Volume I

Fire Hazard Response
&
Mitigation Plan

MUNICIPAL CORPOATION OF GREATER MUMBAI
MUMBAI FIRE BRIGADE

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1. EXECUTIVE SUMMARY

Disaster Risk Management (DRM) is based on the principle that the impacts of disasters can be reduced through appropriate preparedness, planning and management actions. The range of measures utilized in DRM policies, strategies and actions are ultimately meant to contribute to the safety and well-being of communities, at the same time protecting assets and development gains and improving services to population. The Disaster Risk Management Master Plan (DRMMP) is an analytical model based on international standards which is being prepared for Mumbai that will guide Mumbai in efficiently mainstreaming Disaster Risk Reduction (DRR) at the local level through a coherent set of policies, strategies and actions. The collaborative and participatory planning process adopted in the development of the DRMMP ensures consensus and ownership among the stakeholders and enables long term institutional sustainability. By adopting the DRMMP as a management tool for disaster risk management, Mumbai will be able to mobilize institutional and community resources and provide a coherent and efficient approach of actions prior, during and after a disaster.

With one of the highest urban concentration on the globe, and ever growing population requiring a complex system of infrastructure and services, the risk of fire to Mumbai is a constant threat to the city. The threat of fire can come from various sources including conventional residential fires, industrial fires, moving hazardous vehicles explosions and fires, and the extreme case of fire following an earthquake. In fact, the on-going DRMMP project recognizes fire as a major hazard to the city that needs a comprehensive approach to its management.

Keeping with its pro-active disaster risk management policy, MCCM has asked the Earthquake Megacities Initiative (EMI), a not-for-profit international scientific organization based in the Philippines submit a proposal to undertake a scientific analysis of fire hazards and fire risks in Mumbai and to develop a Mumbai Fire Mitigation Plan that would provide the foundations for reducing the fire risk to the population, infrastructure, ecology and economy of the city. MCGM has one of the most sophisticated and trained fire brigade in entire India and has significant experience to provide. However, the knowledge of assessing fire risk and fire

hazards is highly specialized and will need a sophisticated scientific approach that is not currently available in India.

As in the case of the DRMMP, the approach will be to work closely and collaboratively with MCGM, and in particular with the Fire Brigade at each step of the project to ensure that the project is fully anchored in the local conditions, implementable and effective. This approach will also enable optimum knowledge sharing and knowledge transfer. The project is data intensive, and hence, resources will be needed from the MCGM side to help with the data collection task. It must be noted that a certain amount of the data that is needed for the project, such as population distribution by ward, construction distribution, water system, transportation, locations of critical facilities, and others has already been acquired and integrated in a GIS (Geographical Information System) as part of the DRMMP project. Thus, a significant amount of time and resources are saved by using the findings and outcomes of the DRMMP and by continuing with a project management team that has already established deep knowledge of the work environment in Mumbai and has trusted and efficient working relationship with MCGM and other relevant stakeholders in Mumbai.

The project is divided into following tasks:-

1. Discovery and Data Collection.
2. Data Analysis.
3. Fire Hazard Analyses.
4. Consequence Analysis.
5. Gap Analysis with Int. Standards.
6. Fire Mitigation Plan.
7. Reporting.

A total project implementation time is of 18 months. The estimated budget based on the above tasks and effort is US$922,164. It include direct labor cost, travel (excluding local accommodations and local transport), other direct costs such capital equipment and contingency, and fixed administrative and overhead cost.

The detailed proposal received in this regard is as at page 52 - 73.

However, in the mean time Fire Hazard & Mitigation Plan in the proforma provided by Dir. Fire Services, Maharashtra State is prepared and submitted herewith along with above proposal.

The Fire Hazard and Response Mitigation Plan as laid out hereafter takes into account the existing strength of the Fire Brigade, the equipment and infrastructure currently deployed and established to respond to fire and allied emergencies handled by the Fire Brigade in its area of jurisdiction.

Further the Guidelines on scaling, type of equipment and re-vamping of Fire Service issued by the National Disaster Management Authority (NDMA) under Section 6of the DM Act 2005 for effective, efficient and comprehensive management of Fire incidents and standardization of the Fire Services in the country have been kept in mind when preparing the Fire Hazard and Response Mitigation Plan for MCGM.

In its expressive form, the report states clearly the area where the intervention of the State Planning Authorities is necessary for effective response to emergencies.

Assistance to this report would be appropriate in matters relating to the overall preparedness of the Fire Brigade, the present Fire Officers understanding of present and future challenges and their foresight to seek suitable infusion in terms of cadre, equipment and infrastructure.

In view of preparing Urban Fire Hazard & Risk Assessment & Mitigation for Mumbai, it is felt very essential that the risk assessment is being carried out scientifically by the professionals and thereafter the Mitigation Plans have been prepared.

Considering above all, it is requested to consider the project proposal.

S. S. Shinde
Jt. Municipal Commissioner
Municipal Corporation of Greater Mumbai

2. INTRODUCTION

2.1LOCATION

Greater Mumbai Metropolitan area or Municipal Corporation of Greater Mumbai (MCGM) area is divided in two revenue districts viz Mumbai city District and Mumbai suburban District. Greater Mumbai of Maharashtra is entirely urban. It extends between 18^0 and 19.20^0 northern latitude and between 72^0 and 73.00^0 eastern longitude. It has an east to west extend of about 12 km. where it is broadest, and a north - south extend of about 40 km.

Geographically speaking, Greater Mumbai is an island outside the mainland of Kokan in Maharashtra separated from the mainland by the narrow Thane Creek and a somewhat wider Harbour Bay. At present, it covers the original island group of Mumbai, and most of the island of Salsette, with the former Trombay Island appended to it in its Southeast. A small part in the north the Salsette Island however, lies in Thane District. The Salsette-Mumbai island creek and the Thane creek together separate it from the mainland. Thus the area of Greater Mumbai is surrounded on three sides by the seas: by the Arabian Sea to the west and the south, the Harbour Bay and the Thane Creek in the east - but in the north, the district of Thane stretches along its boundary across the northern parts of Salsette. The MCGM limit extends upto Mulund, Mankhurd and Dahisar.

Its height is hardly 10 to 15 meters above sea level. At some places the height is just above the sea level. Part of Mumbai City district is a reclaimed land on Arabian Sea coast. Mumbai City is one of the first four metropolitan areas in India.

It is the capital city of Maharashtra State. It has global importance since Mumbai is an international sea port and the international Sahar airport. Because of these, many multinational companies have set up their commercial base in Mumbai. It is also well connected with other parts of India by Western Express Highway and Eastern Express Highway. Mumbai has strategic importance from the defence point of view, with headquarters of Western Naval Command and important offices of Army, Air force and Coast guard.

2.2Area and Divisions

Greater Mumbai covers an area of 437.71 sq. km. that constitutes 0.14 per cent of the total area of the State of Maharashtra. The importance of Greater Mumbai is also apparent from the fact that the it supports a population of about 11.9 million sharing 8.07 per cent of the population of the State (as per 2001 census) with sizeable day-time floating population from places like Thane, Nasik, Raigad and Pune districts, including the population from municipal corporations of Thane, Navi Mumbai, Kalyan - Dombivili, Ulhasnagar in Thane district and Panvel in Raigad district.

The Mumbai City District is covered by area of only 67.79 sq. kms. This district has no revenue tahsils but land record administration is being done according to Revenue Divisions and there are as such 19 revenue divisions in the District. All other administrative work is being done according the municipal administrative wards and there are 9 municipal wards in the district; A to E wards, F/South and F/North, G/South and G/North wards.

The Mumbai Suburban District covers an area of 370 sq. km. The District consists of one administrative sub-division comprising three Tahsils (that is, Kurla, Borivali and Andheri). The district covers 15 municipal wards of MCGM, and is also referred as Eastern Suburbs and Western Suburbs.

Each ward is under the administrative control of a Assistant Commissioner. There is a Municipal Commissioner along with the various committees to oversee the activities of the MCGM. There is a police commissionerate for the entire MCGM area headed by the Police Commissioner with the headquarters at Crawford Market. The MCGM area is further divided into seven police zones. The traffic commissionerate headquarters is located at Crawford Market and there are seventeen traffic divisions in Mumbai.

The fire brigade is established under the MCGM act, and has its headquarters at Byculla. There are in all 33 fire stations in Mumbai. The Fire Brigade is administratively divided into six Regions, each under the charge of a Deputy Chief Fire Officer. Each Region is further divided into Sub-Divisions, comprising a certain number of fire stations under the charge of Assistant Divisional Officer.

2.3 Salient Physical Features and Land Use Patterns

2.3.1 Soil

The predominant soil cover in Mumbai city is sandy whereas in the suburban district, the soil cover is alluvial and loamy.

Land Use	Mumbai city district (area in sq. km and percentage)	Mumbai suburban district (area in sq. km and percentage)
Inhabited area	53.84, 79.45 `)/0	277.5, 75 `)/0
Agricultural area	Nil	18.5, 5 `)/0
Industrial area	13.5,19.9 `)/0	41.0,11.69 `)/0
Forest Cover	0.4543, 0.7 `)/0	33.0, 8.31`)0
Wastelands	Nil	Nil
Total	67.71square kilometres	370 square kilometres

Backbay and Bandra reclamation are the major reclamation areas of Mumbai in the Arabian Sea.

2.3.2 Geology and Geomorphology

The entire Greater Mumbai area is occupied by Deccan basalt flows and their acid and basic variants, poured out between the late Cretaceous and early Eocene times. The basaltic flows are horizontally bedded and are more or less uniform in character over wide areas. Certain extrusive and intrusive mafic types are associated with basalt's and are found in the Mumbai Islands and its vicinity. This is in contrast to the monotonous uniformity displayed by the Deccan basalt's in general. Furthermore, some fossil ferrous sediment, mainly of tufaceous origin and partly of fresh water origin, rich in fauna, is also found in Mumbai area.

The stratigraphic succession of rocks in Mumbai area is given below: -

Recent	: Alluvium, Sand and recent Conglomerate
Cretaceous to Eocene	: Laterite Trap dykes Volcanic agglomerate and breccia Basalt flows with Interbedded ash beds and fossiliferous fresh water shakes.

2.3.2.1 Mumbai Island

Mumbai Island has ridges along its western and eastern side. The city of Mumbai is built on the centrallow-lying part of the island. The western ridge comprises stratified ash beds overlain by hard, massive andesitic lava flows, both formations showing gentle tilt towards the west. The stratified ashed which display variegated colours and variable textures attain a total thickness of about 45m. The varieties are, from bottom to top : i) coarse grained acid fuffs of variegated colours noticed to the east of Worli fort, ii) Yellowish brown ash exposed near Chowpatty beach, along the embankment of Walkeshwar road, Malabar Cumballa ridge, Haji Ali tomp and the Worli fort hills. The exposures at Worli contain fossil tortoise and frogs (Rana Pussilla) and iii) coarse grained carbonaceous ash covered by yellowish brown tuffaceous ash devoid of fossils.

The ash beds are capped by massive lava flows which attain a thickness of about 16 m. The rocks are aphanitic, have a conchoidal fracture and exhibit conspicuous hexagonal columnar jointing. They are exposed on the Malabar, Cumballa, Worli hills and extend on to the Salsette Island. Dark coloured fossiliferous shales attaining a thickness of about 2m. are exposed at the foot of the Worli hills. Being deposited during a period of quiescence and overlain by a later flow, these beds are known as Intertrapean Beds. They are very significant as the fossils in them are helpful in fixing the possible age of the associated lava flows.

The eastern ridge represents a different suite of rocks. They are, from bottom to top:

i) basalt, greenish amygdaloidal basalt exposed at Bhoiwada, Mazagaon and Koliwada hills,

ii) red ash breccia noticed in the exposures at Sion,

iii) highly chilled basic lavas of Sewri fort and Antophills described as Melaphre in the older literature,

iv) stratified ashes of Sewri and Cotton Green, the exposures described by earlier students of the geology of Mumbai are now covered by building, but are exposed in some road cuttings.

The geology of the intervening low lands is more or less obscured by the development of the city of Mumbai. but some of the recent excavations near Flora Fountain, Old Custom House and Dader have revealed the presence of either the greenish- grey basalt or the yellowish brown ash.

2.3.2.2 Salsette Island

The central portions of Salsette island comprise a range of hills trending north-south merging into the tidal swamps towards the east, while towards the west these hills pass into wide plains with a few isolated hillocks. Basalt is the major rook unit constituting the main ridge extending from Ghatkopar, east of Jogeshwari, Aarey Milk Colony to Kanheri and beyond. At places, there are ash beds intervening between successive flows, these may be seen in the cuttings of the Western Express High-way passing through Jogeshwari. The isolated hills near Andheri, Jogeshwari railway station, Chincholi and Mandapeshwar are also largely composed of basaltic types. Acid to sub-acid types are associated with the basalts at Dongri, Manori, Madh, Karodiwadi, Malad and Kurla. The basalts in the quarries at Gilbert hill, Andheri, exhibit perfect columnar jointing with spectacular pentagonal columns, over 40m. in height.

Another interesting geological feature is the occurrence of a vast thickness of volcanic agglomerate near Tulsi lake and Kanheri caves, indicating a possible volcanic focus from which much of the pyroclastic rocks in the Mumbai and Salsette islands may have extruded. These agglomerates are largely made up of elongated sub-angular vesicular bombs, blocks of brown chert, trachyte, volcanic ejectment and small pieces of yellow to reddish brown limonitic matter, varying in size from a few centimetres to as much as one metre, set in a matrix of dense, dull light grey amorphous material. At places this matrix resembles bauxite. Some of these agglomerates show fine banding and layers with alternate silliceous and tuffaceous matter, at places with beautiful and intricate applications and contortions. Some of the horizons of the agglomerates and breccias, particularly those which are bauxitised, are quite soft. Differential weathering has resulted in the siliceous bands which stand out as fine minute ribs in some places, simulating fossil wood. This feature may be observed in caves no 84, 85, 86 and 87 at Kanheri. The basalts are intersected by sills and dykes of olivine dolelite, tachylyte etc. The dykes have a general north - south trend and appear to be limited to the eastern margin of the main ridge from west of Mulund, and the eastern banks of the Vihar lake to Vikhroli. Some of these dykes extend further south towards Mankhurd, Chembur and Nanole in the Trombay Island.

Volcanic breccias and ashes interbedded with basalts are noticed at several places near Ghod Bunder, around Tulsi and Vihar lakes, Santacruz, Kurla and Sion. The plains to the west of the main ridge extending from north of Bandra to

Borivali and beyond are clothed by marine alluvium represented by saline marine muds, recent shell - limestones, calcareous sand stones, etc. A fair stretch of shore sands with occasional duns extends from Juhu in the south to Varsova, Marve and Manori in the north.

2.3.2.3 Trombay Island

This island is separated from Mumbai and Salsette by intensive tidal flats with a series of low hills extending north-south in the centre. Facies of amygdaloidal olivine basalt dipping gently towards west, with ramified layers and dykes of rock types described variously as oceanite, ankaramite and monchiquite etc. are prevalent in this area.

Laterite: Small plateaus east of Kanheri caves and south-west of Tulsi lake are covered by laterite with bauxite pockets at 5000m. Elevation above sea level.

2.3.2.4 Structure

Faults: A well marked fault is seen near Antop hill. Sukheswala (1958) has given evidence for two north-south running faults in Mumbai Island, one to the east of Western ridge and other running along the western ridges. The faults extend into Salsette Island and have maximum throw of 75' and 40' respectively.

2.4 Climate and Rainfall

BrihanMumbai receive rains from south-west monsoons, which commence usually in the first fortnight of June and last till the end of September. Pre-monsoon showers are received in May. Occasionally, northeast monsoon showers occur in October and November, but rarely more than twice in the entire rainy season.

In Mumbai city district, the average maximum temperature is 31.2 degree Celsius, while the average minimum temperature is 23.7 degree Celsius. The average total annual rainfall is 2146.6 mm. The maximum annual rainfall was recorded in 1954 at 3451.6 mm.

The details about climates and rainfall in Mumbai Suburban District as recorded at Santacruz rain gauge station of India Meteorological Department are as under :-

The climate of the Mumbai Suburban District is tropical maritine. The daily maximum temperature (mean) range from 29.1 c in August to 33.3 c in May the month of April. Daily minimum temperature (Mean) range from 16.3 c in January to 26.2 c in May. The average annual rainfall of this District based on last 30 years data is 2457.0 mtrs. The District receives an average seasonal rainfall of 2363.0 mm during June- September. The average monthly rainfall is highest in the month of July (945.4 mm) followed by August (660.4 mm) The monthly rainfall in June is 647.5 m.m. and 309.2 m.m. in September.

Unprecedented rainfall recorded on 26th July 2005 i.e. 74.6 mm in Colaba and 944.2 mm in Santacruz in 24 hours.

2.5 Socio-Economic Features

During last 35 years there has been a continuing shift of population from Mumbai city District to Mumbai

Suburban District and now further to part of Thane District.

2.5.1 Demographic Features

Mumbai are as follows:

Total number of households	:	2,515,589
Total Population	:	11,978,450
Total Male Population	:	6 ,619,966
Total Female	:	5,358,484
Sex Ratio	:	80 9
Urban Population	:	11,978,450
Population density	:	
Literacy Rate	:	76.87 `)/0
Male Literacy rate	:	81.40 `)/0
Female Literacy	:	71.28 `)/0

SC/ST
[Scheduled Castes/Scheduled Tribes are socially handicapped groups listed in the Schedule of the Indian Constitution]

SC percentage	:	4.88
ST percentage	:	`)/0
Slum Population percentage	:	0.76 `)/0

2.5.2 Historical, religious and tourist centres

There are many historical religious tourist places in Mumbai. The main centres of importance in Mumbai are:

2.5.2.1 Government and semi-government establishments

Mantralaya of the state, Assembly hall, Reserve Bank, India Government Mint, Mumbai University, Municipal Corporation of Greater Mumbai Headquarter, Tata Institute of Fundamental Research International Port, Western Naval Command Headquarters, Bhabha Atomic Research Centre, I. I. T. Powai, NITIE, LIC

2.5.2.2 Religious centres

Haji Ali, Mount Mary Church, Babulnath temple, Mahalaxmi, Siddhi-Vinayak, ISKCON, Dr. Saidhna's Mosque, Chaitanya Bhoomi

2.5.2.3 Entertainment centres

Taraporewala Aquarium, Nehru Science Centre, Jahangir Art Galley, Prince of Wales Museum, Hanging Garden, Chowpatty Beach, Juhu Beach, Madh-Manori-Gorai-Aksa beaches, Film city, Sanjay Gandhi National Park, Esselword Entertainment Park, Powai, Tulsi and Vihar lakes

2.5.2.4 Archaeological and Historical locations

Gateway of India, Elephanta, Kanheri caves, CST Railway station, MCGM building, Western Railway headquarters, Rajabhai Towers at University of Mumbai, High Court, Taj Mahal Hotel, Mahim Sanctuary

2.5.2.5 Places of mass congregation

Shivaji Park, Wankhede Stadium, Andheri Sports Complex, Brabourne stadium, SNDT grounds, Race course

2.6 Power stations/Electrical installations (receiving station)

The electricity requirements of Greater Mumbai are met by the Tata Hydro-Electric system through three distribution agencies; namely the Brihan Mumbai Electric Supply and Transport Undertaking (BEST) in the island of Mumbai, the Brihinmumbai Suburban Reliance Energy covering areas of the western suburbs and southern parts of eastern suburbs and the Maharashtra State Electricity Board (MSEB) covering the Northern areas of the eastern suburbs.

