.

Very little material leaves the bubbling bed – only about 2 to 4 kg of solid is recycled per ton of fuel burned(CFBC). The combustion gases pass over the super heater sections of the boiler, flow past the economizer, the dust collectors and the air pre heaters before being exhausted to atmosphere. The main special feature of atmospheric fluidized bed combustion is the constraint imposed by the relatively narrow temperature range within which the bed must be operated. With coal, there is risk of clinker formation in the bed if the temperature exceeds 950°C and loss of combustion efficiency if the temperature falls below 800°C. For efficient sulphur retention, the temperature should be in the range of 800°C to 850°C

CFBC at Bravo generates super heated steam at 110 kg/cm²a and 5400C

INVENTORY OF RAW MATERIALS

The inventories of raw materials used in the process are listed in the table below, which gives details of material stored. It contains maximum one month storage for each substance in process and transferred to day tanks to meet daily consumption, it is because day tanks are connected to unit where it is consumed.

Table No.6.3 Maximum storage of capacity of raw materials

SL. NO.	Operating Unit	RAW MATERIALS	MAX. STORAGE CAPACITY/ month (Metric Tons/Month)
1.	Sponge Iron Plant	Iron Ore	15,016
		Coal	12,427
		Lime Stone	621
2.	Induction Furnace	Sponge Iron	10356
		Pig iron	1643
		Scrap	821
		Ferro Alloy	180
3.	Captive Power Plant	Waste heat recovery type boilers are installed for electrical power generation, No raw material required.	

4.	Captive Power Plant	Char @ 22% ash	2485
		Coal fines @25% ash	16782

INVENTORY OF HAZARDOUS SUBSTANCES:

TOR 3(V) OTHER CHEMICALS AND MATERIALS REQUIRED WITH QUANTITIES AND STORAGE CAPACITIES

The inventory of Hazardous materials is mentioned below:

Table 6.4: List of Hazardous materials

Sl. No.	Name Of Hazardous Substances	Maximum Storage Capacity	Normal Storage Capacity	Tank Size
1.	LDO for CFBC and DRI kiln cold start up (Above Ground, fenced as per norms of explosive Authority)	2 X 30 KL	2x15 KL	Two no, each Dia-3.0 m Height-3.4 m
2.	FO for SMS ladle preheating (Above Ground, fenced as per norms of Fuel oil storage regulation)	1x30 KL	1x20 KL	Dia-3.0 m Height-3.4 m

Emergency Action Plan:

Emergency Planning begins with the identification and assessment of the principal hazards which are normally fire, explosion and toxic release. With the growing complexity of the process plants, more systematic and searching methods for risk identification and quantification have been developed over the years. Generally the emergencies that occur in process plants are classified into two categories. The one whose effects remain within the boundary limits of the plant is known as On-Site Emergency and the one where the effects go beyond the boundary limits is known as Off-Site Emergency. In BSIPL, the requirements of the On-Site Emergency Plan are addressed due to fire hazard only.

This On-Site Emergency Plan is prepared for Bravo Sponge Iron Pvt. Ltd in accordance with the guidelines provided by the Ministry of Environment & Forests (MoEF), Govt. of India, covering the various hazardous processes and the bulk storages of hazardous materials, toxic gases etc., in different departments.

ToR 3(ix) HAZARD IDENTIFICATION AND DETAILS OF PROPOSED SAFETY SYSTEMS

6.1.3 Identification of Hazards

Hazard is in fact the characteristics of a system/plant/storage that presents potential for an accident and risk is the probability of occurrence of hazard. Hence hazard identification is of prime significance for the quantification of risk and for cost-effective

control of accidents in any industrial installation. Various techniques of predictive hazard evaluation and quantitative risk analysis suggest identification of hazard has very important role in estimation of probability of an undesired event and its consequences on the basis of risk quantification in terms of damage to personnel, property and environment.

Hazards are mostly manifested in the form of fire/ explosion/ toxic release. Each anticipated hazard scenario associated in the unit at described along with its assessment of impact on plant and locality in the following table:

Table 6.5: Anticipated Hazard Scenarios

Sl. No.	Area/Activity	Hazard	Impact
1	Storage and Handling of LDO	Pool fire / Fire ball may occur in case of direct contact with flame.	Fire may propagate to the nearby areas leading into fire hazard.
2	Storage and Handling of Furnace Oil (FO)	Pool fire/ fire ball may occur in case of direct contact with flame.	Fire may propagate to the nearby areas leading into fire hazard

IDENTIFICATION OF MOST CREDIBLE HAZARD SCENARIOS

All the anticipated hazard scenarios associated with the factory (as listed above) are critically analyzed and the following scenarios are identified as Credible Scenarios:

Credible Scenario – A : Pool Fire in Light Diesel Oil Storage Tank area.

Credible Scenario – B : Pool Fire in FO Storage Tank area.

As there is other nearby establishments, the fire from LDO/FO tanks can easily spread causing extensive damage to the materials. On the basis of above consideration the pool fire due to fire hazard in the storage tank is not considered as most credible scenario.