The BEST is supplying electricity in Mumbai City area from Colaba to Sion/Mahim over the area of 60 sq.kms. The BEST Undertaking is purchasing the electricity from Tata Electric Companies (TEC) and distributing the same in Mumbai City. They are purchasing electricity from TEC at four points located in Mumbai City area. These points are

- Carnac Receiving Station: - Sant Tukaram Marg, off Lokmanya Tilak Road,Carnac Bunder, Mumbai.
- Parel Receiving Station: - Parel Tank Road, Parel.
- Mahalaxmi Receiving Station: - Senapati Bapat Marg, Near Ambica Mill, opp.Todi Indl. Estate, Lower parel.
- Dharavi Receiving Station: - Andhra Valley Road, Near Shalimar Indl. Estate,opp. Andhra valley Colony, Dharavi.

They receive the power at their 42 receiving stations and distribute the same through the network of 1927 substations and HV & LV underground cables. The substations are located at different locations in the entire area of their supply. There are two control centres, one at Vidyut Bldg, Pathakwadi opposite G.T. Hospital and another at Transportation House, Tilak Road, Dadar. All these 42 receiving stations, 1927 substations and two control centres are very important installations from point of view for distribution and supply of the electrical energy. The list of these 42 receiving stations and two control centres along with their address is enclosed separately in Annexure I.

The four receiving stations of TEC mentioned above are fed from their generating stations through overhead high voltage transmission lines. These generating stations are also connected to the Maharashtra grid. TEC is also having their high voltage consumers in Mumbai City area.

At present electricity generation and transmission is being done in Mumbai by the Tata Hydro-Electric Power Supply Company. The Company has generation stations at Trombay and Khopoli. It has its receiving stations at Mumbai and surrounding areas. The Andhra Valley Power Supply Company has also a generation station at Trombay and another at Bhivpuri. It has also receiving stations in Mumbai and the surrounding areas. A list of power stations in Mumbai Corporation area and their locations is also enclosed.

In addition to this, direct supplies are also made from the Tata Hydro-Electric system to consumers with huge load demand like the railways, textile mills and a few other industries.

2.7 Water Supply and Sanitation

There are five rivers in Greater Mumbai, Dahiser River, Poisar River, Oshivara River, Vakola River and Mithi River.

The Dahiser River originates at Kanheri caves and meets Gorai creek, Poisar River starts from National Park, Borivali and flows North - West, Oshivara River originates in the hills, flows through Jogeshwari (E) & Majaswadi and discharges into the Malad creek, Vakola River start North of Santacruz domestic airport. It passes through Airport, Prabhat colony, C.S.T. Road and joins Mithi River near drive in theater.Similarly the Mithi River originates at Vihar and meets Mahim creek. Overflow of Vihar, Tulshi and Powai lakes goes to Mithi River. There are no rivers in Mumbai City District.

There are three dams in Mumbai Suburban District. Name, location, capacity and catchment are

Name of the Dam	Tulsi	Vihar	Powai
Location of the Dam	National Park area between Mulund &	Near NITIE Bhandup	Between Vikroli and Bhandup Near I. I. T.

Capacity of the Dam in M C M	10.415 MCM	41.766 MCM	5.46 MCM
Catchment area in sq. km.	6.70 sq.km.	18.90 sq.k.m.	6.68 sq. k.m.

All the above three dams are impoundage on lakes. Mumbai receives its water supply through these dams and other dams located in Thane district. Solid waste dumping sites are located at Deonar, Mulund, Malad and Gorai.

2.8 Slums

Around 54.1 per cent of the total population in Greater Mumbai is staying in hutment or slum colonies. Due to escalating costs of land and materials and increasing population, it has become almost impossible to acquire residential property on ownership or even rental basis for a very large proportion of households.

MCGM has focused its efforts to provide the basic amenities like water, toilets and electricity in authorised slum colonies but still large proportion of population is staying in unauthorised slums and these basic amenities are very rare in such slums. All the slum colonies whether authorised or unauthorised are vulnerable to floods, health hazards, fires and cyclones.

2.9 Economy and Industrialisation

The employment count for Greater Mumbai was 44.64 lakhs in 2001 and this level of economic activity is higher than remaining part of the Maharashtra. As regards the pattern of employment in the primary, secondary and tertiary sectors, the primary sector is not important in Greater Mumbai since only about 2 in 1000 workers are working in primary sector as their main activity whereas 41.21 percent of the workers are working in secondary sector and 58.12 percent workers are working in tertiary sector.

The proportion of women workers is much lower in primary and secondary sectors. The geographical distribution of the main workers according to their residence shows that the workers are concentrated in F/S and G/S wards of Mumbai city and P/S, P/N, R/S and R/N wards of suburban area. As for trade workers, the workers come from all the wards of Mumbai city as well as H/W, K/W, R/S, R/C and R/N, M/W and T wards in Mumbai suburban area.

The extent of industrialisation gets reflected by the member of industrial estate and industrial activity and in terms of movement of cargo.

Extent of Industrialisation	City	MSD	MIDC
Number of Industrial Estates:	77	336	2

Number of Chemical Industries / tank farms	71	98	I
Total work force in Industries	1,09,837	2, 39,283	50,000
Number of pipelines carrying chemicals.	1	31	I
Number of potentially hazardous locations.	1	15	I
Number of vehicles carrying hazardous:	334	502	I
Raw materials for industries (during a month).			
Number of vehicles carrying hazardous:	33099	24599	I
Finished products from industries			
(During a month)			
Number of container terminals:	11	2	

Types of Industries : Engineering, Printing, Garments, Plastic, Textiles, Chemical Oil Installation etc.

It is reported by the Director of Industrial Safety & Health, Mumbai that the major types of hazardous chemicals and hazardous finished products transported are:

(1) Chlorine, (2) Ethylene Oxide, (3) L.P.G., (4) Motor Spirit, (5) Superior Kerosene Oil, (6) Methanol, (7) Ammonia, (8) Hexene, (9) Naptha, (10) Propylane, (11) Butadience (12) Styrene.

2.10 Transport and Communication Network

Mumbai has three entry and exit points at Mankhurd, Dahisar and Mulund with octroi check posts at each point. The main road stretches are the Eastern Express Highway from Sion to Mulund leading to NH- 3, Western Express Highway from Bandra to Borivali leading to NH-8, and Sion-Panvel road leading to NH- 4 and NH-17.

2.10.1 Surface Transport

The main modes of transport are through the mass transport provided by Central Railway (from CST to Khopoli and Kasara on the main line and Panvel on the harbour line), Western Railway (from Churchgate to Virar) and BEST buses within MCGM limits and upto Navi Mumbai and Mira Road which are outside MCGM limits.

DAILY TRAINS FOR YEAR 2007

Mode of Transport	Daily Number of trips (daily)	Total number of passengers	Average peak time

Central Railway	730	1.32million	8.30am to 11 am 05.00 pm to 8.30
Railway (Harbour	475+58 (Thane to Vashi)	0.828 million	--------K------
Western Railway	1064 trains	3 million	8.30 to 11.30 am 4.30 pm to
BEST	54000	40 lakhs	City - 9 to 11 am and 5 pm to 7 pm Sub - 8am to 11

2.10.2 Outstation Travels

For outstation traffic, Central Railway, Western Railway and Konkan Railway operate from CST, Mumbai Central, Dadar, Bandra, and Kurla terminus while MSRTC operates buses from Mumbai Central, Parel, Dadar, Borivali and Kurla depots. In addition, there are many private transporters who operate luxury and semi-luxury buses to outstation locations.

2.10.3 Waterways

Recently, hovercraft services and ferry services have started operating during the non-monsoon period from Gateway of India to Navi Mumbai, Uran, Alibag, Rewas and Juhu.

2.10.4 Air Travel

The international airport is at Sahar, which on an average has 4 million passengers alighting and departing in a day.

The domestic airport is located at Santacruz which on an average has 4.2 million passengers alighting and departing in a day.

2.10.5 Details of transport network

	City	MSD
Number of National Highways	NIL	NIL
Length (in Kms) of National Highways :	NIL	NIL
State Highways (in Kms) Western Express Highways Eastern Express Highways. MCGM Roads (in Kms.)	NIL 1350 Kms.	 23.33Kms. 25.50Kms. 1660 Kms.

Number of bridges on rivers	NIL	3
Number of S.T. depots/BEST	2/7	2/17
Number of Jetties	2	14
Number of Boats licensed in Greater Mumbai	2027 (Commo	
Number of railway stations with mail/	6	3
Number of Railway bridges W/R C/R	13 17	7 10
Electrified railway routes (in Kms) All Broad Gauge, Single 1.Churchgate - Mahim 2.C.S.T. -Sion 3.C.S.T. - Mahim 4.Wadala - Chunabhatti 5.Bandra - Dahisar 6.Kurla - Mankhurd	44 Kms. 14 Kms 13 Kms 14 Kms. 3 Kms. — — —	42.56 Kms — — 21.68 Kms 5.72 Kms. 15.16 Kms.
Number of unmanned railway crossings	NIL	NIL
Number of Airports	NIL	2
Number of Helipads	Nil	1

List of Jetties (Minor landing Centre) :

Bandra Port, Worli, Mahim, Sewree, Sasoon Dock, Apollo Bunder, Chimbai, Mahul, Turbhe, Manori Port, Gorai, Manori Marve, Malvni, Yerangle, Bhati, Juhu Tara, Danda (East), Danda (West), Versova Port, Madh/Patwadi , Versova (W), Versova (E).

2.11 Wardwise total population, % age of slum population,0-6 population, Sex ratio and Literary rates in slums, 2001

Ward / Sections	Blocks	Total Population	`)/0 age of slum population	0-6 Population of slums			Sex Ration in slums
				P	M	F	
A	102	207514	28.91	8528	4373	4155	785
1	60	46364	74.83	5353	2759	2594	782
2	14	36566	23.1	975	511	464	899
3	20	25674	46.04	1672	832	840	766
5	8	32856	15.33	528	271	257	676
B	32	140481	13.34	2438	1288	1150	638
6	17	30561	29.35	1100	578	522	618
9	15	33918	28.79	1338	710	628	656
C		190672					
D	56	378607	8.93	3733	2006	1727	729
20	11	80088	8.73	741	392	349	650
21	45	131511	20.39	2992	1614	1378	751
E	82	439393	11.89	5496	2850	2646	631
22	77	97692	49.91	5082	2630	2452	618
23	1	61355	0.74	58	31	27	858
24	2	23309	7.11	161	83	78	876
27	2	170724	0.79	195	106	89	772
F/N	432	526839	49.77	36362	18916	17446	716
32	432	476154	55.07	36362	18916	17446	716
F/S	247	395627	35.69	15773	8192	7581	792
28	26	114070	10.7	1075	562	513	834
29	190	185904	60.36	12661	6578	6083	781
30	31	95653	17.54	2037	1052	985	838
G/N	528	590609	54.38	39763	20611	19152	733
33	487	450771	65.59	37360	19339	18021	724
34	5	82300	4.6	427	229	198	770
35	36	57538	37.74	1976	1043	933	857
G/S	256	457095	34.84	18046	9268	8778	732
35	30	76167	23.7	1871	977	894	763
36	74	175050	26.33	4797	2496	2301	816
37	53	121502	27.71	3997	3032	1965	660
38	99	83788	73.35	7381	3763	3618	703

H/E	54	5791	54.1	386	201	184	783
43	2	23	6	51	74	77	794
45	19	1258	94.3	130	685	617	770
48	2	47	9	33	9	4	792
H/W	230	336051	40.42	15831	8154	7677	795
39	42	43250	59.04	3519	1793	1726	849
40	15	36198	23.95	902	455	447	916
41	26	53607	29.12	1440	709	731	895
42	88	54013	100.04	6734	3585	3149	685
43	6	33551	8.58	447	213	234	1072
44	5	20859	13.49	228	122	106	981
46	7	27700	16.65	431	220	211	898
47	19	30755	41.73	1116	556	560	866
51	22	21832	40.59	1014	501	513	804
K/E	747	806360	33.63	28943	14845	14098	852
49	140	168826	48.82	9385	4826	4559	832
55	345	379629	8.59	3128	1586	1542	883
56	249	249661	59.43	15745	8072	7673	860
58	13	7812	100	685	361	324	799
K/W	489	694151	54.73	33484	17319	16165	775
50	43	58124	38.1	2268	1202	1066	864
57	180	149875	69.02	12664	6642	6022	655
51	11	77616	7.64	695	365	330	740
52	209	298134	37.66	14960	7635	7325	867
53	46	102024	23.37	2897	1475	1422	846
L	1168	774812	85.25	86629	44992	41637	744
75	183	141285	77.39	14141	7266	6875	720
76	35	21981	94.01	2096	1071	1025	727
77	177	162647	66.24	13434	7044	6390	822
78	773	448899	94.18	56958	29611	27347	732
M/E	905	672767	77.63	80952	41545	39407	785
80	834	631377	76.31	75595	38817	36778	780
79	71	448899	94.18	56958	29611	27347	732
M/W	498	408077	68.49	36062	18784	17278	788
79	379	336884	64.45	28780	15045	13735	809
80	119	70089	88.98	7282	3739	3543	717
N	693	614945	70.39	54995	28599	26396	825
81	163	212293	48.98	14445	7500	6945	797
82	44	46070	60.71	3339	1662	1677	862
83	335	244013	85.03	25310	13347	11963	830
84	151	111184	84.03	11901	6090	5811	831

P/N 61 62 63 64 65	10829 92 116 65	789645 8579 143030 1240	58.77 42.72 30.22	63477 626469 9599	32805 338240 5319	30672 288229 4280	772 925 887
P/S 58 59 60 63	31342 73 144 54	43690719555 86126 298934 32292	36.85 96.68 45.87 24.75 88.56	20643 2321 5320 9666 3336	10756 1216 2742 5014 1784	9887 1105 2578 4652 1552	687 557 743 708 656
R/C 69 70 72 73	31574 27 103 111	509503 254491 59458 92060 98547	18.92 14.58 25.48 40.3 7.12	11085 4827 1651 3972 635	5631 2531 842 1952 306	5454 2296 809 2020 329	782 796 802 744 885
R/N 70 73 74	26864 139 65	363991 90116 132772 141103	44.02 41.9 64.68 25.93	21156 5151 11387 4818	11216 2700 6071 2445	9940 2451 5316 2173	747 717 761 745
R/S 67 68 S 84 85	558 276 282 1011 273 738	579954 296162 283792 691107 216080 475027	56.1 54.12 58.16 82.73 65.84 90.41	44543 22743 21800 66125 17018 49107	23347 11954 11393 34177 8702 25475	21196 10789 10407 31948 8316 23632	687 688 685 816 826 813
T 88 86 87	209 16 42 151	330168 34998 96493 198677	34.11 24.72 23.73 40.8	13217 1137 2485 9595	6840 583 1303 4954	6377 554 1182 4641	827 807 843 825
Total	10763	11914398	48.88	745932	386688	359244	769

These slums are located on the lands of state government (25 %), MCGM (20 %), Housing Board and central government (5 %), private lands (50 %). The ownership of these lands has implications for intervention strategies.

2.11.1 Fires

Greater Mumbai is greatly diversified and practically has every type of fire risk. The fire risk can arise from the following sources :

- large number of closely built old timber framed buildings in Ward A, B and C
- high-rise buildings with inadequate fire-fighting facilities
- commercial activities in Kalbadevi, Mumbadevi, Bhuleshwar, Vadgadi, Bhendi Bazar, C.P.Tank
- small, medium and heavy hazardous industries in suburban areas
- widespread docks area
- oil refineries in M-W ward
- petrochemical industries
- large slum settlements.

There are 2405 officers and men spread over 33 stations, to fight the fires.

2.11.2 Earthquakes and house crashes

Mumbai city falls in sesmic zone III which is Moderate Damage Risk Zone (MSK VII).The major earthquakes that have occurred in Mumbai region in the last 400 years are given below :

Year	1594	1618	1678	1832	1854	1877	1906	1926	1933	1951	1963	1966
Intensity (MMI)	IV	IX	IV	VI	IV	IV	VI	V	V	VIII	IV	V

As per the 2001 census, Greater Mumbai has 2,768,910 dwellings, including residential, commercial and industrial establishments. Of these, only 9.08 `)/0 of the dwellings were made of re-inforced concrete while 31.35 `)/0 were engineered masonry constructions. Thus, 59.57 `)/0 of all constructions were non-engineered. This can partly be attributed to the large percentage of population living in the slums.

Therefore, the major risk category of structures is that of the engineered masonry constructions. Many of these are essentially load-bearing structures.

There are 19642 cessed buildings in Mumbai city district. Due to the Rent Control Act restrictions against raising the monthly rent, the landlord did not take up maintenance of buildings for several years. This has resulted in the deterioration of the buildings ultimately leading to their collapse. The Maharashtra Government intervened and took over the responsibility of maintaining these building by constituting the Bombay Building Repairs & Reconstruction Board in the year 1969.

The break up of these 19642 buildings is as follows:

1) A- category (constructed prior to 1-9-40) 16502
2) B- category (constructed between 1-9-1940 to 31-12-50) 1489
3) C- category (constructed between 1-1-51 to Sept. 1969) 1651

Total 19642

Out of the total 19642 buildings, some of the buildings have been reconstructed and some have collapsed. Thus the total number of cessed buildings existing today is around 18,580. Many of these buildings have been repaired several times in the past from the permissible cost ceiling limit of Rs.75/mtr2. This has now been revised to Rs. 750/mtr2.

The Engineers of the Board undertake frequent inspection of these buildings and take all preventive measures to protect the building from any collapse due to its weak structural constitution. Usually dangerous portion of these buildings are propped up and in many cases demolition of dangerous portion also has also been resorted to.

Apart from the legal hurdles, paucity of funds has slowed down the work of Mumbai Repairs Board considerably. House Collapse is therefore a regular phenomenon and in the absence of adequate transit accommodation, emergency shelters become a major requirement in the event of house collapse.

2.11.3 Landslides

Greater Mumbai also faces the risk of Landslides With pressure on land, many vacant sites on hill slopes or bottoms of hills have turned into inhabited area and thereby become vulnerable to landslides. Most cases of landslides occur during heavy rain associated with high velocity winds. It sometimes results in loss of human lives and damage to structure.