Tanks are described by their roof type: Combustible liquids are typically stored in large cone-roof tanks, smaller low-pressure vertical or horizontal tanks, A flammable liquid is defined as a liquid whose flash point does not exceed 38°C, when tested by closed- cup test methods, while a combustible liquid is one whose flash point is 38°C. Flash point of LDO is 660C and it is not a flammable liquid. Tank fire spreads vertically taking a conical shape due to rush of air from all directions,

Tank fire may be caused by lightening, but when tank leaks or overflows due to mal operation of instruments or negligence of operator and liquid gets ignited by chance; then this may be treated as a large pool fire and to be dealt as a common fire.

But in case of disaster due to natural calamities a disaster management team will come to action.

6.1.4 ROLE OF KEY PERSONS

WORKS MAIN CONTROLLER:

He is the Managing Director of the unit and is generally available in the factory or in the colony nearby except on tours. On emergency, he can reach work site at any odd hour within 20 minutes time. In his absence, GM (Plant) shall take up his charge as Works Main Controller (WMC).

On being informed of an incident, he has to:

Rush to the emergency Site, collect all information from SIC.

- Decide if emergency is to be declared and advise Site incident Controller (SIC) accordingly and reach Emergency Control Room (ECR).
- Advise Rescue Team Leader (RTL)/ Security Gate to blow the siren with appropriate code for declaration of emergency.
- Two minutes with a pause of five seconds for 3 times for fire hazard.
- Three minutes with pause of five seconds for 5 times for Gas leakages.
- Advice (Auxiliary Team Leader) ATL for communication to statutory authorities and for mutual aid as required.
- Through (Auxiliary Team Leader) ATL ensure constant communication to statutory authorities and to mutual aid partners as required.
- Maintain continuous communication with Site Incident Controller (SIC) to review the situation and assess the possible course of action for emergency operations.
- To declare normalcy at the end of operation and advise Rescue team leader (RTL)/security Gate to blow "all clear siren" [for 1 minute continuously].
- Ensure the record keeping of emergency operations chronologically.

SITE INCIDENT CONTROLLER:

He is available at the factory or in the colony nearby. At any point of time and on being informed about an accident, he has to:

Intimate the works main Controller (WMC) and proceed to the emergency site.

- Take the necessary instruction from Combat Team Leader (CTL), assess the situation and call Rescue Team Leader (RTL) and Auxiliary Team Leader (ATL).
- Inform Works Main Controller (WMC) regarding the situation.
- Take necessary steps and provide guidance to Combat Team, Rescue Team, and Auxiliary Team Leaders to mitigate the emergency situation.
- Examine for major emergency shutdown operation activities, decide safe escape route and announce for evacuation to Assembly Point.

- Inform Works Main Controller (WMC) about the status of the situation at regular intervals.

COMBAT TEAM LEADER

He is the leader to attend to the emergency and is available in the factory or in the colony at any instant.

On being informed about an accident, he has to:

- Immediately rush to the site and lead the team to control the situation.
- Inform Site incident controller (SIC) about the incident and request him to rush to the spot.
- Instruct the rescue Team leader (RTL) for fire fighting and medical assistance.
- Co-ordinate the activities of team members and combat the emergency, so as to eliminate the root cause of the hazard.
- Shut-down the plant if necessary to take up repair measures.
- To arrest the leakage and spillage from various equipments, shut down the concerned equipments.
- Take necessary action to remove unwanted persons from the site of the incident.
- Keep informed about the developments to Site incident Controller (SIC).

RESCUE TEAM LEADER

He is the person who conducts rescue operations and should be available at any instant.

On receiving the information about the incident he has to:

- Rush to site of emergency through safe route.
- Ensure presence of all his team members, availability of fire fighting facilities and take necessary action to arrest the fires/leakage of gas.
- Arrange for safe escape of entrapped persons.
- Make necessary arrangements to send the affected persons for immediately medical attention through the medical officer.
- Search for the missing persons on the basis of role call taken by Auxiliary team leader (ATL).
- Give the feedback to the site incident controller (SIC) about the developments.

AUXILIARY TEAM LEADER

He is the communication manager for the crisis management. On being informed of the emergency, he should proceed to Emergency Control Room (ECR) and:

- Keep in constant touch with works main controller (WMC) and Site Incident Controller (SIC).

- Inform the Statutory Authorities and District Administration.
- Communicate to mutual Aid Partners, Fire service stations at Jajpur Road.
- Send communications to District Hospital Jajpur Road for rendering services.
- Inform the relatives of casualties and send them to their residence or hospital as the case may be.
- Take care of visit of the authorities to the Emergency site.
- Give feed back to work main controller (WMC) about the status with respect to his areas of activities.

Table 6.6: Action Plan for On-Site Emergency

STEP NO	INITIATOR	ACTION TO TAKE
1.	The person noticing the emergency	<ul style="list-style-type: none"> • Inform the Security Gate, Combat team leader and the concerned Shift-in –charge immediately.
2.	Combat team Leader (CTL)	<ul style="list-style-type: none"> • Inform site incident Controller (SIC) and rush to spot and organize his team. • Take charge of the situation, arrange for fire fighting and medical first-aid available at site. • To start combating, shut-down equipments, arrest the leakage of gas/fire.
3.	Site Incident Controller (SIC)	<ul style="list-style-type: none"> • Inform works main controller (WMC) and rush to emergency site. • Discuss with Combat Team Leader (CTL), assesses the situation and call the Rescue Team Leader (RTL) & Auxiliary Team Leader (ATL). • Organize the Rescue Team and Auxiliary Team and send the rescue Team to site. • Arrange to evacuate the unwanted persons and call for additional help. • Pass information to the works main controller (WMC) periodically about the position at site.
4.	Works main Controller (WMC)	<ul style="list-style-type: none"> • Rush to emergency site and observe the ongoing activities. • Take stock of the situation in consultation with the SIC. • Move to Emergency Control Room. • Take decision on declaration of emergency. • Advise Auxiliary Team Leader to inform the statutory authorities and seek help of mutual aid from partners as required. • Decide on declaration of cessation of emergency. • Ensure that the emergency operations are recorded chronologically.