The sites vulnerable to landslides in Mumbai city district are as follows :

Sr. No	Ward	Landslide Location	Approx. Populatio
1	D ward (Nana chowk)	Asha Nagar, Jaldarshan Apartment, Nr Nephency	700
		Simla Nagar, L.D. Ruparel Marg,	300
		Sham Kunj, Walkeshwar Road, Behand Sahyadri.	250
		M.P.Mill Compound, Janata Nagar, Tardeo.	800
2	E Ward (Byculla)	Mazgaon,Bhandar wada Hill, Dr.Nath Pai Road,	1000

3	F/S ward (Parel)	2 Octombar Colony	5000
		2 Octombar Colony (Extention)	5000
		Bhim Nagar colony	700
		Parmanand Wadi Colony	200
		Turner Sanaterioum Colony	200
		Ambedkar Colony.	700
		New Shivaji Nagar, Acharya Dhonde Marg,	500
		Ganesh Nagar	1000
		Marwadi wadi	1000
		GolanjiHill	300
		Ram Laxman Hill Colony	300
		Hanuman Tekdi Colony	300
		Bara Devi Colony	300
		Wagheshwari Colony	400
		Dabholkar Adda	300
		Extention Turner Sanatrioum	200
		Jijamata Nagar	700
4	F/N ward (Dadar-Matunga/East)	Salamati Hill (M.A road, H.M. road)	300
		Rawali camp hill, (Reservoir)	250
		Walchand Bunglow Hill	
		(Indira Nagar, Near Antop Hill Post Office)	500
		Barkat AliHill,	200
5	G/S ward (Worli)	Prem Nagar, B.G. Kher Marg,	700
		Maya Nagar, B.G. Kher Marg,	500
		Siddharth Nagar, Dr.Ambedkar Marg	700
		Anand Nagar, Dr. Ambedkar Marg	1000
		Shivaji Nagar, Dr. Ambedkar Marg	800
		Amar Nagar , Dr. Ambedkar Marg	300
		Jaikar wadi, Wadala	350
6	H/West(Bandra West)	Kadeshwari Mandir,Kadeshwari road, Bandra	400
		Jafarbaba colony, Jafar Baba road, Near Mount	300
7	K/West (Andheri,Jogeshwari)	Girbert Hill, Andheri (West) Gaondevi	300
8	P/South (Goregaon)	Koyana Colony, Goregaon Mulund link road,	1000
		r Society,Goregaon Mulund link road, Goregaon(East)	700

9	P/North Malad(East)	Tanaji nagar, Kurar village, Malad (East)	200
		Gupta compound, Nr Anand nagar, Appa Pada,Malad	700
		Agarwal Compound, Khadan , Malad (East)	500
		Giri Compound, Ban Dongri,Malad (East)	200
		Shivaji Nagar, Pathan Wadi road, Malad(East)	200
		Dhanji wadi, Western Express Highway,	150
		Opp. Jagruti Bus depot, Western Express , Malad	200
		Tadiwala Compd, Kokani Pada, Pathan Wadi, Malad	300
10	R/South (Kandivali)	Gautam nagar, Kandivali (East)	500
		Shree Ram Nagar, Kandivali (East)	300
11	R/North (Dahisar)	Bhim Nagar, Kandarpada, Link road,Dahisar (West)	700
		Near N.G. Park , Shiv Vallabh Cross road, Dahisar	150
12	R/Central(Borivali)	Western Express highway ,Masjid Kulupwadi, Borivali	150
12	R/Central(Borivali)	Western Exprerss highway,Devi	200

13	L/Ward (Kurla)	Jay Ambika nagar,Sunder Baug Lane, Ghatkopar	700
		Gurunanak Nagar Society, B/d Narayan nagar,	400
		Himalaya Society, Behind Shankar Mandir, Ghatkopar	500
		Ramkrishna Society, Sunder Baug lane, Ghatkopar	450
		Bhuddha Parna Kutir, Devi Charan chawl, Kajupada,	700
		Nanshi Munshi Compound, Chandivali, Kurla (West)	400
		Ganesh Nagar,Pareira Wadi Hill	500
		Vijay Nagar Hill, Near Air Port, Jari mari Andheri Kurla	800
		Garib Mohalla ,Dr.Ambedkar nagar	500
		Devi Charan Chawl, kajupada, Kurla (West0	400
		Goyenka Estate, Roshan Compound, Ganesh Gully,	600
		Hindi Bal Vidhya Mandir, Mohili Village, Ghatkopar	300
		Ashapura Compound, Ghatkopar (West)	200
		Khadi No.3, G.A. Link road, Saki naka Mumbai -72	700
14	M/East (Mankhurd,Gowandi)	Sayadri Nagar A, Panjara Pol, V.N.Purav Marg	300
		Om Ganesh Nagar,Sayadri Nagar B, Bharat Nagar,	500
		Vishnu nagar, L.K. Gadkari Marg,	200
		Gautam nagar, Dean Query road	700
		Ashok Nagar, R.C. Marg, Vashi naka	300
		Bharat nagar, R.C. Marg, Vashi Naka	700
		Rahul Nagar, R.C.Marg, Vashi Naka	800
15	M/West (Chembur)	Lal Dongar Siddi Society, S.T. road.	700

15	M/West (Chembur)	Bhai Bhai nagar, D.K. Sadue marg,	200
		Postal colony	200
		Swastik pakrk, Extern Express Highway	300
		Shell Colony	400
16	N/Ward (Ghatkopar)	Narayan Nagar Hill No.2, Marathwadi Chawl,	200
		Dattatraya Nagar, Zopadpatti, Ghatkopar	500
		Bhaktidham Sevashram Bhim Nagar,Ghatkopar	300
		Narayan Nagar, Home guard ,N.S. road, Ghatkopar	400
		Chandpura Momimpura,Kokanpada,	700
		Ashatvinayak society, Pandhsheel nagar,	300
		Sai Prerna Soc., Jay Bhavani So, Sayadri	250
		Rahul nagar, Vikroli (West), Near Suryavanshi House	300
		Shantidoot Society, Rahul nagar, Vikroli parksite	400
		Sanjay Gandhi nagar, Vikroli Park site.	300
		Chatrapati Shivaji Society, Ram nagar, Vikroli Park site.	400
		Ram Nagar, Vikroli.	500
		Lokmanya Society, Varsha nagar, Vikroli.	300
		Sant Krupa society, Varsh Nagar, Vikroli.	400
		Kranti Soceity, Vikroli	250
17	S/Ward (Bhandup)	Mata Ramabai Ambedkar nagar No.1 & 2,	
		Water Tank road, Near Bhandup Reservoir	300
		Sai Hill Tembi pada, Zara Line, Bhandup (West)	250
		Sai Hill Temibipada road,Bhandup(West)	300

17	S/Ward (Bhandup)	Rawate Comp No.1,2,3 Ram Nagar, Tembipada,	400
		Khindipada, Khadan ,Sonapur road, Bhandup	200
		ine, near Rajaram Maha Vidhyalaya, Khindipada	250
		Ambhyachi Bharni, Ambedkar Ngr, Tulshet	350
		Patkar Compound,Tulshet pada, Bhandup (West)	400
		Gaondevi Nagar, Milind Nagar, Bhandup (West)	200
		Gaondevi road, Gaondevi Tekdi, West side	300
		Gurkha Chawl and Sarvodaya Nagar, Jangal	250
		Radha Krishna Mandir, Surya Nagar, Vikroli (west)	300
		Chaitanya Nagar, Pawai, Bhanudup (West)	400
		Mirashi Nagar, Arey Colony road, Pawai ,Bhandup	450
		Ramabai Nagar, Filterpada, Pawai ,Bhandup (West)	250
		Surya Nagar, L.B.S. Marg, Bhandup (West)	360
18	T/Ward(Mulund)	Amar Nagar, Mulund (West)	400
		Shankar Hill,Mulund (West)	350
		Shankar Hill,Mulund (West)	300
		New Rahul Nagar, Mulund (West)	350
		Ganeshpada, Mulund (West)	250
		Hanuman Pada, Mulund (west)	350

The many sites vulnerable to landslides in Mumbai suburban district are essentially located on or near the abandoned quarries and hill ranges. These hillside lands are mainly owned by different authorities like the State/Central Government, MCGM or the Maharashtra Housing Board.

Maharashtra Government has enacted the Maharashtra Slum (Improvement, Abolition and Rehabilitation) Act, 1971 under which slums in specified areas are notified as regularised slums and given protection. Since 1991, under the slum improvement programme, these slums are being improved by Slum Improvement Board, a unit of Maharashtra Housing Area Development Authority (MHADA). These slums are being provided with basic amenities. To avoid the damages due to landslides, a programme of constructing retaining wall is being carried out by the Slum Improvement Board

2.11.4 Road Accidents

The major road sections in Mumbai which are accident prone in Mumbai city along with details of fatal and serious injuries from 1993 to 1995 are given below :

Vehicles Registered in Greater Mumbai:

Sr. No.	Class of Vehicle	2004-2005	2005-2006	2006-2007
1	Motor Cycles	50247	54837	65029
2	Scooters	17112	17134	17617
3	Moped	197	254	299
4	Cars	32067	38076	40123
5	Jeeps	1131	1562	1629
6	Stn. Wagons	00	0	0
7	Taxis	1979	1786	2531
8	Auto Rokshaws	7825	6497	5618
9	Stage Carriages	231	863	315
10	Contract Carriages	231	324	273
11	School Buses	334	104	121
12	Private Service Vehicles	126	139	92
13	Ambulance	102	100	76
14	Trucks & lorries	253	317	696
	(a) Art./Muli. Veh.	1	1	0
15	Tankers	1	5	4
16	Delivery Van (4 Wheelers)	974	1401	1693
17	Delivery Vans (3	3514	3618	3784
18	Tractors	9	33	29
19	Trailors	1	7	3
20	Others	130	170	237
	Total	116707	127228	140169

b. Accidents:

Accident Statistics in Mumbai

YEAR	FATAL		SERIOUS		SLIGHT		MINOR	TOTAL
	ACCIDE	KILLED	ACCIDE	INJURE	ACCIDE	INJURED		
2003	377	394	1391	1504	4471	4716	18923	25162
2004	519	534	1525	1630	4037	4271	19596	25677
2005	633	654	2590	2750	4466	4726	21576	29265
2006	965	993	3442	3976	7332	7781	34127	45866
2007	756	780	2428	2530	4364	4552	23516	31609

Traffic density is highest at the following locations:

- Nariman Point
- Flora Fountain
- CST
- Nana Chowk
- Haji Ali
- Mahim-Bandra junction
- Andheri Flyover
- Crawfford Market
- J.J junction
- Dadar T.T
- Sion junction

2.11.5 Industrial and Chemical Accidents

There are approximately 900 industries either involved in the manufacture or processing of hazardous goods or in the storage of hazardous goods. A comprehensive list of these industries along with fact sheets are given in a separate volume. Many of these godowns are in the close proximity of the residential areas or other storages, thereby increasing the risk of fires and chemical explosions in residential as well as industrial estates.

The major concentration of the hazardous industries is seen in the Chembur-Trombay belt, spread over an area of about 10 square kilometres, having major chemical complexes, refineries, fertiliser plants, atomic energy establishment and thermal power station. Clustering of various operating units make them highly vulnerable.

BARC, HPCL, BPCL, RCF, Tata Thermal Generating Station and Oswal Petrochemicals are some of the hazardous industries operating in this belt. This area is also in close proximity to the port activities of Mumbai Port Trust which handles hazardous cargo. MPT has identified 32 hazardous chemicals which are loaded and unloaded requiring handling and storage. The list of these chemicals along with the handling capability and necessary actions required to be taken in case of emergency is given in the volume on "Hazardous industries

including fact sheets". MPT also has its independent fire service and a disaster management plan.

The atomic energy establishment, with its residential colonies, has taken adequate measures to reduce the risk. It also has a comprehensive on-site hazard management plan with necessary know-how and equipments. However, due to its close proximity with hazardous industries, namely the refineries, a close on-going coordination of these units and BARC is required, so as to restrict any potential damage.

The mutual aid schme in this area encompasses over 15 industrial units. The combined resources of these industries provide a highly enhanced degree of insurance to minimise loss by fire/emergency.

HPCL, BPCL, RCF and Tata Thermal Generating Station, all have their on-site plans, with manpower and equipment. Industries in the Chembur-Trombay region, though handling flammable and toxic liquids and gases, are equipped to take care of minor to moderate emergencies the settlements, which are in the vicinity of the units increase the risk and require off-site disaster management activities. None of these organisations have the capacity to manage an off-site impact of the emergencies. Therefore, the nature of emergency that can develop may require re-inforcement from Mumbai Fire Brigade and municipal authorities. The detailed fact sheets of these industries in given in the volume on "Hazardous industries including fact sheets".

These fact sheets highlight the specific threat of the hazardous chemicals in terms of the physical consequences and the resources available with these industries to tackle the emergencies. The fact sheet identifies the individual responsible for co-ordinating the activities with other organisations. In view of the fact that the ward officer is responsible for co-ordinating disaster response at the ward level, it may be necessary that these units establish a direct contact with the ward officer in all emergency situations, even when on-site emergencies occur, and keep him posted with the status of the emergency. This will improve the co-ordination and allow for timely reinforcement from fire.

3. Fire Hazards Response And Mitigation Plan

A Law and Authorities:
(Public Relation & Crisis Coordination, Coordination with other Govt. Agencies)

1. Name of City : Mumbai
2. Population of City as per 2001 Census : 119.78 Lakhs.
3. Area of City (In Sq.Kms.) : 437.71 sq. kms.
4. Population Density of City : 27.37 sq. kms.
5. Name of the Authority maintaining Fire & Emergency Services : Municipal Corporation of Greater Mumbai.
6. Are you maintaining Fire & Emergency Service as per Govt. of India Guidelines
   a) One fire engine for 50,000 population upto 3,00,000 population. From 3,00,000 upwards additional Fire Engine per lack of population or Fraction thereof — Yes
   b) One fire station for 10 sq. Km Urban area — Yes
   c) One fire station for 50 sq. Km Rural area — N.A.
   d) Response time maximum 5 minutes in Urban Area and 20 minutes in Rural area : — Yes
7. Administrative Head of Fire & Emergency Service : Additional Municipal Commissioner

   Name : Smt. Manisha Patankar-Mhaiskar
   Designation : Additional Municipal Commissioner (Western Suburbs)
   Address with Pin code : Municipal Head Office, C.S.T. 400001
   Telephone No. (with STD Code) : 022 – 22620251 – Ext. 2327, 22620433
   Fax No. : 22620639
   Mobile No. : 9769044000
   E-Mail : amcwsmcgm@gmail
   Website : www.mcgm.gov.in

8. Head of Fire & Emergency Service :
   Name : Shri Uday Keshav Tatkare
   Designation : **Chief Fire Officer (I/c.)**
   Address with Pin code : 'E' Ward Office, 10, Shaikh

Haffizudding Marg, Byculla,
Mumbai-400008

Telephone No. (with STD Code) : 022-23076111
Fax No. : 23086183
Mobile No. : 9930464805/9820270481
E-Mail : cfotatkare@rediffmail.com

9. Name of Central Fire & Emergency Station
Fire & Emergency Service Head Quarters :
Address with Pin code : 'E' Ward Office, 10, Shaikh Haffizudding Marg, Byculla, Mumbai-400008.
Telephone No. (with STD Code) : 022 23076111
Fax No. : 23086183
E Mail

10. Do you conduct any fire safety training program or awareness program for the public. : Yes.

11. Do you carry out evacuation drills/ mock drills in vital installations/ industrial plants/ Govt. Buildings : Yes, As per requisition of the organization.

B Risk Assessment, Incident Prevention & Mitigation of City:

(Risk Evaluation and Control)

1. Is the Fire Approval is Mandatory for construction of all types of buildings : Yes, for the building above 24 meters and all commercial buildings.

2. Is the Fire Approvals are as per the Provisions contained in National Building Code 2005. No. As per the rules of D.C. Rules of M.C.G.M.

3. Is the central data of all fire approval is maintained in Head Quarters. Yes.

4. Please provide the copy of Development Control Rules of the city. Attached

5. **Please Provide the details of Potential Fire Risk in the City**

Sr. No.	Particulars	Nos.	
		Residential	Non-residential
1	**Buildings**	**27,68,910**	
	Upto 15 Meters	**19,642 Cessed Building**	
	15 to upto 24 Meters		
	Above 24 to upto 36 Meters		
	Above 36 to upto 45 Meters		
	Above 45 to upto 60 Meters		
	Above 60 to upto 75 Meters		
	Above 75 to upto 100 Meters		
	Above 100 to upto 150 Meters		
	Above 150 Meters above.		
2	Industrial Area / Chemical Zone		630
3	Cinema Halls/ Malls/ Drama Theatres		688
4	Public Gathering Places		161
5	Hazards storage		16
6	Pilgrims Area (Floating Population)		07
7	Exhibition/ Public Function Grounds where permission for erecting pedals for circus or any other religious / social functions are granted.		14
8	Other (Please give details)		

Note: All above buildings should be sub-classified on the basis of following classification as per Part 4 of NBC 2005:

A) Residential Buildings : 27,68,910
   a) Lodging or Rooming Houses :
   b) One or Two Family private Dwelling :
   c) Dormitories :
   d) Apartment Houses (Flat) :
   e) Hotels : 12729

f) Hotels (Starred) : 1069

B) Educational Buildings
a) School upto Senior Secondary Level: 1721
b) All other Training Institutes

C) Institutional Buildings : Appendix A
a) Hospitals & Sanatoria : 48 BMC & Govt. + 1505 Private Hospitals.
b) Custodial Institutions : 2
c) Penal & Mental Institutions : --

D) Group D Assembly Buildings : 630
E) Group E Business Buildings :
F) Group F Mercantile Buildings : 151
G) Group G Industrial Buildings : 415
H) Group H Storage Buildings : 169
I) Group J Hazardous Buildings :

6. Road Network **:**

a.	Any major National Highway passing though City	Yes, N.H.3, N.H.4 & N.H. 8
b.	Any State Highway passing though City	Nil
c.	Any Tunnels in the City	Metro Railway under process.
d.	Major Bridges in the City	56
e.	Accident prone patch	Many
f.	Roads in Hilly Areas or Hilly/Mountain Area in the City or near City	05

7. Railway Network

a.	Mail/Express Train main stations	CST, Mumbai Central, L.T. Terminus, Dadar.
b.	Local Train stations	CST to Thane, Churchgate to Borivali, CST to Mankhurd
c.	Metro train stations	Under project stage.
d.	Underground Metro stations	Under project stage.
e.	Sky Bus	Under project stage.
f.	Mono Rail	Under project stage.

8. Airport
a) Domestic : Santacruz, Pawanhans.
b) International : Sahar
c) Cargo : Sahar Airport
d) Helipad : 4 (INS Kunjali, Ins Hamala, Raj Bhavan, Worli)
e) Air force Airbase : Navy Nagar.

9. Sea / River Port

a)	Passenger Jetties	: 04
b)	Container Jetties	: 02
c)	Bulk Material Handling Jetties	:25 Berth
d)	Petroleum Products Handling Jetties	:04 (Butcher Ireland)
e)	Chemical & Hazardous Goods Handling Jetties	:02 (Peerpav)
f)	Fishing Jetties	:07
g)	Ship Breaking Areas	:02
h)	Ship Building Docks	:01
i)	Naval Base	:02

10. Vital Installations in the City

a)	Secretariat	:01
b)	Legislation Assembly	:02
c)	Bank Headquarters	:15
d)	HQ's of major Govt & Semi Govt. Organisations:	
e)	Atomic Power Stations	:01
f)	Chemical Factories	:03
g)	Fertiliser Plants	:01
h)	Major Hazardous Units	:03
i)	Cross Country Pipelines	:No
j)	Petroleum Oil Companies like Refinery, Bulk Storages Depot	:04
k)	Petroleum & Flammable Gas, LPG filling Stations	:03
l)	Domestic Gas Pipe Network	:Mumbai Suburbs.
m)	Cylinder Gas Storage-outlets	:All over Mumbai.

11. Temporary Structures such as Exhibition Halls, Circus tent, Pedals erected for religious activities. **:** 14 places.

12. Dilapidated & Unsafe Buildings in the City**. :** Many

13. Unorganised Houses like Juggi Zopadi & Slum Area**:** Dharavi, Worli, Bandra, Santacruz, Kurla, Mankhurd, Govandi, Deonar, etc

14. Geological Hazards Associated with Cit**y** :

a)	Earthquake	:	Possible
b)	Tsunami	:	Possible
c)	Landslide, Mudslide, Subsidence	:	Once in every year.
d)	Glacier, Iceberg	:	Never.