5.	Rescue Team (RTL)	<ul style="list-style-type: none"> • Consult with Site incident controller (SIC) and organize his team with amenities to arrest fire fighting and medical treatment. • Rush to Emergency Site through safe route along with the team members. • Arrange to set off the fire by fire fighting equipments and hydrant points to arrest the fire or to evacuate the area. • Shift the injured persons to hospital by ambulance after providing necessary first aid. • To inform the auxiliary team Leader for necessary help from mutual aid Partners.
6.	Auxiliary Team (ATL)	<ul style="list-style-type: none"> • On being directed by works main Controller (WMC) inform about the emergency to statutory authorities. • Seek help of Mutual Aid partners and Coordinate with Mutual Aid partners to render their services. • Arrange to inform the relatives of casualties. • Take care of visit of the authorities to the Emergency site.
7.	Team members	<ul style="list-style-type: none"> • Each of the team members should follow the instruction of concerned team leader to mitigate the emergency.

6.1.5 Salient Hour Command Structure

- The Senior Officers/ Key Persons of the plant remain during day time i.e. 8am to 8 pm. Hence the timing of 8pm to 8am is considered as silent hour that to 10pm to 8am is the crucial time. Still each and every unit/section of the plant is headed by shift in charge in the rank of Officer, Engineer or Sr. Engineer or Asst. Manager, who shall be responsible for handling the emergency. The other supporting/services and emergency sections like Fire Service, Ambulance, Security, Personnel, Water Supply, Transport departments etc. are also running for 24 hours shift wise with shift in charge and crew to handle emergency during the silent hour till main command personnel arrive. However, most of the key persons of the main command structure reside in nearby area and can reach within minimum time.
- The command structure of the silent hour shall be same as during normal hour, however, during the silent hour, the operation Shift-in charge of the concerned area where the fire or leakage of gas has taken place, shall act as SIC-in – charge, till the arrival of actual designation members.

6.2 ACTIVATION & CLOSING PROCEDURE FOR ON-SITE EMERGENCY

ACTIVATION PROCEDURE



The person noticing the incident of fire or leakage of gas, shall inform about the location & nature of fire to the combat team Leader (CTL), security Gate and concerned Shift-in-charge.

Combat team Leader (CTL) shall inform site incident controller (SIC) and shall rush to the site immediately. He shall arrange for fire fighting and first aid available at site. He shall arrange to take necessary steps to eliminate the root cause of fire.

Site incident controller (SIC) on getting information shall inform the WMC and reach the site at the earliest. He shall take over the charge and shall direct Rescue Team Leader (RTL) to carry out rescue operations including fire fighting and medical attention. Site incident controller (SIC) shall co-ordinate with Combat team leader (CTL) to eliminate the root cause of fire.

Work main controller (WMC), on arrival at site shall take stock of the situation from site incident controller (SIC) and then rush to emergency control room (ECR) to declare emergency on the basis of assessment made by (Site incident controller (SIC)). He shall give direction to the security gate/ (Rescue team Leader) RTL to activate siren.

Two Minutes with a pause of five seconds for 3 times for fire Accident.

- Three Minutes with a pause of five seconds for 5 times for leakage of gas.
- Rescue Team Leader (RTL) shall mobilize fire fighting and medical resources to site and shall assist (Site incident Controller) SIC.
- Auxiliary Team Leader (ATL) shall take charge of Emergency Control Room (ECR), shall ensure smooth operation of ECR and shall inform relatives of casualties. Informs mutual Aid partners and ensures their arrival at site if required.
- Auxiliary Team Leader (ATL) informs statutory authorities and district administration regarding emergency suitably and coordinates their visit at site.
- Works main controller (WMC) coordinates and keeps the track of all the activities at site and off the site and arranges the recording of the activities in a chronological manner for review of the Onsite emergency Plan.

6.2.1 Facilities Available For On-Site Emergency Plan:

(a.) Assembly Point:

In any emergency it will be necessary to evacuate people from affected zones or the zones likely to be affected, to a safer place. Safer places are identified and designated as Assembly Points. Taking the area and hazard zones into consideration two assembly points have been marked in two different areas i.e. one near administrative building (Assembly Point-1) and other near the SMS Area (Assembly Point-2) Both the points are well connectable to the plant road and facilities like drinking water, temporary shelter and first aid is available there. These points are to be displayed at different places inside plant and admin. Building.

(b.) Escape routes:

Escape routes are those that, allow reasonably safe passage of persons from the work area to assembly point during emergency situation. These routes would be different depending on wind direction, Fire and explosion scenario. Escape routes are ear marked on the drawings as well as on the routes, which will facilitate all for safe evacuation.

(c.) Emergency Control Room (ECR):

The emergency Control Room is a place from which all emergency management operation are directed and coordinated. Also it is the place from where all communication will be established, with outside agencies and district authority also.

Facilities Available at ECR:

- Plant general Layout, ear marked with hazard zone, Assembly points and escape routes.
- List of working personnel in various shifts and general shift.
- Mobile telephone Nos., of emergency command structure personnel.
- Emergency command structure.
- Rhythmical siren code for different emergency situation.
- Relevant material safety data sheet.
- Emergency Control Room Register.
- First Aid Box with antidotes.
- Required personal protective equipments with self carrying breathing app.

6.2.2 FACILITIES AVAILABLE

Fire Hydrant System

Fire pumps are to be connected to main fire hydrant to maintain a pressure of 7Kg/cm². In case of temporary power failure, the fire pumps are to run through DG set connection. An underground tank to store and supply water to the fire main. A security jeep is to be stationed at main gate (main control) to meet the emergency.

Fire Extinguishers

Required types of fire extinguishers are to be provided at different locations of the plant.

Fire Buckets

Fire buckets filled with dry sand must be provided in different locations of the plant.

Fire Tender

The company may have a fire tender of its own for major fire fighting operations or take external help, but that has to be finalized with external agency.

Siren

Company must have Siren/ hooter arrangement, which can be activated manually during fire related emergency.

Communication



Public address system and EPABX telephone will be available for effective communication inside the plant. Telephone directory is available in all the departments.

Dispensary

A well organized First-aid centre with ambulance, stretchers, oxygen cylinder etc. shall be located inside the factory. The First-aid centre is manned by one pharmacist, one attendant, external Ambulance service to be hired to meet emergency. The first-aid center is manned round the clock. In the event of emergency, doctors and staff attend from outside shall be called for which a doctor to be empanelled.

First Aid Box

Company has provided First Aid boxes with required first aid medicines at different locations inside the plant to address minor injuries. First aid boxes are checked by the pharmacists once in a month & medicines are filled/replaced. The first aid boxes are provided in the following locations:

DRI, Power Plant, Electrical Substation, DG room, Administrative building, SMS, Rolling Mill and Security Office.

6.3 DISASTER MANAGEMENT PLAN

Introduction:

Disaster may be defined as a sudden occurrence of incidence in such a magnitude as to affect the normal pattern of life inside or in the vicinity of plant which have the potential of causing extensive injury or loss of life or damage to property and tend to cause disruption inside/outside the site.

Hazardous substances are being handled, generated and stored in increasing quantities at various manufacturing facilities in recent years. This has posed a serious risk for the plant, persons and the environment encompassing thereof. The disasters following incidents in some industrial units handling hazardous substances in the last 2 to 3 decades has made it imperative for all concerned to devise measures and implement them immediately and effectively to mitigate their adverse effects, if not, to totally eliminate them. The need to protect human being, the flora and fauna as well as our bio-diversity against these potential dangers has prompted the government for promulgation of various statutory provisions for preparation of hazard mitigation plans based on their risk impacts.

The Factories (Amendment) Act 1987 and manufacture storage and Import of

Hazardous Chemical Rules- 1989 has provided regulation making mandatory for all owners of hazardous undertakings to prepare for their Onsite Emergency Plan in a pragmatic way and keep those well re-harassed for rapid action in actual crisis situation.

The goal of DMP is the effective containment of the emergency situation by proper mitigative action at the place of occurrence, cautioning people in adjoining affected localities; prompt rescue and provisions of medical aid to affected persons and communication to civil authorities for rushing in help from outside.

This objective is to be achieved by defining the functions and responsibilities of all concerned managerial, operational and supporting services department personnel with respect to detection and effective implementation of emergency action plan.

Objectives of Disaster Management Plan (DMP):

The objectives of DMP is to describe and spell out industry's emergency response actions that requires to be initiated to deal with various emergencies that could occur at the facility, with the response organization structure deployed in the shortest possible time. Thus the objective of emergency response plan can be summarized as:

Rapid control and containment of the hazardous situation.

Minimization of the risk and impact of event / accident.

Effective rehabilitation of the affected persons and prevention of damage to property.

Elements of DMP:

In order to effectively achieve the above mentioned objective of, the critical elements of the DMP are:

- Reliable and early detection of an emergency and careful planning.
- The command, co-ordination, and response organization structure along with clearly demarcated line and staff function.
- The availability of resources for handling emergencies.
- Appropriate emergency response actions forecasted with least margin of error.
- Effective notification and communication facilities.
- Proper training of the concerned personnel.
- Regular review and updating of the DMP.
- The DMP should open up with a forward duly signed by the plant-in-charge.
- Responsibility of Implementation of DMP:
- Responsibility for establishing and maintaining an Emergency Preparedness

Plan/DMP belongs to the Plant-in-charge. He is responsible for the control of the plan, and for ensuring that the plan is applicable and implementing procedures are operated during emergency situation and are reviewed and revised annually.

As a member of top management he is responsible for the training of personnel to ensure that adequate emergency response capabilities are maintained in accordance with the plan. He is also responsible for ensuring the regular conduct of drills and other measures, as outlined in the DMP.

6.4 ESC ACTIVITIES AS PER COMPANIES ACT

The company will spend 2.5% of its project cost i.e. Rs 390.85 lakh towards development of locality and local people under the guide line of Section 135 of the 2013 Companies Act, giving priority to issues raised during public hearing and in consultation of local administration. During any financial year BSIPL shall constitute the corporate social responsibility committee of the board to look after ESC activities.