15. Meteorological Hazards Associated with City **:**

a)	Flood, Flash Flood, Tidal Surge	:	Flooding in Monsoon.

b) Drought : Never.
c) Fire (Forest, range, urban, wild land): Urban fire.
d) Snow, Ice, Hail, Avalanche : Never.
e) Windstorm, tropical, cyclone, hurricane, tornado, water spout, dust/ sand storm. :Water Born Disaster possible.
f) Extreme temperatures (Heat, cold): Never.
g) Lightning strikes : Possible
h) Famine : Never
i) Geomagnetic storm : Never

16. Biological Hazards Associated With City :
a) Emerging diseases that impact human or animal (Swine-flu, Malaria, Birds flu, Plague, Smallpox , Anthrax, Foot & Mouth Disease. : Possible.
b) Animal or Insect infestation or damage. : Possible

17. Human Caused events such as the following :-
a) Accidental
i. Hazardous material (explosive, flammable liquid, flammable gas, flammable solid, oxidizers, poison, radiological, corrosive) spill or release. : Occasionally.
ii. Explosion / fire : Almost every day.
iii. Transportation accident : Almost every day.
iv. Building / structure collapse : Average 350 per year.
v. Energy / power/ / utility failure : Frequently.
vi. Fuel/ resource shortage : Adequate.
vii. Air/ water pollution, contamination : Serious in due future.
viii. Water control structure/ dam/ lever failure: Likely.
ix. Financial issues (economical depression, inflation, financial system collapse) : Current trend.
x. Communication system interruptions : Advance communication system adopted.
xi. Misinformation : Sometimes.
b) Intentional
i. Terrorism (explosive, chemical, biological, radiological, nuclear, cyber) : Occasionally.
ii. Sabotage : Sometime
iii. Civil disturbance, public unrest, mass hysteria, riot : Occasionally
iv. Enemy attack, war : Last faced in 1975
v. Insurrection : Sometimes
vi. Strike or labour dispute : Regularly.
vii. Disinformation : Yes
viii. Criminal activity (vandalism, arson, theft, fraud, embezzlement , data theft : Yes
ix. Electromagnetic pulse : Yes
x. Physical or information security breach : Yes
xi. Workplace violence : Yes
xii. Product defect or contamination : Yes

xiii. Harassment : Yes
xiv. Discrimination : Yes

18. Technological Caused events that can be unrelated to natural or human caused events, such as the following :
a) Central computer, mainframe, software, or application (internal / external) : Yes
b) Ancillary support equipment : Yes
c) Telecommunications : Yes
d) Energy / power / utility. : Yes

19. Analysis of Fire & Rescue Calls to Draw a Probability of Hazards.

Sr. No.	Particulars	2005	2006	2007	2008	2009
1	Total No. of Fire & Rescue Calls	11,155	7984	13653	15167	16797
	a) No. of Fire Calls		3250	5225	5014	4861
	b) No. Rescue Calls		1883	3468	5050	6476
	c) No. of Gas Leaks		2627	4494	4625	4942
	d) Building Collapse		224	347	381	407
	e) Hazards Material calls					
	f) Animal Rescue Calls					
	g) Other calls			119	97	111
2.	No. of Lives Saved	604	624	860	1222	762
	No. of Lives Lost	372	273	336	369	234
	No. of Injured	610	655	890	1268	813
3.	Property Saved (Rs. In Lakhs)					
	Property Lost (Rs. In Lakhs)	1245.80786	1147.70714	0625.26746	1677.60005	405.70440

20. Analysis of Incidents :

Sr. No.	Particulars	2005	2006	2007	2008	2009
A	Nos. of Fire/Rescue Calls received from 0700 hrs to 1900	4308	3422	5795	6709	7558
B	Nos. of Fire/Rescue Calls received from 1900 hrs to 0700	2615	1711	2898	3355	3779

C Planning, Resource Management & Incident Management :

(Mutual Aid/ Assistance, Emergency Response and Operations, Developing and Implementing emergency response plan & procedures.)

1. Please provide the copy of Disaster Management Plan of the city. : Attached.

2. Do you have any Mutual Aid with any Central or other State Govt. Authority for conducting fire & rescue operations Please provide details. :Yes, Mutual Aid scheme with surrounding Municipal Corporation and refinery.

3. Is on site and off site disaster managements Plan is in place for all vital installations, buildings and industrial plants. And is in sync with the district disaster management plan. : Yes

4. Addresses of Fire Stations

Sr. No.	Name of Fire Station	Type of Construction of Fire Station i.e. RCC/Metal Shade / Temporary Shade	Address	Telephone No.	Fax No.
01.	Colaba Fire Station	RCC	Shahid Bhagatsing Marg, Jt. Narayan Atmaram Sawant Marg, Mumbai 400005.	2204 3603	
02.	Fort Fire Station	RCC	Rustam Sidhawa Marg, Fort Mumbai-400001.	2261 1942	
03.	Memonwada Fire Station	RCC	Sardar Vallabhbhai Patel Marg, Jn. Memonwada Marg, Mumbai 400 003.	2373 8818	
04.	Gowalia Tank Fire Station	Tiled roof	Nana Chowk, August Kranti Maidan, Mumbai 400 007.	2364 6001	
05.	Byculla Fire Station	RCC	Bapurao Jagatp Marg, Jn.Shaikh Haffizuddin Marg, Byculla, Mumbai 400 008.	2307 6111	
06.	Worli Fire Station	RCC	Dr.Annie Besant Road, Jn.Nariman Marg, Worli, Mumbai 400 025.	2430 0178	
07.	Dadar Fire Station	RCC	Dr.Babasahbe Ambedkar Marg, Mumbai Marathi Granthsangrhalay Marg, Mumbai 400 014.	2413 4200	

08.	Shivaji Park Fire Station.	A.C.sheet roof	Prakash Kotnis Marg, Mahim, Mumbai 400 016.	2445 7203	
09.	Indira Dock Fire Station.	RCC	P.D'Mello Marg, Carnac Bunder, Mumbai 400 038.	2261 1589	
10.	Mandvi Fire Station	RCC	Sardar Vallabhabhai Patel Marg, Wadi Bunder, Mumbai 400 009.	22611589	
11.	Sewree Fire Station	RCC	Br.Nath Pai Marg, Near Cotton Green Railway Station, Mumbai 400 033.	2377 5765	
12.	Andheri Fire Station	RCC	Swami Vivekanand Marg, Erla Bridge, Tata Compound, Andheri (W), Mumbai 400 058.	2620 5301	
13.	Vikhroli Fire Station	RCC	Vikhroli Park Site, L.B.S. Marg, Vikhroli(W), Mumbai 400 079.	2517 0730	
14.	Chembur Fire Station	RCC	Vithal Narayan Purav Marg, Chembur Naka, Near Vijay Talkies, Chembur, Mumbai 400 071.	25224824	
15.	Dharavi fire Station	RCC	12/E, Rajashree Shahu Nagar, Dharavi, Mumbai 400 017.	2407 7868	
16.	Deonar Fire Station	A.C.sheet roof	5/4 Sector, New Mun. Colony, Gowandi, Deonar, Mumbai 400 043.	2556 3391	
17.	Mulund Fire Station	RCC	L.B.S. Marg, Jn.Devi Dayal Marg, Mumbai 400 080.	2568 7637	
18.	Raoli Camp Fire Station.	RCC	Bldg.No.3,Sector 'C' Sardar Nagar No.4, Dr.Mukundrao Ambedkar Marg, Mumbai 400 037.	2407 7841	
19.	Kandivali Fire Station	RCC	Swami Vivekanand Marg, Jn.Kamala Nehru Marg, Kandivali (W), Mumbai 400 067.	2805 0101	
20.	Marol Fire Station	RCC	Madhuradas Wasanji Marg, Jn.Agnishaman Dal Marg, Andheri (E), Mumbai 400 069.	2821 0940 2821 0941	
21.	Malad Fire Station	RCC	Chunilal Girdharlal Marg, Malvani Gate No.1, Malad W, Mumbai 400 095.	2807 1010	
22.	Bandra Fire Station.	RCC	Near Bandra Reclamation, Bandra(W), Mumbai 400 050.	2643 5206	
23.	Nariman Point Fire Station.	RCC	Jagannath Bhosle Marg, Nariman Point , Near Sarang	22898278	

			Bldg., Mumbai 400 038.		
24.	Wadala Fire Station.	RCC	Indian Hum Pipe Pvt. Ltd. Co.Compound C.G.S. Colony, Barkat Ali Dargah Marg, Wadala (E), Mumbai.	24132058	
25.	Gawanpada Fire Station	RCC	Swatantraveer Savarkar Marg, Mulund (E), Mumbai 400 081.	25839191	
26.	Borivali Fire Station	RCC	Opp.Don Bosco High School, L.T. Road, Borivali West, Mumbai 400 092.	2860 2847	
27.	Vile-Parle Fire Station.	RCC	Azad Road, Vile-Parle (East), Mumbai 400 057.	2611 2121	
28.	Bandra-Kurla Complex Fire Station	RCC	Bandra-Kurla Complex Marg, Opp. International School, Bandra-Kurla Sankul, Mumbai-400 051.	26522426	
29.	Kurla-Kamani Fire Station	RCC	Lal Bahadfdur Shashtri Marg, Kamani Junction, Mumbai-400 070.	25039200	
30.	Goregaon Fire Station	RCC	Gajanan Maharaj Road, Motilal Nagar, Opp. BEST Colony, Goregaon (W), Mumbai-400 104.	28712869	
31.	Chincholi Fire Station	RCC	Link Road, Nirlon Housing Society, Chincholi Bunder, Mumbai-400 064.	28769101	
32.	Dindoshi Fire Station	RCC	General Arun Kumar Vaidya Marg, Opp. Dindoshi Bus Depo, Mumbai-400 097.	28406729	
33.	Dahisar Fire Station	RCC	S.V. Road, Near Shailaendra Nagar, Post Office, Dahisar (East), Mumbai-400 068.	28977702	

5. Details of Fire and Rescue Appliances made available in Fire Stations :

Sr. No.	Name of Fire Station	Number of Water Tenders	Number of Rescue Tenders	Number of Ladders i.e. TTL/ ALP's	Other fire or rescue Appliances
01.	Colaba Fire Station	1	-	-	3
02.	Fort Fire Station	1	-	1	1
03.	Memonwada Fire Station	2	-	-	3
04.	Gowalia Tank Fire Station	1	-	-	-
05.	Byculla Fire Station	3	1	3	10
06.	Worli Fire Station	1	-	1	2
07.	Dadar Fire Station	2	-	-	2
08.	Shivaji Park Fire Station.	1	-	-	1
09.	Indira Dock Fire Station.	1	-	-	2
10.	Mandvi Fire Station	2	-	-	-
11.	Sewree Fire Station	1	-	-	-
12.	Andheri Fire Station	2	-	1	3
13.	Vikhroli Fire Station	2	1	1	2
14.	Chembur Fire Station	2	-	-	7
15.	Dharavi fire Station	1	-	-	2
16.	Deonar Fire Station	1	-	-	1
17.	Mulund Fire Station	2	-	1	3
18.	Raoli Camp Fire Station.	1	-	-	-
19.	Kandivali Fire Station	3	-	-	5
20.	Marol Fire Station	3	1	1	6
21.	Malad Fire Station	2	-	2	1
22.	Bandra Fire Station.	2	-	1	1
23.	Nariman Point Fire Station.	2	-	1	3
24.	Wadala Fire Station.	4	-	2	4
25.	Gawanpada Fire Station	1	-	1	2
26.	Borivali Fire Station	2	-	-	2
27.	Vile-Parle Fire Station.	1	-	-	2
28.	Bandra-Kurla Complex Fire Station	1	-	1	-
29.	Kurla-Kamani Fire Station	2	-	-	3
30.	Goregaon Fire Station	1	-	1	2
31.	Chincholi Fire Station	1	-	-	-
32.	Dindoshi Fire Station	1	-	-	1
33.	Dahisar Fire Station	1	-	-	2

6. Summary of Fire and Emergency Service :-

Sr. No.	Type of Vehicles	Nos.	Future Plan
1	Number of Fire Stations	33	03
2	Water Tenders	57	22
3	Rescue Tenders	03	05
4	Advance Emergency Rescue Tenders		
5	Flood & Rescue Tenders		
6	Hazmat Vans		
7	Turn Table Ladders	06	02
8	Hydraulic Platforms	10	01
9	DCP Tenders }	03	
10	Foam Tenders }		
11	Smoke Blowers	01	06
12	Control Post Vans	01	03
13	Water Tankers	32	06
14	Ambulances	23	-
15	Cars	08	06
16	Jeeps	49	06
17	High Pressure Portable Pumps	04	10
18	Portable Pumps		10
19	Breathing Apparatus Sets		60
20	Flood rescue boats		
21	Life jackets		
22	Details of others Appliances & Equipment	03 01 01 02 02 03	06 B.A. Van Break down Van MDV Mini Bus Goods truck Hose Lorry

7. Do you have Staff Quarters in Fire Station premises? Please provide numbers in each fire station. : Yes

8. Do you have Parade Ground in Fire Station compound? : Yes

9. Do you have Drill Tower in Fire Station compound? Yes

10. Is there Water Tank in Fire Station compound? If so please give its capacity Yes

11. Do you have facilities to arranged training classes in Fire Station premises? Please give its capacity Yes

12. Details of Officers & Staff attached to Fire & Emergency Service :

Sr. No.	Designation	Pay In Pay Band	Grade Pay	No. of Posts		
				Sanctioned	Filled	Vacant
1	Chief Fire Officer	22320-39100	7600	01	---	01
2	Dy. Chief Fire Officer	18600-39100	6600	07	---	04
3	Divisional Fire Officer	11330-34800	4200	11	08	03
4	Asst. Divisional Fire Officer	10920-34800	4200	16	14	02
5	Station Officer	10520-34800	4200	54	48	06
6	Assistant Station Officer	9380-20200	2800	146	100	46
7	Sub-Officer	8710-20200	2800	66	17	44+5 in abeyance
8	Leading Fireman/Rescuer	6600-20200	2400	243	232	11
9	Driver Operator	7100-20200	1800	483	399	84
10	Driver	N.A.				
11	Fireman/Rescuer	5200-20200	1800	1686	1587	99
12	Others (Specify designation)					

D Response Mechanism:
(Communication, Warning and Operational Procedures)

Centralised Control Room/Emergency Operation Rooms for Handling Disaster is provided or in operation.	:Yes, Disaster Management Cell at Municipal Head Office.
Internet Connectivity is provided for all fire stations.	: Yes
Computerisations of centralised control room is done? i.e. all the fire stations are connected with internet to Centralized control room.	: Yes
Communication System (Like VHF/UHF with details of Frequency should be given.)	: Yes
Any warning system is design to alert the occupants in case of disaster (Tie ups with Radio, TV channels, Cable Channels Mobile service providers etc.)	: Yes
Is Systematic Operational Procedures (SOP's) are in place for responding to any emergency? Please provide copies of the SOP's.	: Yes, Appendix B
Please provide cities digitised maps (which shows road, rail, airports, seaports, and other vital installations.)	: Attached.
Is all fire appliances are provided with Global Positioning System devices i.e. GPS system. Provide details.	: Yes
Is all fire appliances are provided with Vehicle tracking system. Provide details.	: Yes

E Training, Exercises, Evaluations and Corrective Actions:

1. Do you have any Fire & Emergency Training School/ centre for imparting Training to your staff or public. Please provide details.	:	Yes, at Wadala Fire Station
2. Type of training program conducted in the training school/ centre.	:	Physical & Class Room Lectures.
3. Is the residential facility available in the training centre.	:	Dormitory provided.
4. Number of class rooms available in the training centre.	:	03
5. Number of staff made available to the training centre.	:	Rank-vise staff posted.
6. Please provide the details of the Labs, laboratory, library available In the training centre.	:	No.
7. Any Auditorium, Convention Hall available in the training centre. Please provide seating capacity.	:	Yes, with 100 people sitting Capacity.
8. Does you impart training to outsiders or industries or public.	:	Yes

F Financial Management of Fire & Emergency Service:
(Fire Tax, Fire Cess, Capitation Fees, Service Charges etc.)

1. What are the statutory instruments the (Special Act, Corporation Council Acts Rules,) to levy taxes / cess as service Charge. Please give details thereof. :Free services are rendered to citizens of Mumbai in case of emergency.

2. Do you recover Fire Tax or Cess from the properties in the city. : Fire tax is recovering through Assessment & Collection Deptt.

   Please provide circular or office order

3. Do you levy any other fees or tax for special or High Rise buildings. : Only capitation fees levied to High-rise & Low-rise Buildings

   Please provide circular or office order Appendix C.

4. Any fees levied for grant of Fire Approvals for buildings. Please provide a copy of circular. : No.

5. Do you charge any special charges for standby duties or service rendered. Please provide circular or office order. : Copy of scheduled fees is Appendix C

6. Do you have separate fund for up gradation of fire and emergency services. : separate fund "Mumbai Fire Brigade Fireman Benevolent Fund" for fire brigade staff.

7. Details of Expenditure of Fire Service

(Rs. In Lakh)

Sr. No.	Year	Establishment Expenditure	Maintenance Expenditure	Civil Expenditure	Other Expenditure
1	2004-05		3,87,57,000		
2	2005-06		4,58,26,000		
3	2006-07		2,58,47,000		
4	2007-08		1,38,88,000		
5	2008-09		11,65,52,000		
6.	2009-10		5,12,49,168		

8. Details of Future Plan

Sr. No.	Year	Rs. In Lakhs	% of Expenditure of Fire Department with respect to funds allocated
1	2010-11	10200	60%
2	2011-12		
3	2012-13		
4	2013-14		
5	2014-15		

9. Give details about the income received by your Fire Service

Sr. No.	Year	Income Received				
		Fire Tax	Fire Fee	Fire Service Charges	Capitation Fee	Any other & Ambulance
1	2004-05			1,08,700.00	6,97,87,000	29,85,000
2	2005-06			68,300.00	7,50,00,000	59,50,000
3	2006-07			70,620.00	14,16,66,000	48,17,000
4	2007-08			44,900.00	9,99,36,000	1,18,48,000
5	2008-09			61,000.00	13,62,99,000	2,03,48,000
6	2009-10			76,300.00	18,85,39,246	3,16,00,874

G Human Resource Management:

a) Manpower Planning : Considering the retirement & development of Fire Stations.

b) Number of post sanctioned & vacant : As per point No. 43.

c) Recruitment procedure i.e
   a. Recruitment Rules : Yes
   b. Group Discussions : No
   c. Personal Interview : Yes

d) Training and Development
   1. Induction Training : 6 months training course.
   2. Refresher Training : Intermediate training course
   3. Motivation Training : Yearly drill competitions conducted
   4. Special Skill Training : Deputed to N.F.S.C.
   5. Any other : Nil.

e) Carrier and Successor plan : Promotional training of higher post.

f) Migration plan : Transfer after every 3 years.

g) Retirement : At the age of 55 years + 3 years superannuation.

h) Plan for utilization of retired persons services : Nil.