The committee shall formulate the policy, including activities specified in Schedule VII, which are as follows:

- Eradicating extreme hunger and poverty
- Promotion of education
- Promoting gender equality and empowering women
- Reducing child mortality and improving maternal health
- Combating human immunodeficiency virus, acquired immune deficiency syndrome, malaria and other diseases
- Ensuring environmental sustainability
- Employment enhancing vocational skills
- Social business projects
- Contribution to the Prime Minister's National Relief Fund or any other fund set-up by the central government or the state governments
- Such other matters as may be prescribed

The committee will also need to recommend the amount of expenditure to be incurred and monitor the policy from a time-to-time. The board shall disclose the contents of the policy in its report, and place it on the website, if any, of the company.

TOR 8 (I) PLAN FUND ALLOCATION TO ENSURE THE OCCUPATIONAL HEALTH & SAFETY OF ALL CONTACT AND CASUAL WORKERS

M/s BSIPL has decided to expand its existing unit with 0.096 MTPA Sponge Iron to 0.192 MTPA Rolled product. ESC activities for the above said project will be based on Companies Act 2013 and will be decided based on public hearing, considering the requirements of people.

Separate fund allocation will be done under Occupational health head for expansion project.

Operations in the iron and steel industry may expose workers to a wide range of hazards or workplace activities or conditions that could cause incidents, injury, death, ill health or diseases.

6.5 OCCUPATIONAL HAZARD

"Source or situation with a potential for harm in terms of injury or ill health, damage to property, damage to the workplace environment, or a combination of these"

The modern definition of Occupational health is "The promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations – total health of all at work".

Occupational health is concerned with physical, mental and social well-being in humans in relation to his work and work environment, their adjustment to work and adjustment of work to humans

ILOs' Occupational health services recommendation, 1959 (No. 112) aims with following:

Protecting workers against any health hazard, which may arise out of work or condition in which it is carried on.

Contributing towards workers' physical and mental adjustment, in particular by adaptation of work to workers and assignment to jobs in which they are suitable and; Contributing to establishment and maintenance of highest possible degree of physical and mental social wellbeing of workers.

1972 ILO/WHO Conference Recommendations:

Occupational health is a wide field, and during last decade relative importance of its component parts has changed. This changing concept has been linked with scientific progress in relation to occupational health and safety and also with changes in evolution of work and work environment on part of individuals. In past emphasis was on safety, now it is more on health and job satisfaction.

In 1976, 29th session of World Health Assembly directed Director General to promote planning and implementation of comprehensive health programs for workers, as an integral part of National Health Programs.

Safety and Occupational Health policy of M/s BSIPL



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Safety and Occupational Health Policy (SOH)

Bravo Sponge Iron Pvt. Ltd. (BSIPL) reaffirms its commitment to provide safe work place environment to its personnel and other stakeholders as an integral part of its business philosophy and values. It will continually enhance our Safety and Occupational Health (SOH) performance in our activities, products and services through a structured SOH management framework.

Towards this commitment, we shall;

- Ensure compliance with applicable SOH legislations and other requirements
- Establish and achieve SOH objectives
- Prevent / minimize SOH risks through continual improvement in process and practices at all levels and functions for prevention of injury and ill health of the personnel
- Ensure that SOH is integrated in all managerial decision including procurement of materials; selection of machinery / equipment; selection / placement of personnel and setting up of projects
- Enhance awareness, skill and competence of our personnel so as to enable them to demonstrate their involvement, responsibility and accountability for sound SOH performance
- Carryout risk assessment associated with operations and take remedial measures proactively and implement system of health and safety audits
- We shall review this SOH Policy periodically and to be communicated to all people working under the control of the organization and shall be available to the interested parties.

Fig 6.1 Safety and Occupational Health Policy

Legal Provisions

The Indian Constitution has shown notable concern to workmen in factories and industries as envisaged in its preamble as Directive Principles of State Policy.

- ✚ For securing the health and strength of workers, men and women
- ✚ That the tender age of children is not abused
- ✚ That the citizens are not forced by economic necessity to enter avocations unsuited to their age or strength
- ✚ Just and humane conditions of work and maternity relief are provided and,
- ✚ That the Government will take steps, by suitable legislation or in any other way, to secure the participation of workers in the management of undertakings, establishments or other organizations engaged in any industry

The Factories Act, 1948, the Mines Act, 1952, the Dock Workers (Safety, Health & Welfare) Act, 1986 are some of the laws, which contain provisions regulating the health of workers in an establishment. Whereas the Employees State Insurance Act, 1948 and the Workmen's Compensation Act, 1923 are compensatory in nature. These various legal provisions to protect health and safety of the workers are given in Chapter 8. It may be sufficient to indicate at this stage that metallurgical industries are classified as hazardous industry and legal provisions must be adhered to avoid any harm to work force and local residents in the vicinity of the industry.

Occupational health hazard in steel plants are of two types. One occupational health hazard 1) common to all shops including Raw material/Product handling & 2) Hazards specific to individual Major Shop.