4. Resources required as per Govt. of India Guidelines

Sr. No.	Type	Admissible	Available	GAP
1	Fire Station	44		11
	a. City		12	
	b. Suburb		21	
2	Fire Tender	66	57	09
3	Rescue Tenders	08	03	05
4	Advance Emergency Rescue Tender	06	-	06
5	Flood & Rescue Tender	06	-	06
6	Hazmat Van	02	-	02
7	Turn Table Ladder	10	06	04
8	Hydraulic Platform	10	10	00
9	DCP Tender	06	03	03
10	Foam Tender			
11	Smoke Blower	06	01	05
12	Control Post Van	03	01	02
13	Water Tankers	44	32	12
14	Ambulance	44	23	21
15	Water Bouser	-	-	-
16	B.A. Van	06	03	03
17	High Pressure Portable Pump	10	04	06
18	Search & Rescue Gears Including Lukas, Nike gears, Pneumatic Lifting Bags, Search Camers, Gas Detectors, Thermal Imaging Cameras	 66 66 44 06 - 06	 57 57 33 04 - 03	 09 09 11 02 - 03

5. Proposal of Urban Fire Hazard & Risk assessment & Mitigation for Mumbai

EMI

The Earthquakes and Megacities Initiative

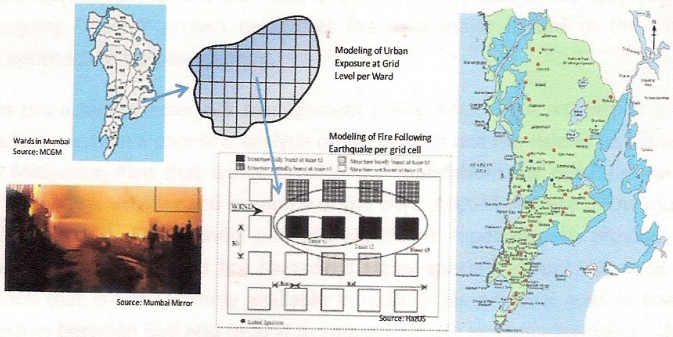
An international, not-for-profit, scientific organization dedicated to disaster risk reduction of the world's metropolises

In Collaboration with **MMI Engineering** Oakland, California

MMI ENGINEERING

Proposal for

Urban Fire Hazards and Risks Assessment and Mitigation for Mumbai



Prepared for

Municipal Corporation of Greater Mumbai
Mumbai, India

January 6, 2011

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http://www.emi-megacities.org

A Member of the Global Platform for Disaster Risk Reduction

5.1 Purpose and Rationale

The Earthquake Megacities Initiative (EMI), a not-for-profit international scientific organization based in the Philippines, is pleased to submit this proposal to the Municipal Corporation of Greater Mumbai (MCGM) to undertake an Urban Fire Hazards and Risks Assessment and Mitigation Study for the City of Mumbai. The study will be undertaken in cooperation with the Mumbai Fire Brigade and other relevant stakeholders in Mumbai, and will be a specialized investigation of the Mumbai Disaster Risk Management Master Plan (DRMMP) project. The ultimate goal is to develop a Mumbai Fire Mitigation Plan that would be anchored on international standards and best practices in urban firefighting of major metropolises.

With one of the highest urban concentration on the globe, and ever growing population requiring a complex system of infrastructure and services, the risk of fire to Mumbai is a constant threat to the city. The threat of fire can come from various sources including conventional residential fires, industrial fires, moving hazardous vehicles explosions and fires, and the extreme case of fire following an earthquake. In fact, the on-going DRMMP project recognizes fire as a major hazard to the city that needs a comprehensive approach to its management.

Keeping with its pro-active disaster risk management policy, MCCM has asked EMI to put together a team of experts to undertake a scientific analysis of fire hazards and fire risks in Mumbai and to develop a Mumbai Fire Mitigation Plan that would provide the foundations for reducing the fire risk to the population, infrastructure, ecology and economy of the city. MCGM has one of the most sophisticated and trained fire brigade in entire India and has significant experience to provide. However, the knowledge of assessing fire risk and fire hazards is highly specialized and will need a sophisticated scientific approach that is not currently available in India. This proposal goes in line with the long-standing partnership between EMI and MCGM to support MCGM in managing risks to the best available knowledge, technologies and standards.

5.2 Project Management

EMI has put together an exceptional team of scientists, practitioners and fire fighting experts from the United States, Germany, and Australia to undertake this project. It will partner with MMI Engineering (www.mmiengineering.com), a California-based specialized engineering firm that will provide pertinent expertise in Fire Hazards and Risks assessment, and which will act as consultant to EMI. Several other specialists are also brought in the project to support the team of experts and/or cover particular areas of expertise and review. The project will be managed by EMI's multi-disciplinary team in Manila, which has been managing the DRMMP project, is fully familiar with the working processes of MCGM, and which will be responsible for the implementation and performance of this particular undertaking.

As in the case of the DRMMP, the approach will be to work closely and collaboratively with MCGM, and in particular with the Fire Brigade at each step of the project to ensure that the project is fully anchored in the local conditions, implementable and effective. This approach will also enable optimum knowledge sharing and knowledge transfer. The project is data intensive, and hence, resources will be needed from the MCGM side to help with the data collection task. It must be noted that a certain amount of the data that is needed for the project, such as population distribution by ward, construction distribution, water system, transportation, locations of critical facilities, and others has already been acquired and integrated in a GIS (Geographical Information System) by EMI as part of the DRMMP project. Thus, a significant amount of time and resources are saved by using the findings and outcomes of the DRMMP and by continuing with a project management team that has already established deep knowledge of the work environment in Mumbai and has trusted and efficient working relationship with MCGM and other relevant stakeholders in Mumbai.

5.3 Items to be Investigated and Approach

The scope of the project will cover the following sources of fire are of interest to MCGM:

1. Residential fires
2. Transport of hazardous materials
3. Industrial fires
4. Fire-following earthquake

The methodology to be undertaken to evaluate the potential impact of each of the above fire sources will include the steps indicated below. The level of resources and support from MCGM and stakeholders' validation steps are also indicated.

- Discovery: Data/Literature collection and review
  - Level of Support from MCGM: Very High
- Data analysis and data preparation for computer simulation
  - Level of Support from MCGM: Low
  - This is a stakeholders' validation step
- Global urban fire-fighting best practices and model regulations
  - Level of Support from MCGM: Low
- Gap Analysis of local fire fighting capabilities relative to international best practices
  - Level of Support from MCGM: Very High
  - This is a stakeholders' validation step
- Hazard Assessment: Qualitative and quantitative assessment of hazard potential relative to data
  - Level of Support from MCGM: Moderate
  - This is a stakeholders' validation step.
- Impact and Consequence Analysis
  - Level of Support from MCGM: Moderate
  - This is a stakeholders' validation step.
- Mitigation Planning and Recommendations
  - Level of Support from MCGM: High
  - This is a stakeholders' validation step

The project will be undertaken under a Project Implementation Team (PIT) which will be manage the issue-solving and decision-making process with co-project managers one from MCGM (Fire Brigade) and one from EMI. The stakeholders will be organized into a Fire Management Focus Group, which will be headed by an officer designated by the Fire Brigade and which will serve as both a resource and a validation group to the project.

5.4 Proposed Tasks

The remainder of this section presents the details of the above proposed tasks and also articulates specific ideas within each task by fire source.

Task 1: Discovery and Data collection

The data collection task will be undertaken through the support of MCGM. EMI experts will provide the type and content of the data that need to be collected and the format and resolution of the data. The data may reside with MCGM and/or several public and private institutions and could be highly technical. In other cases, it is likely that all requested parameters may not be available, and appropriate inference will be made as needed. This will require good communication between the EMI experts and the counterpart from MCGM. . Thus, MCGM should provide the adequate resources to support the data collection process. Guidance and input from the PIT will also be needed in a timely manner to ensure that the process of data collection is effective and thorough. It is also assumed that all data collected and produced by the DRMMP project, including raw data and intermediary output used for the earthquake and flood assessment studies will be available for use in the study without restrictions.

It is expected that the following data that would be collected:

- Historical fire incident and loss data for the city of Mumbai, with key parameters of interest being:
    - Fire location
    - Ignition source
    - Fire spread area
    - Extent of damage to property and people
    - Fire suppression response (number and location of responding fire brigades, times needed for arrival, suppression, clean up)

    - Fire suppression capability including water availability through hydrants supplied by the Mumbai water transmission and distribution system
    - Alternate water suppression sources
- Exposure data
    - Building value, construction type, fire resistive type
    - Building location/density by area/Ward, square footage
    - Presence of sprinkler systems
- Development of fire suppression data
    - Fire brigade data
    - Water supply system and vulnerability (Note: vulnerability from earthquakes will be taken and expended from the DRMMP study)
- Meteorological data
    - Prevailing wind speeds and direction at different times of day, season and year
    - Humidity
- For residential fire source:
    - Demarcation of ignition location by key metrics such as slum vs. non-slum, or by level of urban density (low, medium, and high)
    - Type of fire source: cooking apparatus used (chulah versus gas cylinders)
- For hazardous material fire source:
    - Permitted routes through Mumbai versus proximity to property and people
    - Vehicle accident rate per road kilometer (inferred from prior studies)
    - Flammability of hazardous material
- For industrial fires
    - Location of industrial facilities, and warehouses
    - Severity potential of fires
    - Exposure around industrial facilities
- For fire following earthquake
    - Water system vulnerability

- Relevant outputs and analysis results from the scenario earthquake analyzed in DRRMP.

EMI will also undertake a literature review in the public domain on urban fire, especially in densely populated cities and post-fire studies and analyses that can be relevant to the project. EMI will support the expert team in California with a technical staff in Manila that includes an urban safety expert and a transportation expert. Dr. Craig Davis who undertook the evaluation of the Mumbai water system in the DRMMP project will continue as an expert in evaluating Mumbai water system including potential vulnerabilities and capabilities for fire following.

EMI will develop a GIS system and plot all relevant data into the GIS system which will be validated by MCGM and be part of the deliverables.

Figure 1: Example of building densities for Mumbai

Task 2: Data Analysis and Integration in GIS System

EMI experts will review and quality control the data collected by the project and provide guidance on gaps in data and alternatives on dealing with the gaps in case the missing data becomes difficult or impossible to secure. They will establish the validity and completeness of the data for analysis purposes, and will prepare the data structures necessary for analysis from the data collected in Task 1. The collected data will be digitized and incorporated in a Geographical Information System (GIS) that has been developed by EMI in the context of the DRMMP Project. The GIS system will be of great value to MCGM, the fire brigade and other institutions in terms of improving their data collection and data sharing systems and in improving the fire fighting capabilities in the future.

Task 3: Qualitative and Quantitative Assessment of Fire Hazard Potential

EMI experts will undertake the following hazard assessment studies:

- Empirical analysis of historic fire loss and fire fighting data
    - Temporal and spatial analysis
    - Assess frequency and severity of fire
        - By fire source type (e.g., residential, industrial, or hazardous material transport)
        - By Urban density (low, medium, high)
        - By urbanization type (slum vs. non-slum)
        - By damage to property and people
        - By fire suppression type (sprinkler vs. non-sprinkler)
        - By level of fire brigade response
- For fire-following earthquake (FFE)
    - Use the two earthquake scenarios analyzed before and post-process data to permit a FFE consequence analysis, including water system vulnerability post-earthquake

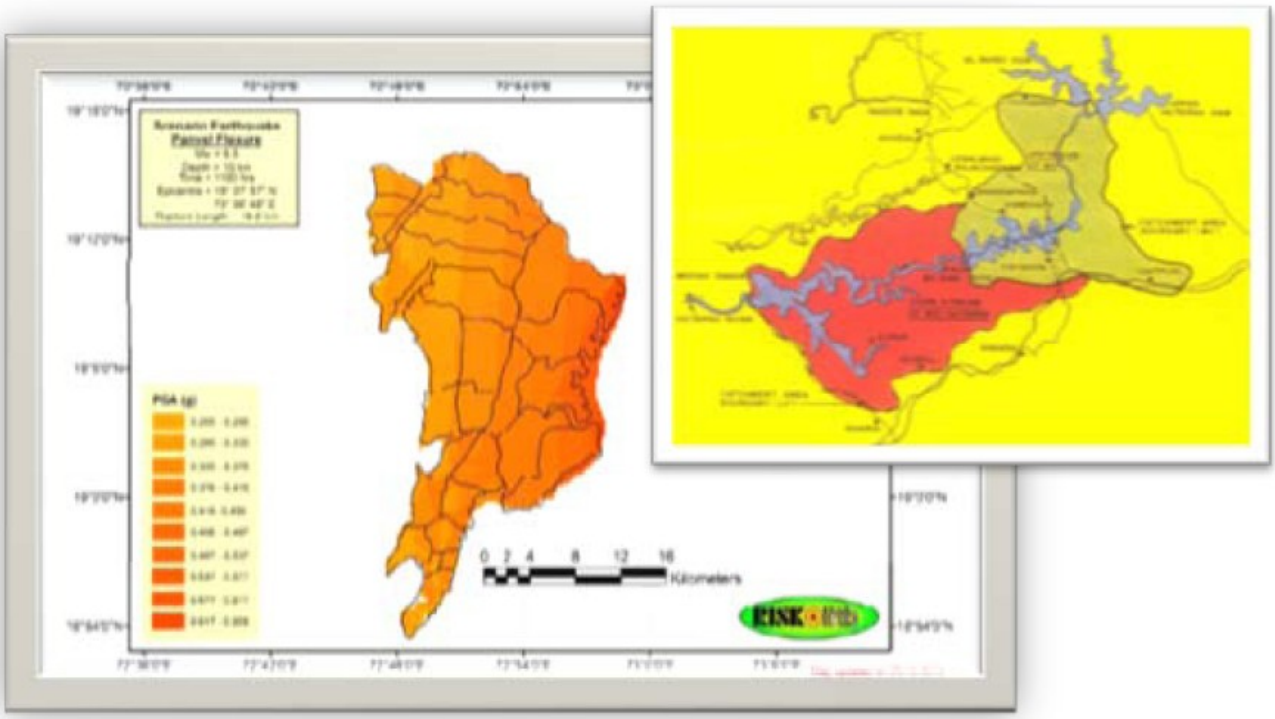


Figure 2: Seismic hazard map of Mumbai for Postulated M6.5 Earthquake and Water Supply System (Source: Sinha et al. 2010, DRMMP)

EMI will review the inputs, analyses and outputs and work with the PIT and the Mumbai Fire Brigade to ensure that the hazard assessment captures and responds to their needs.

Task 4: Consequence Analysis

A consequence analysis will be performed for each of the fire hazard source, the sophistication of the analysis will be largely governed by the available data to analyze the scenarios; however, based on prior experience, relevant analysis methods are proposed below for each hazard source. The methods will be adjusted to the data availability and to the requirements of the fire brigade during the project undertaking.

- For residential fires, it is assumed that relatively large amount of data would be available and so an empirical model will be develop to assessment the range of possible fire losses to property and people from residential fires. A

tool will be developed to permit analysis using this empirical model. Results will be validated with the Fire Brigade and the PIT.

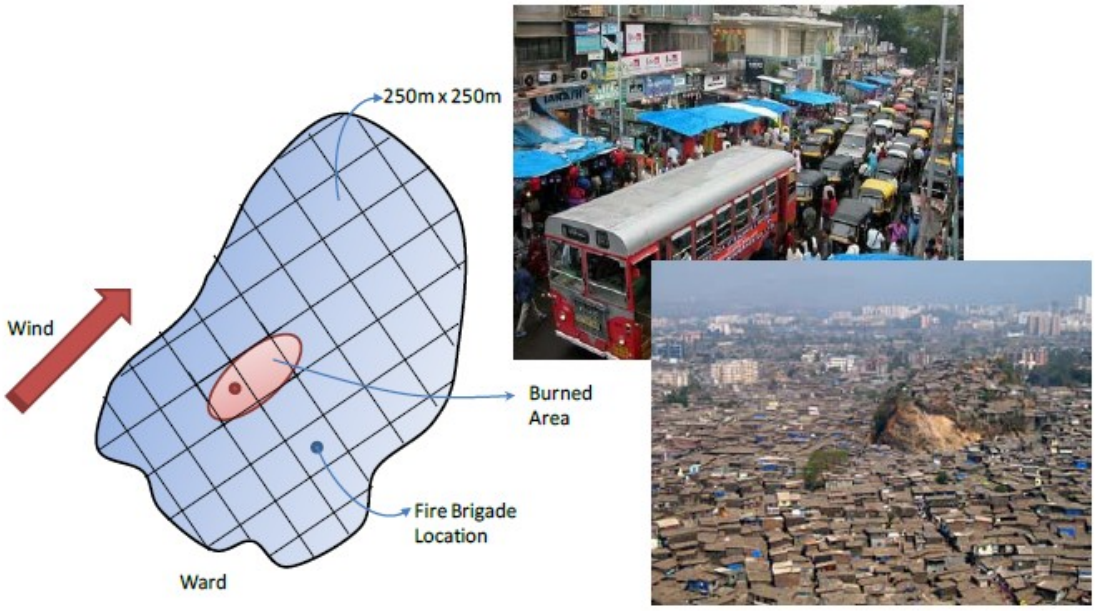


Figure 3: Modeling of burned area for residential fires

- For transport of hazardous materials, up to four relevant scenarios will be modeled with the materials en route and placed in critical areas of Mumbai. Fire burn scenarios will be developed with representative severity including effects of prevailing wind speed and direction to assess the extent of burned area, and consequent loss to property and people. A tool will be developed to permit the assessment of the sensitivity of the results to these scenario analyses under a range of parameters (e.g., severity of fire, wind speed and direction, and urbanization type, suppression capability, among others)

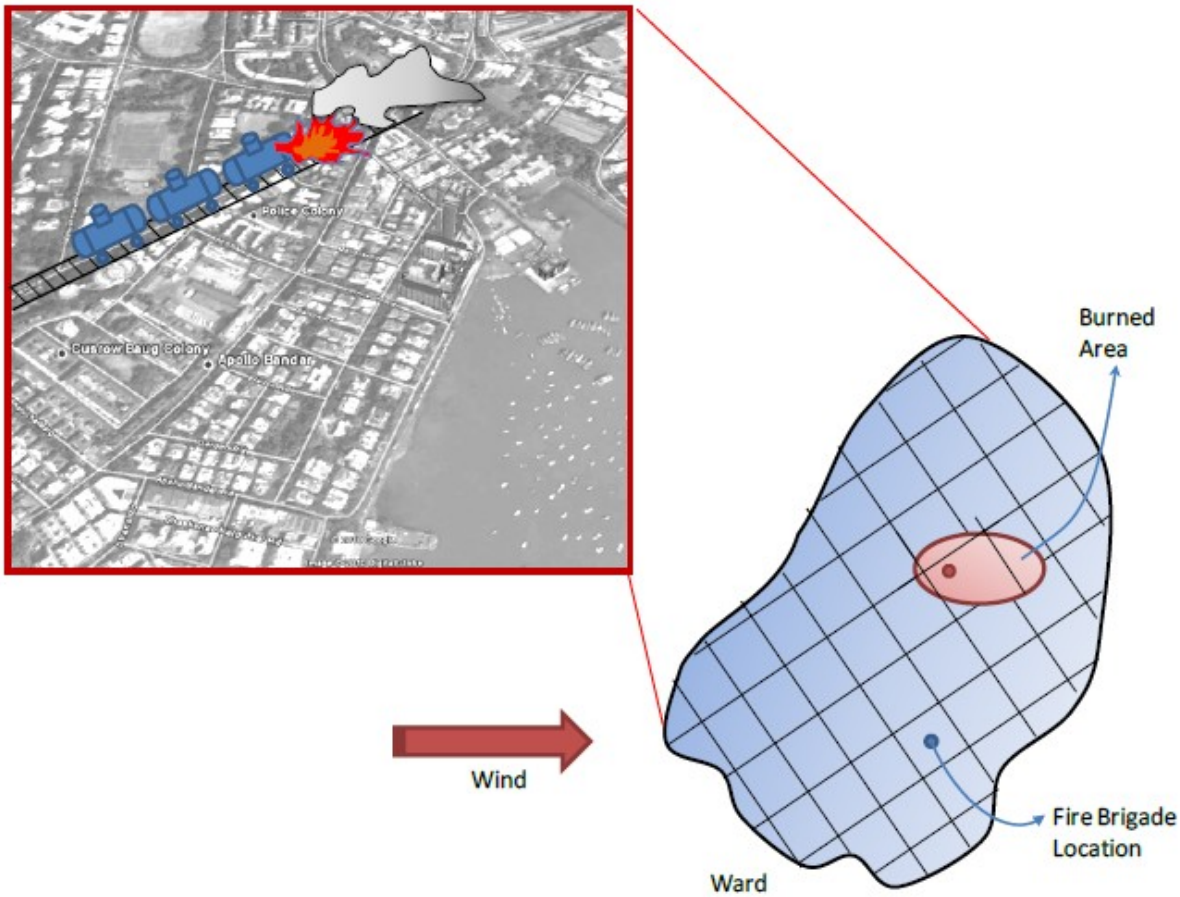


Figure 4: Modeling of fire consequence from transport of hazardous materials

- For industrial fires, two (up to four) sites will be selected in discussions with project stakeholders to develop fire severity scenarios and this will be overlaid with the exposure data to permit consequence analysis with different passive and active fire fighting scenarios (e.g., different sprinkler types, private and public fire brigade strategies)