TOR 8 (III) DETAILS OF EXISTING OCCUPATIONAL AND SAFETY HAZARDS, EXPOSURE LIMIT AND MEASURES TAKEN TO KEEP THEM IN PERMISSIBLE EXPOSURE LEVEL (PEL).DETAILS OF COMMON HEALTH AND SAFETY HAZARD:

(A)Common Health hazards in a Steel Plant are due to dust in eye contact, skin contact, inhalation and ingestion.

Dust

The iron ore and coal are stored in raw material yard. The main health hazard in the storage yard is uncontrolled dust during loading/un loading and transportation of material in the stock yard.

Eye Contact:

Airborne dust may cause immediate or delayed irritation or inflammation. Eye contact with large amounts of dust particles can cause moderate eye irritation, chemical burns and blindness.. Eye exposures require immediate first aid and medical attention to prevent significant damage to eye.

Skin Contact:

Dust of coal, Iron ore and silicon may cause dry skin, discomfort, irritation, severe burns and dermatitis. These dusts are capable of causing dermatitis by irritation. Skin affected by dermatitis may include symptoms such as, redness, itching, rash, scaling and cracking.

Inhalation

Breathing dust may cause nose, throat or lung irritation, including choking, depending on the degree of exposure. Inhalation of high levels of dust can cause chemical burns to the nose, throat and lungs.

Ingestion:

Internal discomfort or ill effects are possible if large quantities are swallowed.

Common safety hazards in an Integrated Steel Plant are - Posture, Excess Load, Harmful Contact By Cranes : Defective Tackles, Slings, Excess Load, Wrong Signaling, Working Under Load, Unskilled Operator, Defects in Crane, Improper / Unauthorized Handling and most important is stress

EXPOSURE LIMITS

The exposure limits for Manganese, Crystalline, silica, Coal Dust are as given in the following table for awareness.

Airborne concentrations of chemical substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, over a working lifetime, without adverse health effects are threshold limit values.

Table 6.7: Exposure Limits of various chemicals used in BSI PL and dise.

SR. NO.	Raw materials	Chemical Name	*NIOSH TLVTWA (mg/m ³)	Factory Act TLV (mg/m ³)	Target Organs
1	Manganese	Manganese oxide (Mn ₃ O ₄)	1mg/m ³	C*05mg/m ³	Resp. System, CNS, Blood, Kidneys,
2	Silicon (a) Crystalline (b) Quartz (1) In terms of dust count. (2) In terms of respirable dust. (3) In terms of total dust	Si	- 10mg/m ³ (total) dust/m ³ -5mg/m ³ (respiratory)	10600/(% Quartz+10mg/m 10/(%respirable Quartz+2)mg/mt. 10/(%respirable Quartz +3)mg/mt.	Eyes, Skin, Resp sys.
3	Coal(Dust)		<5%SiO ₂) ₂ m g/m ³ as the respirable	Not available	Respiratory system

			dust fraction) 0.1mg/m ³ (as the respirable quartz fraction)		
4	Iron ore	Iron oxide dust & fume(as Fe) (Fe ₂ O ₃), Iron(III) Oxide	5mg/m ³	5mg/m ³	Respiratory system

*NIOSH-National Institute of Occupational Safety & Health *TWA-Time Weighted Average

*TLV-Threshold limit values *C-Ceiling Limit

FIRST AID MEASURES

Following first aid measures shall be taken.

Eye Contact:

Rinse eyes thoroughly with water for at least 15 minutes, including under lids, to remove all particles. Seek medical attention for abrasions and burns.

Skin Contact:

Wash with cool water and a pH neutral soap or a milk skin detergent. Seek medical attention for rash, burns, irritation and dermatitis.

Inhalation:

Move person to fresh air. Seek medical attention for discomfort or if coughing or other symptoms.

Falling from height

Proper scaffolding to withstand the load, use of safety belt and other PPEs can protect from injuries.

Ingestion:

Vomiting not to be induced. If conscious, have person drink plenty of water. Seek medical attention.

EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Controls:

- Control of dust through implementation of good housekeeping and maintenance;
- The bag filters will be installed to control dust emission.
- Use of PPE, as appropriate (e.g. masks and respirators)
- Use of mobile vacuum cleaning systems to prevent dust buildup on paved areas;
- Personal Protective Equipment (PPE):
- Respiratory Protection: When the dust level is beyond exposure limits or when dust causes irritation or discomfort use Respirator.
- Eye Protection: Wear Safety goggles to avoid dust contact with the eyes. Contact lenses should not be worn when handling the materials.
- Skin Protection: Wear impervious abrasion and alkali resistant gloves, boots, long sleeved shirt, long pants or other protective clothing to prevent skin contact.

Preventive Measures

- The storage yards are constructed and maintained as per the guidelines.
- Regular weekly inspections of storage yards will be carried out with regard to proper earthing, adequate fire fighting facilities, any combustible materials, prevention of growth of wild vegetation etc.
- No naked fires will be allowed in and around coal storage areas and height of coal/ coke heap should not be high to prevent auto ignition.

Stress

The process by which we perceive and respond to certain events, called stressors, that we appraise as threatening or challenging.

Uncertainty at work place cause high level of stress. The cause of uncertainty can be 1) lack of information or instruction what exactly to do or lack of job knowledge. 2) No job satisfaction i.e. boss is not happy with or what boss & colleagues think about his/her ability or 3) receiving vague inconsistent instruction. 4) Sometimes that work place is not safe and catastrophe anticipated due to wrong operation.