Figure 5: Location of Critical Facilities in Mumbai

- For fire-following earthquake, a fire following earthquake simulation model will be developed that takes into consideration the following parameters
    - Given earthquake hazard data and building exposure data, simulate FFE as follows (using HazUS methodology adapted for Mumbai conditions)
        - Fire ignition
        - Fire spread
        - Fire suppression
    - The output for each simulation would be mean and standard deviation of the following:
        - Burned area by Ward
        - Population exposed to fire
        - Building value consumed by fire
    - The parameters to be considered in simulation of each earthquake scenario includes the following:
        - Building stock inventory (square footage by building type and fire-construction type)
        - Location and strength of fire brigade throughout Mumbai
        - Water supply system available for fire suppression

- Meteorological conditions including: Wind speeds, direction
- Other parameters including: Presence of natural fire barriers, performance of fire brigade post-earthquake

- The simulation tool will be to develop with the primary objective being to rapidly develop robust statistics for fire simulations. The results can be read into GIS applications for visualization of FFE simulation results.
- Primary methodology for simulation tool: The intent is to adapt the HazUS FFE methodology for use for Mumbai. However, other approaches, for example, such as those applied in New Zealand using rules-based simulation approach will be considered for applicability for high density urban environment, such as in Mumbai, India.
- The simulation is planned to be performed at a 250mx250m grid since our understanding is that this would make it consistent with prior studies and the results will then be aggregated to Ward level

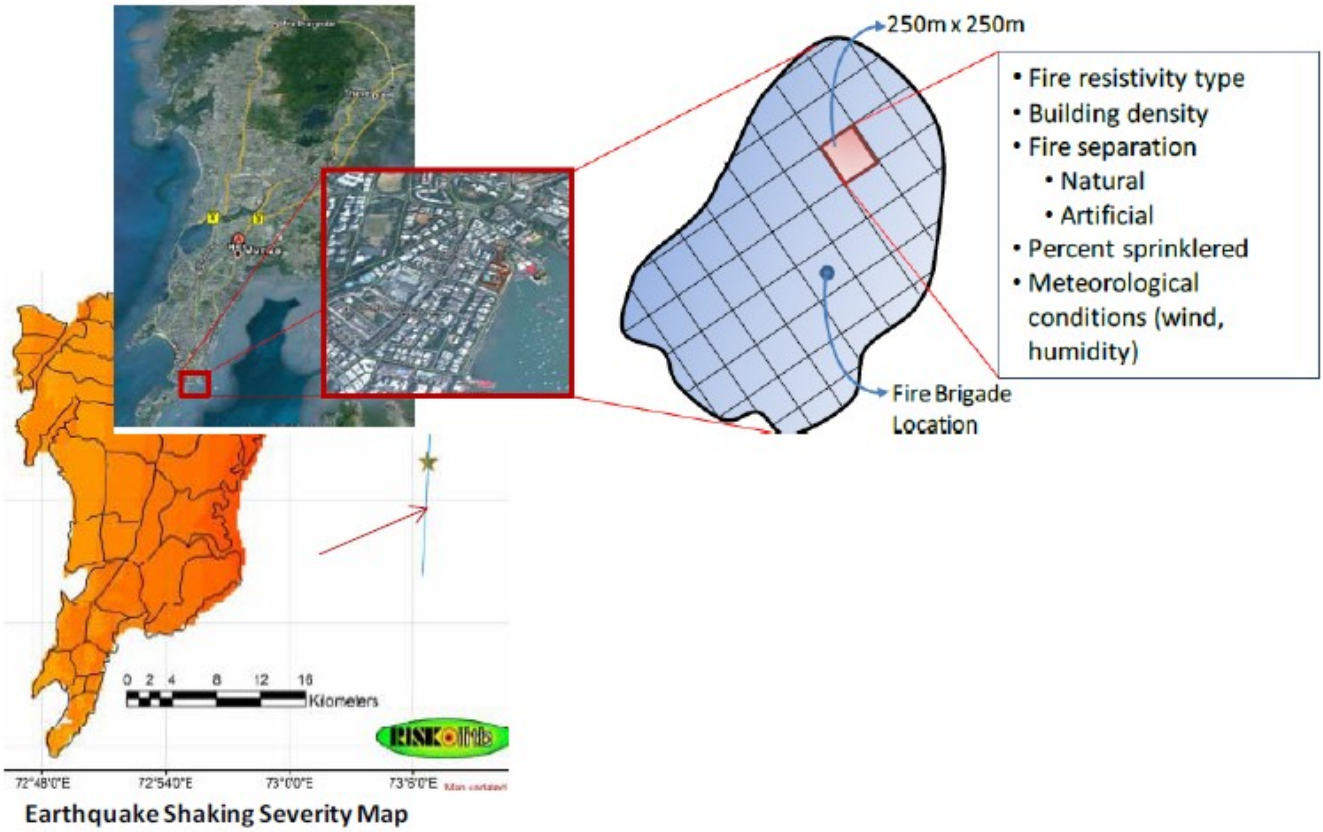


Figure 6: Consequence analysis for fire-following earthquake

The plan is to first develop the consequence analysis methodology based on the above anticipate strategy and in discussions with the PIT, the Fire Brigade and other relevant stakeholders, and then decide the sophistication to be finally employed for each fire hazard source. The methodologies will then be implemented as tools to permit rapid analysis of different fire severity scenarios for each fire source. The final results would include

- The extent of burned area
- Level of damage to property
- Loss of life and injuries to people

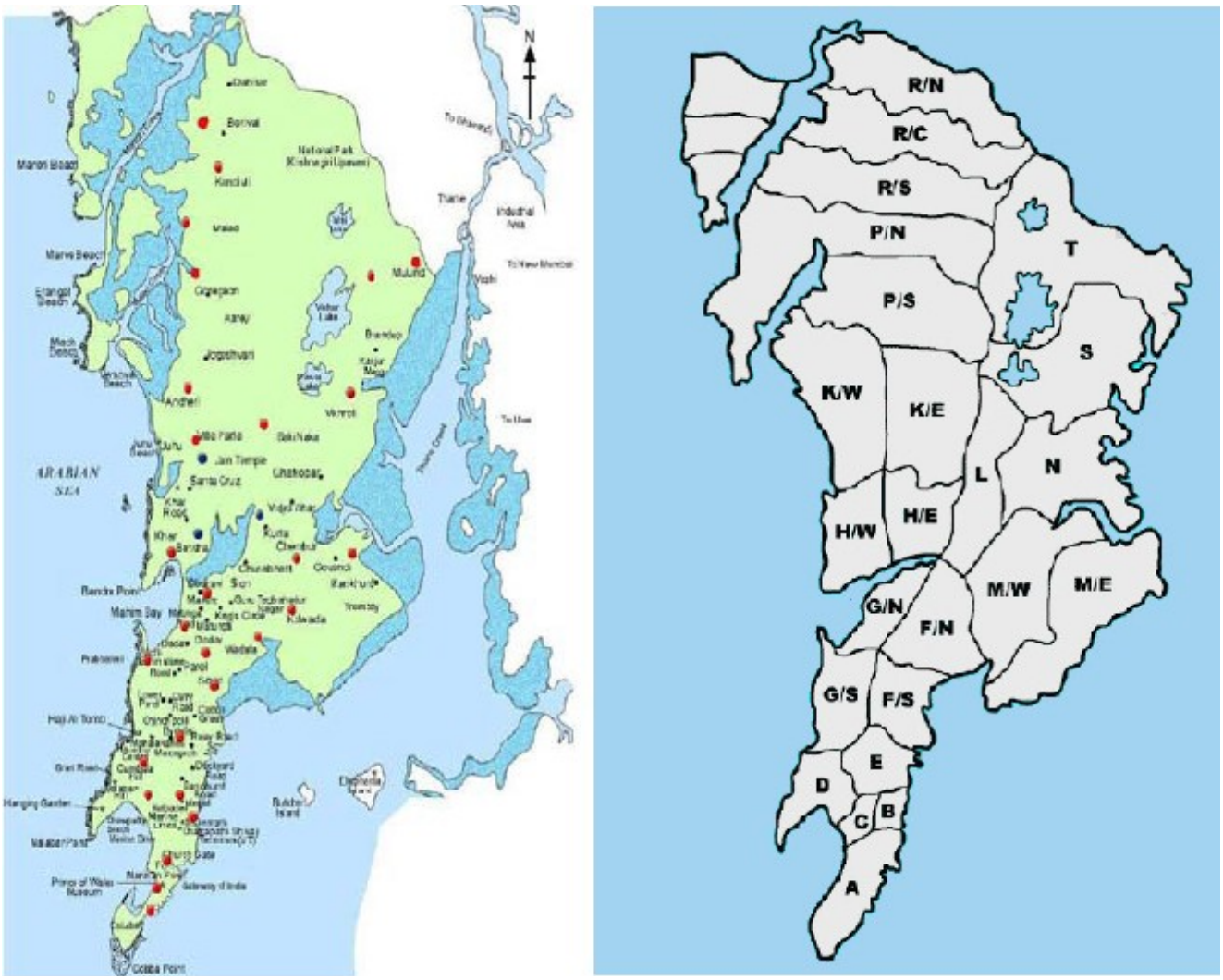


Figure 7: Map of Mumbai showing the fire stations (left) and Ward boundaries (Source: DRMMP, 2010)

After the results from the simulation model are performed, additional sensitivity results will likely be needed to develop an understanding of which parameters cause the most impact on loss results (e.g., is it fire construction type, or fire suppression mechanism - location or number of fire brigades).

Task 5: Gap Analysis Relative to International Standards

- Parallel to the analyses indicated in the previous tasks, an investigation of the best urban fire fighting practices and related standards will be undertaken and a gap analysis will be developed to establish a strategy for bringing the fire fighting capabilities of Mumbai to international standards of practice
- EMI fire engineering experts will offer technical assistance in studying the fire safety challenges that face Mumbai, which can ultimately be developed into a Master Fire Mitigation Plan (See Task 6 below) with short and long term recommendations for the improvement of the City¡¦s fire safety strategy. The Plan would identify appropriate steps to address the most critical areas and vulnerable facilities.
- It is expected that the study would need to address a variety of issues: from fire prevention (how codes are used to design and construct buildings) to fire suppression and protection (the efficiency and safety of fire fighters). There may be critical areas of Mumbai which incorporate industrial facilities that are particularly hazardous and pose great challenges to fire fighters. On the other hand, there may be areas of high density that pose great conflagration hazards (e.g., slum areas). The infrastructure, including roads, water supply and power systems play significant roles in the efficiency and effectiveness of fire fighting, however, for long term protection, adequate training and equipment, and a comprehensive regulatory system may provide the overall structure to reach international standards.

Task 6: Fire Mitigation Plan

- Based on the analytical results of Tasks 2-4 and the gap analysis of Task 5, we will develop relevant mitigation strategies for fire loss according to cost investment needed and/or according to their impact of fire losses reduction estimates

- The mitigation strategies will be discussed with PIT, the Fire Brigade and other relevant stakeholders to jointly and collaboratively decide on a draft mitigation plan.
- EMI experts will then develop a Mumbai Fire Mitigation Plan with short and long term recommendations for the improvement of the City¡¦s fire safety strategy. The Plan would identify appropriate steps to address the most critical areas and vulnerable facilities
- The Mumbai Fire Mitigation Plan will benefit from the knowledge acquired during the DRMMP project and will be consistent with its policies, strategies and recommendations. It will ultimately become an element of the DRMMP. This will facilitate implementation and funding mechanisms.

Figure 8: Impact of mitigation on fire risk consequence

5.5 Field Investigations

We anticipate five (5) field investigations in Mumbai where EMI experts will come to discuss the various elements of the project, collect data, make site visits, and hold workshops and meetings. The field investigation schedule and agenda will be as follows:

- **Field Investigation No. 1**: About 1 month into the project to discuss and achieve agreements on the project organization including organization of PIT, stakeholders, and Fire SeverityFire FrequencyRisk without mitigationRisk with mitigationReduce FrequencyReduce Severity Focus Groups; to reach agreements on data collection exercise, milestones and project work plan.
- **Field Investigation No. 2**: About five months into the project. To review the data collection and analysis process and to undertake initial consultations on hazard analysis procedures and gap analysis.
- **Field Investigation No. 3**: About mid-way through project to present initial results on hazard assessment and gap analysis and to discuss proposed methodology for Consequence Analysis. This will take the format of a workshop to reach optimum interaction and input from stakeholders. To agree on most pertinent investigations and most relevant presentations of the results.
- **Field Investigation No. 4**: About a year into the project. To review the results of the hazards and gap analysis and to present initial results on consequence analyses. To initiate the discussion on the Fire Disaster Management Plan. This FI will also include a workshop on best practices in urban fire fighting.
- **Field Investigation No. 5**: To present the final results of the consequence analyses and present the draft Mumbai Fire Mitigation plan for discussion and input. To undertake a workshop where the team members with prior fire fighting experience from different countries and members knowledgeable in international fire fighting regulation and enforcement would meet with the fire brigade member from Mumbai to discuss the state of practice in Mumbai and develop a institutional process for adopting the Fire Disaster Management Plan and international standards of practice

5.6 Reporting and Deliverables

The project deliverables will include:

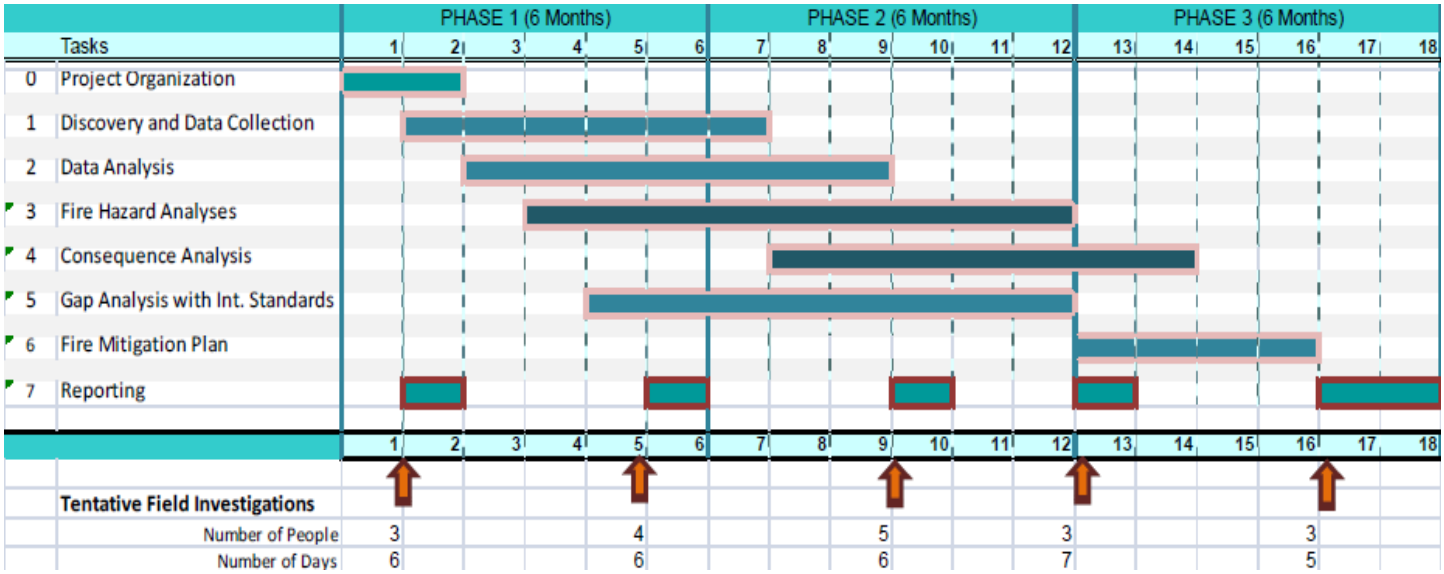
1. Inception report delivered 1 month after Field Investigation No. 1. This will also serve as FI 1 report and will provide a summary of the project agreements and organization.

2. Field Investigation Reports (a total of 3 corresponding to Field Investigations 2, 3, and 4). This will serve as progress reports as well and will include feedback and input provided by PIT, Fire Brigade and other stakeholders.
3. Draft final report for review and comments by PIT and Fire Brigade that include the findings, the hazard analysis results, the consequence analysis results and the fire mitigation plan as well as annexes summarizing the data collected during the project.
4. Final report that incorporates of all reviews received from MCGM.
5. Geographical information system that includes data collected in the project together with previous digitized data collected in the DRMMP project.

Regular phone conferences and online meetings with PIT and project management team will be scheduled to ensure smooth implementation of the project. If needs arises, an additional field investigation can be added and will be funded from the contingency line item in the budget.

5.7 Project Schedule and Budget

A total project implementation time of 18 months is planned to complete the project. The schedule of tasks during this time period is shown below. The chart also shows the scheduled Field Investigations, the number of EMI experts expected in each field investigation and the number of planned days.



5.8 Project Budget

The estimated budget based on the above tasks and effort is US$922,164. It include direct labor cost, travel (excluding local accommodations and local transport), other direct costs such capital equipment and contingency, and fixed administrative and overhead cost. The budget excludes any local taxes (e.g., TVA) which are assumed to be paid by MCGM.