With increased stress, blood pressure increases, productivity thoughts decrease and destructive thoughts increase and there is likelihood of taking risky alternatives due to poor judgment and there may be greater tendency of escape behaviors.

Alcohol & stress in combination are deadly and smoking is not the solution considering its long term harmfulness.

Communicating problems at work place to seniors, colleagues; asking in a positive way and executing their guide lines and giving much importance to each & every job that comes on the way can remove stress at work place.

Table 6.8: Health Hazard in Major Shops:

Sl. No.	Group	Item	Potential Health hazard	Preventive measures
I	Raw materials and products handling	Iron ore	Eye/skin irritation	Water sprinkling'
		Coal , lime stone, Dolchar	Respiratory track diseases	Dry fogging in conveyors, ID fan
		Other fluxing minerals	due to Dust, burning due to	bag filter, PPE like safety shoes, safety goggles.
		Acids/Alkalis		Water jet for eye washing
II Major shops				
	DRI kiln	flue gas CO, dust, heat		

	Billet caster	Hot molten metal	due to falling from height & explosion	Keeping area dry so that hot Metal does not come in water Contact, wearing PPE
	Captive power plant	Fly ash, explosion, noise, vibration, HTelectric equipments, Acid and alkali	Electric shock, injury due to chemicals, burn/ eye injury	Use of PPE, barricading high voltage area.
	Rolling mills	Heat, Splinters, Cobbles, Hydraulics, Cranes, trapping between the rolls, edge of thin steel sheets	Eye injury due to red hot mill scale, hot metal glare, injury, Due to shearing, cropping, trimming and guillotine machines,	Use of PPE like goggles, hand, gloves & Guarding, Dangerous areas
III	Utilities			
	Fuel gas	Gas leaks	Fire and gas	Use of PPE
	Distribution		Poisoning	
	Electric power	Short circuit	Electric shock	Use of PPE
	Supply			
IV	All shops			
	Falling from height	Collapse of scaffoldings	Injury, breaking of bone	Proper scaffolding to withstand
		Breaking of slings		Load and use of safety belt
				Tested from time to time.
	Falling of heavy Objects from height People working over Head, next floor		Head injury	Use of helmet and safety belt

TOR-8(II) DETAILS OF EXPOSURE IF THE WORKERS' HEALTH IS BEING EVALUATED BY PRE DESIGNED FORMAT.

Following format has been designed to be filled up after medical examination of all employees at the employment to the project.

CONFIDENTIAL	ENTRY MEDICAL	EXAMINATION	
<p>I hereby authorize any of the doctors, hospitals or clinics mentioned in this form to provide the Medical Service with copies of all my medical records so that the organization can take action upon my application for employment.</p> <p>I certify that the statements made by me in answer to the questions below are to the best of my</p>			

knowledge, true, complete and correct. I realize that any incorrect statement or material omission in the medical information form or in any other document required by the organization renders a staff member liable to termination or dismissal.							
Date(dd/mm/yy)				Signature			
Pages 1 and 2 are to be completed by the candidate.							
FAMILY NAME (IN BLOCK CAPITALS)		GIVEN NAMES		MAIDEN NAME (FOR WOMEN ONLY)		SEX M <input type="checkbox"/> <input type="checkbox"/>	
ADDRESS (STREET, TOWN, DISTRICT OR PROVINCE,COUNTRY) AND TELEPHONE				DATE OF BIRTH (day/month/year)			
				NATIONALITY			
POSITION APPLIED FOR (DESCRIBE NATURE OF WORK)		TELEPHONE		BIRTHPLACE			
DUTY STATION		PRESENT MARITAL STATUS					
		Single <input type="checkbox"/>					
		Married <input type="checkbox"/> DATE (dd/mm/yy).....		Divorced <input type="checkbox"/> DATE:		(dd/mm/yy).....	
		Separated <input type="checkbox"/> DATE (dd/mm/yy).....		Widowed <input type="checkbox"/> DATE:		(dd/mm/yy).....	
Have you ever undergone a medical examination for any other agency? ----- -----							
Have you ever been employed by this company or any other agency? ----- -----							
If so, please state when, where and for which organization ----- -----							
FAMILY HISTORY							
Relative	Age (If still alive)	State of Health (If still alive, present state: If deceased, cause of death)	Age at death	Have members of your family had the following illnesses or disorders?	Yes	No	Who?

Father				High Blood Pressure			
Mother				Heart Disease			
Brothers				Diabetes			
Sisters				Tuberculosis			
Spouse				Asthma			
Children				Cancer			
				Epilepsy			
				Mental Disorders			
				Paralysis			

Each question requires a specific answer (yes, no, date etc); to leave a blank or draw a line is not sufficient. Completed and enquires are therefore needed, time may be lost.

1. Have you suffered from any of the following diseases or disorders? Check yes or no. if yes, state the year

	YES	NO		YES	NO		YES	NO	
	Date			Date			Date		
Frequent sore throats			Heart and blood vessel disease			Urinary disorder			Fainting spells
Hay fever			Pains in the heart region			Kidney trouble			Epilepsy
Asthma			Varicose veins			Kidney stones			Diabetes
Tuberculosis			Frequent indigestion			Back pain			Gonorrhoea
Pneumonia			Ulcer of stomach or duodenum			Joint problem			Any other sexually transmitted disease
Pleurisy			Jaundice			Skin disease			Tropical diseases
Repeated			Gall stones			Sleeplessness			Amoebic

bronchitis						ss			dysentery
Rheumatic fever			Hernia			Any nervous or mental disorder			Malaria
High blood pressure			Haemorrhoids			Frequent headaches			

2. Are you being treated for any condition now?-----Describe-----
 -
3. Have you ever coughed up blood? -----

4. Have you ever noticed blood in your stools? -----In your urine?-----Give details: --
5. Have you ever been hospitalized (hospital, clinic, etc.)? -----
 --
6. Have you ever been absent from work for longer than one month through lines? -----If so, when? .
7. Have you had any accidents as a result of which you are partially disabled? -----
8. Have you ever consulted a neurologist a psychiatrist or a psychoanalyst? -----
9. Are you taking any medicine regularly? ----- If so, when? -----

10. Have you gained or lost weight during the last three years? -----If so, state reason: -----
11. Have you ever been refused life insurance? ----- If so, state reason:-----
 --

12. Have you ever been refused employment in health grounds? ----- If so, state reason:-----
13. Have you ever received or applied for a pension or compensation for any permanent disability? ----D
14. Have you ever stayed in any other country? -----If so, for how long? -----
-
15. Have you in the past suffered from any condition which prevented travel by air? -----
16. Do you consider yourself to be in good health? -----Do you have full work capa
17. Do you smoke regularly Yes No -----If so, what do you smoke ci rettes
For now many years have you smoked? -----How much per day? -----

18. Daily consumption of alcoholic beverages: -----

19. Has any doctor or dentist advised you to undergo medical or surgical treatment in the foreseeable
details -----

20. Give any other significant information concerning your health: -----

21. What is your occupation? -----Indicate at least three posts you have occupied:-----

22. List any occupational or other hazards to which you have been exposed -----

23. Have you ever been rejected for military service for medical reasons? -----

24. FOR WOMEN Are your periods regular? Yes No Do you take contraceptive pills? Yes No

Are they painful? Yes No You been doing so?-----
gynecological

Do you have to stay in bed when they come? Yes No Compliant? Yes No

If so for how long? -----Date of your last period ----- If so, which? -----

TO BE COMPLETED BY THE EXAMING PHYSICIAN				
GENERAL APPEARANCE		Height: cm.		Weight:
		kg		
Skin:		Scalp :		
SIGHT. MEASURED VISUAL ACUITY				
Gross vision	Right	Left	Pupils: Equal? Regular?	
Vision with spectacles	Right	Left	Fundi (if necessary):	
Near vision	Right	Left	Colour vision:	
With correction	Right	Left		
Hearing (test by whisperin g)	Right	Normal:	Sufficient :	Insufficient :
	Left	Normal:	Sufficient:	Insufficient :
	Ear drum	Right:	Left :	
NOSE-MOUTH-NECK	Nose :		Pharynx :	Teeth :
	Tongue :		Tonsils :	Thyroid:
CARDIOVASCULAR SYSTEM				Peripheral arteries
Pulse rate:	Auscultation:		-carotid:	
Rhythm:	Blood pressure:		-posterior tibial:	
Apex beat:	Varicose veins:		-dorsalis pedis:	
Electrocardiogram-Please attach tracing.				
RESPIRATORY SYSTEM		Breast s	Right	Left
Thorax				
DIGESTIVE SYSTEM		Spleen:		
Abdomen		Hernia :		

Liver		Rectal examination:	
NERVOUS SYSTEM		Plantar reflexes	
Papillary reflexes	-To light:	Motor functions:	
	-On accommodation:	Sensory functions:	
Papillary reflexes:		Muscular tonus:	
Achilles reflexes:		Romberg's sign:	
MENTAL STATE			
Appearance:		Behavior :	
GENITO-URINARY SYSTEM			
Kidneys :		Genitals :	
SKELETAL SYSTEM			
Skull :		Upper extremities:	
Spine :		Lower extremities :	
LYMPHATIC SYSTEM			
CHEST X-RAY (Full size film- Please send the radiologist's report.)			

LABORATORY			
The results of <u>all</u> the following investigations must be included except where marked "if indicated".			
Urine	Albumin	Sugar	Microscopic
Blood	Hemoglobin %	grams/l	Leucocytes:
	Haematocrit %		Differential count (if indicated):
	Erythrocytes		Blood sedimentation rate:

Blood chemistry:					
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Sugar</td> <td style="width: 50%;">Urea or creatinine</td> </tr> <tr> <td>Cholesterol</td> <td>Uric acid</td> </tr> </table>	Sugar	Urea or creatinine	Cholesterol	Uric acid
Sugar	Urea or creatinine				
Cholesterol	Uric acid				
Serological test for syphilis : Please attach laboratory report					
Stool examination					
<p>COMMENTS (please comment on all the positive answers given by the staff member and summarize the abnormal findings.</p>					
<p>CONCLUSIONS (Please state your option on the physical and mental health of the candidate and fitness for the proposed post):</p>					
<p>The examining doctor is requested before sending this report to verify that the questionnaire, pages 1 and 2 or this form, has been fully completed by the candidate and that all the results of the investigations required are given on the report. Incomplete reports are a major source of delay in recruitment.</p>					
Name of the examining physician (in block capitals):	Signature				
Address	Date: (dd/mm/yy)				