A.	DIRECT LABOR COST	Total	Percent	
0	Project Organization	$18,880	2.5%	
1	Discovery: Data collection, Lit. review	$50,638	6.7%	
2	Data Analysis and GIS Development	$33,984	4.5%	
3	Hazard Assessment	$37,525	5.0%	
4	Consequence Analysis	$170,313	22.7%	
5	Fire Mitigation Planning	$99,826	13.3%	
6	Gap Analysis	$104,777	13.9%	
7	Field Investigatns, Wkshops & Reports	$173,622	23.1%	
8	Project Management	$62,290	8.3%	
	Total Direct Labor	**$751,856**		
B.	**TRAVEL COST*)**	Cost	People	Days
1	Field Investigation No. 1	$9,800	3	6
2	Field Investigation No. 1	$12,600	4	6
3	Field Investigation No. 1	$16,000	5	6
4	Field Investigation No. 1	$10,100	3	7
5	Field Investigation No. 1	$9,200	3	5
	Other Travel (Project Coordination)	$3,300		
	Total Travel	**$61,000**		
*) Hotel Accommodation & Local Transportation in Mumbai assumed by MCGM				
C.	**OTHER DIRECT COST**	Unit		
	Capital Equipment (Soft/Hard ware)	$12,000		
	Publications and Communication	$4,000		
	Contingency for Unknown Conditions	$25,000		
	Total Others	**$41,000**		
	TOTAL DIRECT LABOR	$853,856		
D.	Fixed Admin Cost and Overhead 8%	**$68,308**	0.08	
F.	**TOTAL PROJECT COST**	**$922,164**		

5.9 Key Project Team Members

- The EMI project team will be composed of several experts in various discipline related to fire safety engineering, urban fire fighting, risk assessment, reliability analysis, system engineering data analysis, and GIS. The project will be under the direct supervision of Dr. Fouad Bendimerad who will act as Project Director. Mr. Jerome Zayas will be the Project Manager. Dr. Alok Jha from MMI Engineering will be the Task Leader for the Fire Hazard and Risk Modeling. Mr. Raymond Grill and Mr. David Barber, two worldwide fire safety engineers will act as Fire Protection and Life Safety Task Leader and Fire Regulation and International Standards Task Leader, respectively. Dr. Bijan Khazai will serve as Data Analysis and Decision Systems Task Leader; whereas Dr. Craig Davis will serve as Water System Reliability Specialist. The team will be augmented by other specialists, reviewers and researchers from both EMI and MMI as needed.
- Mr. Dieter Farrenkopf, former Fire Chief for the City of Hamburg, Germany and Vice President of the International Association of Fire and Rescue Services will serve as a principal fire fighting advisor to the project.
- The key personnel includes:
    - Dr. Fouad Bendimerad, Project Director and Urban Disaster Risk Management Expert
    - Jerome Zayas, Project Manager
    - Dr. Alok Jha, Task Leader: Probabilistic Fire Hazard and Risk Modeling
    - Raymond Grill, Task Leader: Fire Protection and Life Safety
    - David Barber, Task Leader: Fire Regulation and International Standards
    - Dr. Bijan Khazai: Task Leader: Data Analysis and Decision-Systems
    - Mr. Dieter Farrenkopf : Principal Fire Fighting Advisor (Former Fire Chief of the City of Hamburg, Germany)
    - Dr. Craig Davis, Water System Reliability Engineer
    - Armin Wolski, Fire Engineer, PE
    - Leigh Lingrad, GIS and data analysis Expert
    - Jose Mari Daclan, Knowledge Management Expert

Biographies of key personnel are provided in the next section of the proposal.

5.10 Brief biographies of Key Personnel

This section includes brief biographies of key personnel that will be leading and managing the project. The project director is Dr. Fouad Bendimerad holding ultimate responsibility of the project and will be the chief point of contact with the MCGM. Mr. Jerome Zayas will act as project manager and will be in charge of the day-to-day implementation. They will be supported by several Task Leaders, who will have responsibility over particular tasks of the project. The project manager at MMI is planned to be Dr. Alok Jha. Dr. Jha¡¦s biography is also listed below.

Fouad Bendimerad, Ph.D., P.E.

Dr. Bendimerad is a founding member and currently the Chairman of the Board of EMI. He is an active researcher, practitioner and educator with focused interest in megacities and urban risk assessment and management, where he is credited with advancing both methodology and practice. He developed and put into application several urban risk management models such as the Disaster Risk Management Master Plan (DRMMP), which have led to advances in DRR in major cities such as Istanbul, Metro Manila, Kathmandu and Mumbai. Dr. Bendimerad published extensively on the topic of risk assessment and risk management and lectured at several universities in the United States, Japan, Germany, Turkey, and elsewhere. He has advised several international organizations, governments and international corporations and maintains an active earthquake engineering consulting practice in California where he is a registered professional engineer. He was Principal Scientist and Vice President at RMS Inc., a California Corporation for 11 years, and served in the faculty of Stanford University for 13 years. He holds Master and Ph.D. degrees in Civil Engineering from Stanford University.

Alok Jha, PhD

Dr. Alok Jha is an Associate at MMI Engineering in the firm¡¦s Oakland, California office. He specializes in probabilistic risk and reliability analysis applied to engineering problems and has over 12 years of experience in providing these analytics for a broad range of problems on probability of failure assessment or loss risk assessment from natural and man-made perils. Dr. Jha has a PhD from Stanford University in Civil Engineering specializing in reliability analysis. Specific examples of

Dr. Jha¡¦s experience portfolio include: reliability and operational availability analysis of Mobile Offshore Base for the US Navy; stochastic risk analysis of offshore platforms for hurricanes in the US Gulf of Mexico; casualty risk analysis from earthquakes and man-made disasters (a variety of terrorist attack modes including blast, chemical, biological, radiological, and nuclear); and earthquake risk analysis at national and regional level for residential, commercial, and industrial portfolios for the insurance industry.

Jerome B. Zayas

Jerome Zayas is a Technical Manager at EMI and has served as Project Manager in the Disaster Risk Reduction in Greater Mumbai Project to develop the Mumbai Disaster Risk Management Master Plan (DRMMP). He was also the Project Coordinator for the Mainstreaming Disaster Risk Reduction in Megacities Project Pilot Application in Kathmandu, Nepal- this project focuses on mitigation through risk-sensitive land use planning and city-level disaster management planning. His expertise spans the social vulnerability and mobilization and conflict resolution. He has several years of field work experience in post conflict and post disaster situations in South East Asia countries and Africa. He holds a Master degree in Health Social Science from De La Salle University in Manila and is completing a Master of Arts in International Relations and Affairs, Fletcher School of Law and Diplomacy, Tufts University, Boston, USA

Craig Davis, Ph.D., PE, GE

Dr Craig Davis is the Geotechnical Engineering Manager for the Los Angeles Department of Water and Power (LADWP), Water System. He has worked for the LADWP since 1987 where he has investigated and evaluated numerous dams, managed several multimillion dollar projects, and implemented unique and innovative designs. Dr. Davis is actively involved in earthquake, geotechnical, and lifeline engineering research, and performed evaluations on the seismic performance of dams and reservoirs, pipelines and underground structures, the effects of ground deformations on water system facilities, and seismic resiliency of lifeline systems. Dr. Davis has published over 60 papers on water systems and earthquake related aspects and is on the executive committee for the ASCE Technical Council for Lifeline Earthquake Engineering. Dr. Davis is an adjunct professor at the Beijing

University of Civil Engineering and Architecture. Recently, Dr. Davis joined EMI to work on the Mumbai DRMMP as an expert in water lifeline networks. He is a California licensed Civil and Geotechnical Engineer and received his M.S. and Ph.D. degree in Civil Engineering from the University of Southern California.

Dr. Bijan Khazai

Dr. Khazai is a research scientist at Karlsruhe University¡¦s Center for Disaster Management and Risk Reduction Technology (CEDIM) and an Associate Researcher at EMI. Dr. Khazai has focused his research on risk management, decision making and systems engineering focusing on applications in megacities. His methodologies for research bring a multi-disciplinary approach that provides room for policy analysis and socio-economic dimensions in urban resiliency analysis. His expertise also encompasses data analysis, information technology and GIS as tools for taking research into practice. Dr. Khazai serves as lead scientist on Shelter and Disaster Risk Resiliency in the DRMMP project. He holds Master and Doctoral degrees in Geotechnical Earthquake Engineering from the University of California at Berkeley and was a post-doctoral follow at the Earth Institute at Colombia University in New York. Dr. Khazai has published extensively in field.

Ahmed Nisar

Mr. Nisar has 22 years of experience in earthquake engineering and seismic hazard analysis. His project experience includes development of seismic design criteria and natural hazard risk and reliability assessment of critical infrastructure and lifelines. He has developed earthquake design criteria for offshore and onshore petrochemical facilities, LNG facilities and other critical infrastructure in a variety of geologic and tectonic settings. He has performed numerous studies for sites located in the subduction zone environments of Peru, Chile, Indonesia, Alaska, New Zealand, the Pacific Northwest of the US, and Papua New Guinea. He authored the chapter on seismic hazard in the ASCE special publication on seismic design and evaluation of petrochemical facilities.

David Barber

David is a Principal with Arup Fire, leading the Australasian Fire team. David has extensive experience in working closely with clients in developing fire safety strategies that compliment buildings and result in systems integrated with the building form, meeting regulatory and non-regulatory fire safety objectives. David has

extensive experience in working closely with operators, design teams and authorities, to understand the drivers for cost-effective and practical design outcomes. David is presently project managing the development of a new performance based fire code for Hong Kong, which is a seven-year project through the Hong Kong Buildings Department. David is a member of the Building Appeals Board of Victoria and also represents Victoria on the National Executive, Society of Fire Safety. He is also on the Board of Directors for the Society of Fire Protection Engineers.

Armin Wolski

Armin Wolski has more than 20 years experience with a broad background in fire engineering. He has been involved with research, testing, consulting, designing and commissioning of building fire safety systems. He has extensive experience in creating fire strategies for protecting large urban developments, complex facilities, interpreting fire safety codes and standards and developing alternate equivalent approaches to building fire safety designs where a prescriptive based building fire safety code approach is deemed inappropriate. Many of his projects have involved special fire safety issues such as fire department response, fire spread inside and between buildings, unusual construction types, existing facilities and densely populated facilities.

Raymond Grill

Raymond Grill has extensive experience in the development of comprehensive fire protection and life safety programs for all building types. Mr. Grill is the editor of the Detection and Alarm Section of the Nineteenth Edition of the NFPA Fire Protection Handbook and is a chapter editor of the Handbook to the 2002 Edition of the National Fire Alarm Code. He has been published on a wide variety of fire protection related topics and regularly presents at industry related meetings such as the NFPA World Fire Safety Congress and Exhibition.

5.11 Appendix A: Fire Statistics for Mumbai

The following data is available from the Government of Maharashtra or from published material.

Fire Brigade Statistics:

- 23 fire stations in Mumbai

Fire sources:

- Large number of closely built old timber framed buildings in Ward A, B and C
- High-rise buildings with inadequate fire-fighting facilities
- Commercial activities in Kalbadevi, Mumbadevi, Bhuleshwar, Vadgadi, Bhendi Bazar, C.P.Tank
- Small, medium and heavy hazardous industries in suburban areas
- Widespread docks area
- Oil refineries in M-W ward
- Petrochemical industries
- Large slum settlements

Exposure and Hazard sources:

- About 74 of the populations lives in hutment or slum colonies
- There are approximately 900 industries involved in the manufacture and processing of hazardous goods or in the storage of hazardous goods. A comprehensive list of these industries along with fact sheets are given in a separate volume. Many of these godowns are in the close proximity of the residential areas or other storages, thereby increasing the risk of fires and chemical explosions in residential as well as industrial estates

Fire Statistics for Mumbai:

Year	No. of Fire Incidents
2002-03	3,900
2003-04	4,000
2004-05	4,500
2005-06	4,700
2006-07	4,900

6. Finance Requirement

Sr. No.	Subject	Estimated Amount in (Rs.)
1	Future development and construction of 11 Fire Stations at proposed sites require Budget Provision	40,00,00,000/-
2	Future development and procurement of the above required Vehicles and Equipments at existing and proposed Fire Stations requires Budget Provision	100,00,00,000/-
3	Proposal of Urban Fire Hazard & Risk Assessment & Mitigation for Mumbai US$9,22,164 x 45.165	4,16,49,537/-
Total		**144,16,49,537/-**

7. Appendix

a. Appendix A – Standard Operating Procedure (SOP)

Mumbai Fire Brigade Fire Ground Standard Operating Procedure

First 60 seconds on the scene of incident

- Sixty seconds reconnaissance is the target
- 360 degree walk – around where possible
- Locate the fire and gauge the extent of fire development
- Establish special risks

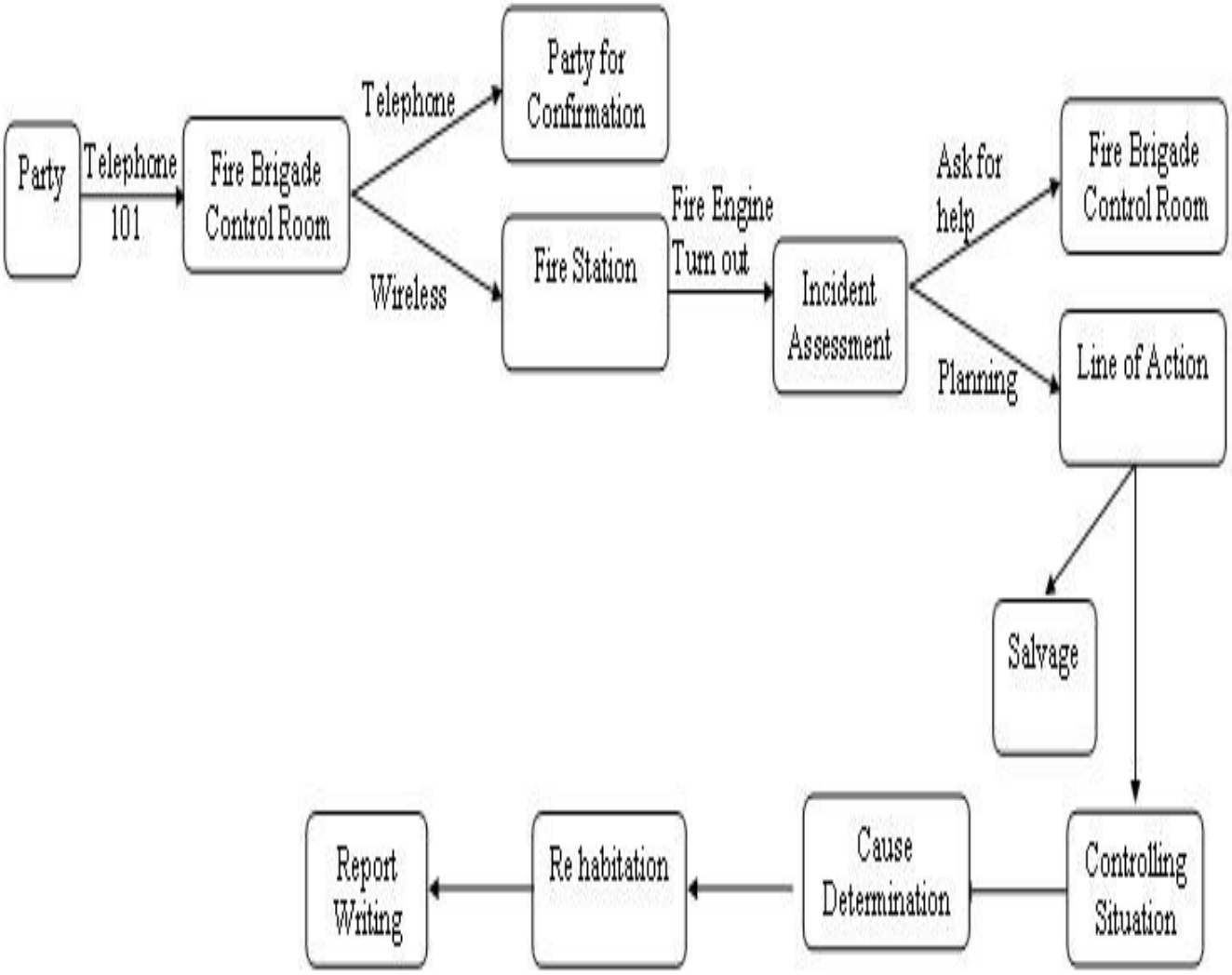
First 120 seconds on the scene of incident

- Complete a dynamic risk assessment (DRA)
- Form a plan based on tactical priorities inline with available resources
- Declare and communicate to all the Tactical Mode
- Select and declare a Command Mode
- Brief crew commanders and firefighters as to tasks and objective
- Establish accountability
- Establish risk control (measures) and secure team safety
- Deploy crews as needed without micro – managing the situation
- Estimate resource requirements
- Send in a progress report

Tactical Mode of Operation

- Offensive
- Defensive
- Transitional

GENERAL INCIDENT FLOW CHART



Primary Fire Attack Hose Line Consideration

- Get water onto the fire as quickly as possible
- A well placed hose line may save lives in itself
- Interior search should not take place without a hose line in place on the fire floor
- The only exception to this rule is for known life risk near the entry point
- At all times try to coordinate both fire attack and interior search together
- The attack hose line team should never leave their nozzle until relieved by other firefighters, or where the fire has been completely and fully uppressed, unless they are forced to evacuate themselves
- It is a tactical error to deviate from your objective without good reason. If the primary line is tasked with locating and attacking the fire, do not deviate into a search pattern for occupants away from the fire. The hose line is needed at the fire.

Search & Rescue

An interior search & rescue operation for potentially trapped occupants is possibly one of the most dangerous tasks a fire fighter may ever attempt. It is critical that the risk versus gain assessment is made, that crews are effectively briefed pre – deployment and updates with the latest information as the search proceeds. If at any time all occupants are subsequently accounted for the search & rescue crew should immediately be called out of the building.

Interior Search & Rescue – Key Factors

- Ensure an effectively pre – deployment briefing takes place
- Offer advice or information on possible occupant status and locations
- Remind firefighters to close doors and zone down the structure as they advance in
- Maintain team integrity at all times
- Always try to coordinate interior search with fire attack
- Do not advance to upper floors, above a fire unless a hose line is protecting your escape route (hose line sited between the fire and the stairs)
- Consider VES approaches where viable as a potentially safer option
- If subsequent information reliably shows that all occupants are accounted for, then immediately contact the search crew/s and evacuate them to safety.

Secondary (Support) Hose Line

- Secondary support hose line deployed within 15 mtrs of the primary attack nozzle
- The prime purpose of the secondary hose line is to protect members on the primary attack hose line
- Look out for indicators and warning signs such as fire getting behind them, changes in smoke volume or velocity, a lowering and raising effect of the smoke layer, etc.
- Don’t use water excessively and don’t compromise the attack team’s position.
- If the primary line advances up a stairway protect this escape route by placing the line between the fire and the escape route. If viable proceed to suppress the fire but be certain that the escape route for the primary attack crew is preserved

- Where the primary attack line is advancing to additional floors above then follow them up the stairs and cover their escape route down
- If this occurs then further support lines may be needed to cover the escape route of the secondary line's advance if they are passing fire on floors below them
- Be certain to suppress fire fully – as a support line you must ensure that the fire will not re – ignite once passed
- Never get so close as to crowd the escape route of the primary attack line
- Where basements are involved, await their communication that they have cleared the base of the stairs before proceeding down behind them – again, do not crowd the primary crew's escape route and try to maintain a 15 mtrs distance to their rear

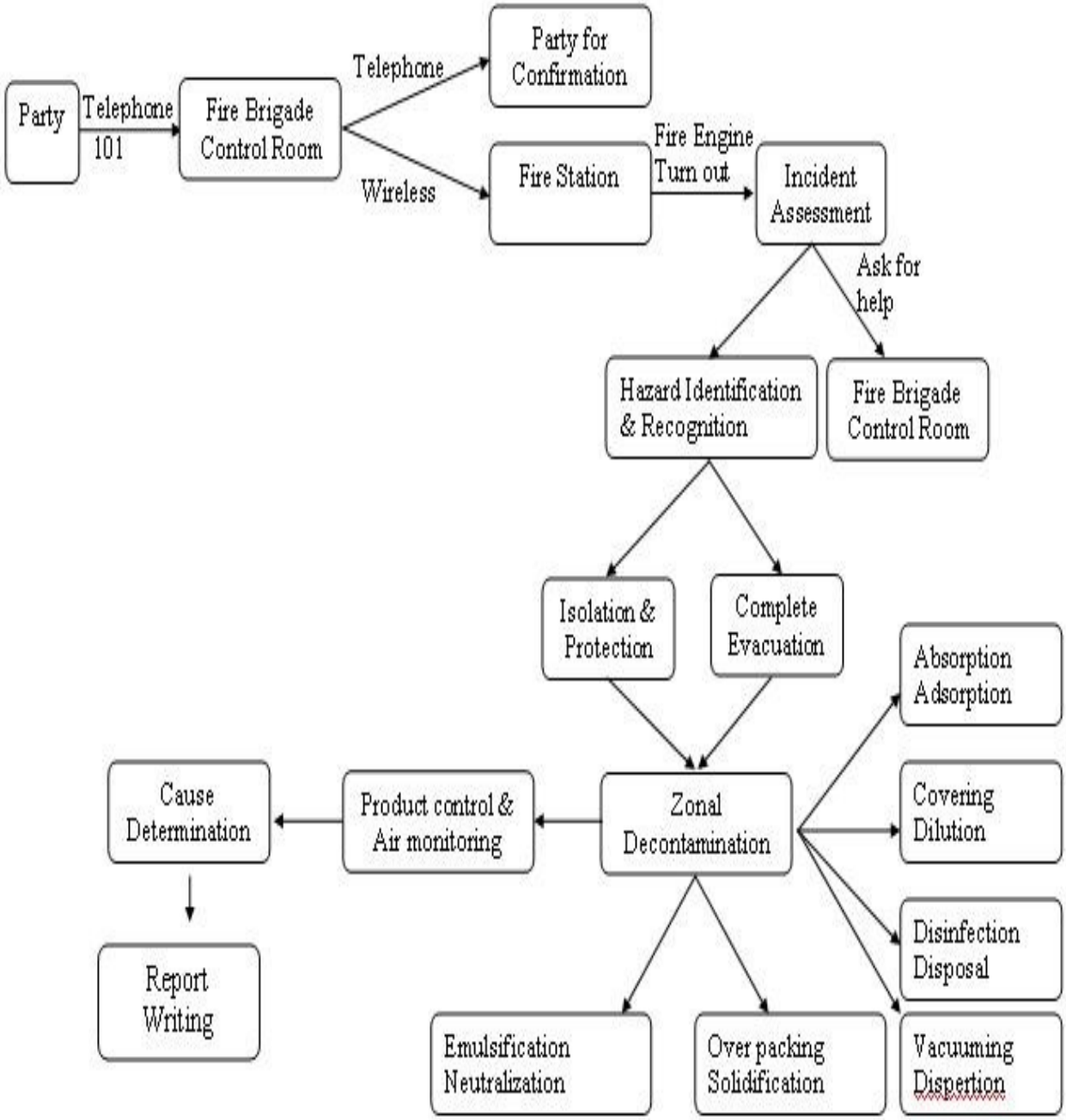
Way of ensuring Team Safety at Fires (examples)

- Secondary support hose line deployed within 15 meters of the primary attack nozzle
- Emergency Teams & Procedure (BA) (RIT)
- Teams to maintain team integrity at all times
- Effective communication links with all interior crews
- Work with Thermal Image equipment
- Provide interior lighting ASAP
- Ladder the windows of upper floors in areas where firefighters may be working
- Always address an effective balance of experience in crew deployments

SOP During Emergency (Chemical Hazard)

- **Receiving Calls (Fire Control Room)**
  - Seek Specialist Advice from P.C.B., I.I.T, Factories Inspectorate, etc.
  - Turn – out a minimum of Two fire Units / one ERT / one Hazmat Equipped with PPE
- **On arrival at the Scene**
  - Assess and evaluate
  - If Release is containable start work
  - If out of control, then
    - Call Technical Assistance
    - Find Wind Direction
    - Establish Hot, Worm, Cold Zones
    - Establish Decontamination Centers
    - Do SAR, Fight Fires, Contain Release, Handle Injured & Causalities

HAZMAT INCIDENT FLOW CHART



The list of Coordinating Agencies & their expected Role

- Assistance from supporting forces, if necessary, for such purpose.
- Police: Crowd Control, Traffic clearance, Communication aid, etc.
- EB: Power supply & Disconnection
- Metro Water: Water Supply
- PCB: Fore Specialist advice and information
- PWD & Corporation: Supply of Drinking water, Lighting arrangements, Food items, provision of Temporary Shelters, etc, on requirement.
- Medical: Rendering Medical Treatment for both Public and Emergency Personnel.
- Transport: Transportation for supply of man power and materials and also for mass evacuation.
- Any other Dept. / Agencies for any specific assistance depends on the contingency

After Action Review

- Studies for Reduction of impact on HES
- Devise prevention & Mitigation Methods
- Initiate R&D
- Up Gradation of Appliances / Equipments / HRD.
- In case of terrorist attack with Chemical Weapons, the same procedure will be adopted under the Protection & guidance of the Police Services.

Standard Operating System for Lift Call

- **Electric lifts**
  - SHEAR TRAP
  - Within a lift car
  - In machinery
  - Hydraulic lifts
  - Firefighting lifts
  - SHEAR TRAP
- Persons must be aware of the term SHEAR TRAP - this is the area between the lift landing and the lift car opening. Any movement of the lift car poses significant risk of life threatening injuries to any person crossing the SHEAR TRAP.
- Officer in charge should carry out a Dynamic Risk Assessment.
- In circumstances where there is no threat to life the safest practice may be to await the arrival of a lift engineer. If possible contact the trapped person and reassure them.
- Locate the lift motor room and isolate the power to the lift. Leave a firefighter stationed at this point throughout operations.
- If urgent actions to protect life are necessary, locate lift car. Do not leave opened doors unattended.
- Check the suspension rope and counterweight rope are taut. Slack rope indicates car is not secure.
- Improvised securing devices should be considered i.e. Hydraulic Rescue equipment or Fire Service lines.

- Personnel may be put at significant risk when placing securing devices and may need to cross the shear trap. This should only be done in exceptional circumstances.
- Before attempting to lower the lift, raise it slightly to ensure the weight of the car is being securely held by the suspension mechanism.
- Personnel observing the movement of the lift car or working at landing openings may need to be protected from fall. Consider use of line safety equipment as a means of work positioning.

To release people trapped within a lift car

- Using the winding handle (in the lift motor room) wind the car to the nearest floor level.
- Automatic locks will allow car and landing doors to open, using lift keys.
- Secure landing gates carefully before leaving.

To release person trapped in machinery

- Generally it is best to move the car in the opposite direction to which it was traveling when trapping the person.
- Establish the correct direction for hand winding.
- It may be possible to lever the car horizontally far enough to free a trapped person.
- If the counter weight needs to be moved the guide shoes can be removed and the weight swung clear.
- If it is necessary to move the weight manually, it should be noted that the direction of winding will be the reverse of that shown for the car.
- If the casualty has been trapped for a period of time then the Officer in Charge must take guidance from ambulance staff prior to releasing the casualty.
- Once the rescue is complete leave power isolated until lift engineer arrives to check the lifts serviceability.

Hydraulic lifts

- Hydraulic lifts can be found in a variety of buildings. They are generally only found in building of up to 4 floors.
- A hydraulic oil pump and motor power the lift. To raise the car, the motor drives the pump, which pumps oil at pressure into the jack, that then lifts the car. The car is raised by power and lowered by gravity. Firefighters must appreciate that with hydraulic lifts the machine room may be remote from the installation itself.

Lowering the Hydraulic lift car

- Firefighters can lower the lift by a special hand lowering valve sited at the hydraulic power unit, the control is usually of the dead man type, either a knob or lever which is pulled or pressed to release the oil from the jack and so allow the lift to lower by gravity. The control will normally be marked as such and painted red. Hand lowering instructions are usually posted by the hydraulic power unit.

Procedures - hydraulic lifts

- The Office in Charge should carry out a Dynamic Risk Assessment.
- In circumstances where there is no threat to life the safest practice may be to await the arrival of the Lift Engineer. If possible contact the trapped person and reassure them.
- Isolate power and check reading on the lift pressure gauge.
- If no pressure reading i.e. the gauge reads zero and lift car is not at the lowest point it may be being held by the emergency braking system or lodged against an obstruction in the shaft.

In either case an extremely dangerous situation exists. If possible wait for an engineer to attend.

If there is a pressure reading on the gauge

- Move the car upwards by means of the hand pump.
- When upward movement is observed, it may be presumed that the weight of the car is being held by the suspension mechanism and is safe to lower the car using the Emergency Lowering Valve.
- If the car does not move upwards when the hand pump is operated it must be assumed that the car is not being held securely by its suspension mechanism, in this case treat as you would a lift with no pressure reading.

Firefighting Lifts

A fire-fighting lift, unlike a normal passenger lift, is designed to operate as long as is practicable when there is a fire in parts of the building beyond the confines of the fire-fighting shaft, and can be used to transport fire-fighters and their equipment to a floor of their choice. The lift may be used in normal times as a passenger lift by the occupants of the building. Fire-fighting lift cars should be clearly and conspicuously marked with a notice stating “Fire-fighting Lift”. A fire-fighting lift SWITCH should be provided to enable the fire service to obtain immediate control of the fire-fighting lift. Provision should be made to control access to the fire-fighting switch.

Fire Fighting Lift - Operation

- The firefighting lift should be returned to the fire service access level by switching the firefighting lift switch from “0” to “1”, from “Off” to “On”, or by use of a firefighting lift “CONTROL KEY”. The car controls should become active only after it has arrived at the fire service access level. Once the fire-fighting lift has arrived at the fire service access level, its doors should open and it should then operate as follows:
- Fire service personnel can select a landing by sustained pressure on a floor number until the car doors close.
- If a floor number is released before the doors have fully closed, the doors will immediately reopen and the call will be cancelled.
- Once the lift is moving, it is possible to register additional calls on the car controls and the car will stop at the first floor encountered.

- Once the lift arrives at a registered floor, the doors remain CLOSED unless they are operated by continuous pressure on the “DOOR OPEN” control. It should not be possible to open the doors without sustained pressure on the control.
- Release of the “DOOR OPEN” control before the doors are fully open should cause the doors to automatically re-close (this allows fire service personnel to observe the situation immediately outside the lift landing doors).
- Once the doors are fully open they should remain open until a new call is registered within the car.
- The lift car can be returned to the fire service access level at any time by switching the firefighting lift switch from “1” to “0” (for at least 5 seconds) then back to “1”.

STANDARD OPERATING PROCEDURE HIGH-RISE BUILDING FIRE

TURN OUTS

I) Officers**:**

- Divisional Fire Officer High-rise Cell with Jeep
- Assistant Divisional Fire Officer High-rise Cell with Jeep
- Station Officer/Asstt. Station Officer with fire engines/special appliances.

II) FIRE APPLIANCES

- Fire engine - 02 Nos.
- Jumbo Tanker - 01 No.
- Ambulance - 01 No.
- Aerial Ladder Platform - 01 No.
- Ultra Pump Jeep 27 - 01 No.
- Light Van (HPLV) - 01 No.

ACCOUNTABILITIES – FIRST ARRIVING OFFICER

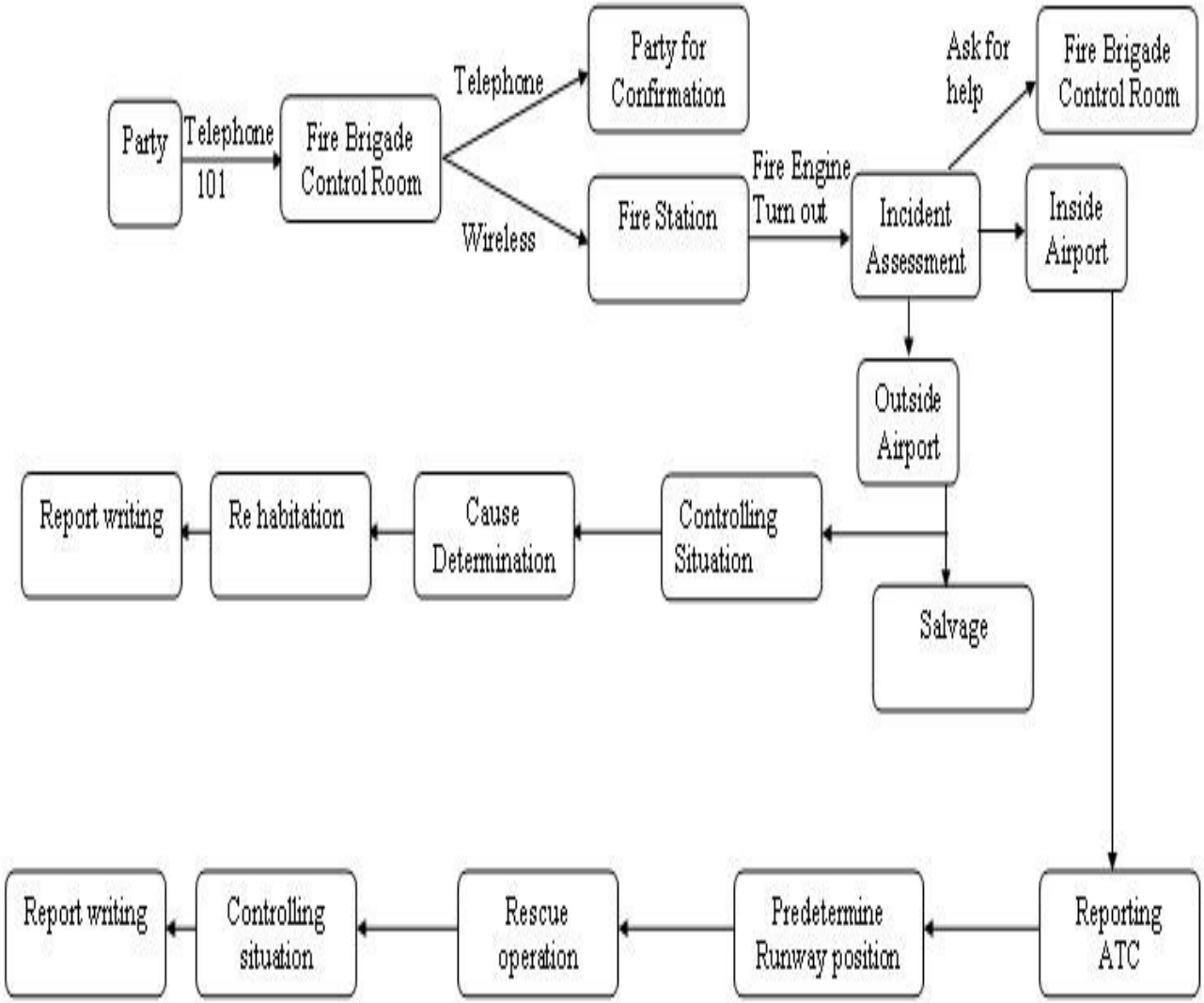
- First Arriving Officer reporting of arrival at the scene of incident immediately to report to Control Room
- Responding the incident by donning the Breathing Apparatus Rope-manila (Long line), 38 mm dia required hoses with appropriate branch with nozzle, thermal image camera, cutting/breaking tools through staircase/fire lift.
- Seizing of the situation and transmitting appropriate message to the Control Room.
- Rescue operation carried out on priority basis and simultaneously controlling the spread of the fire.
- Acquainting the situation to the senior officer after their arrival.
- Requisition of the additional aids, through Control Room without loss of time.

Assistant Divisional Fire Officer / Divisional Fire Officer

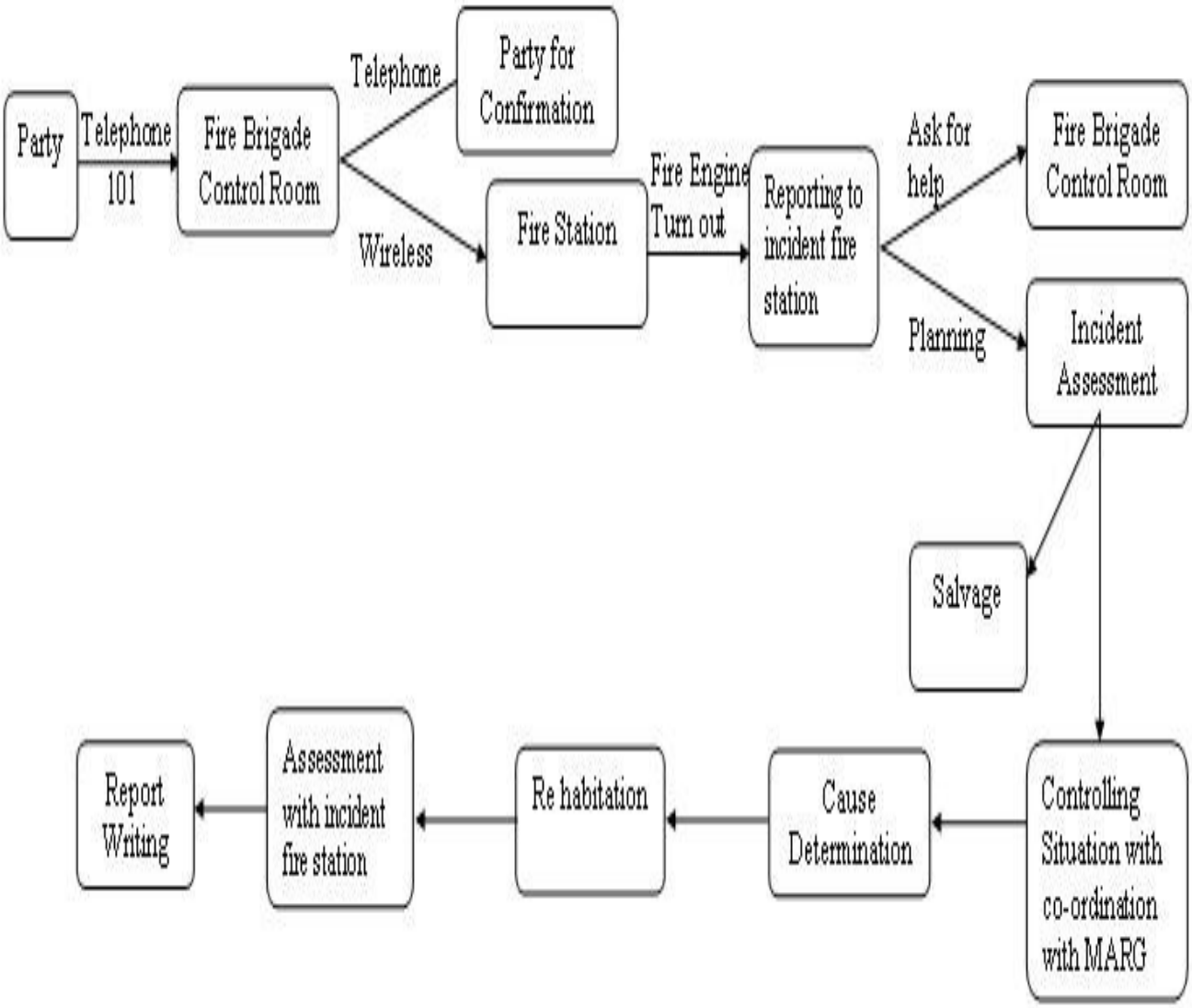
- Sizing of the situation and requisition of the additional, aids if any without loss of time.
- Correcting the time of action if required without loss of time.
- Acquainting the situation to control room and Chief Fire Officer**.**

- Overall supervision on the rescue operation and fire fighting work hospitalization of the injuries.
- Investigation of the fire,
- Inspection of the fixed fire fighting installations active and passive measures,
- Handing over the charge as per the standard procedure.
- Make-up of the incident.

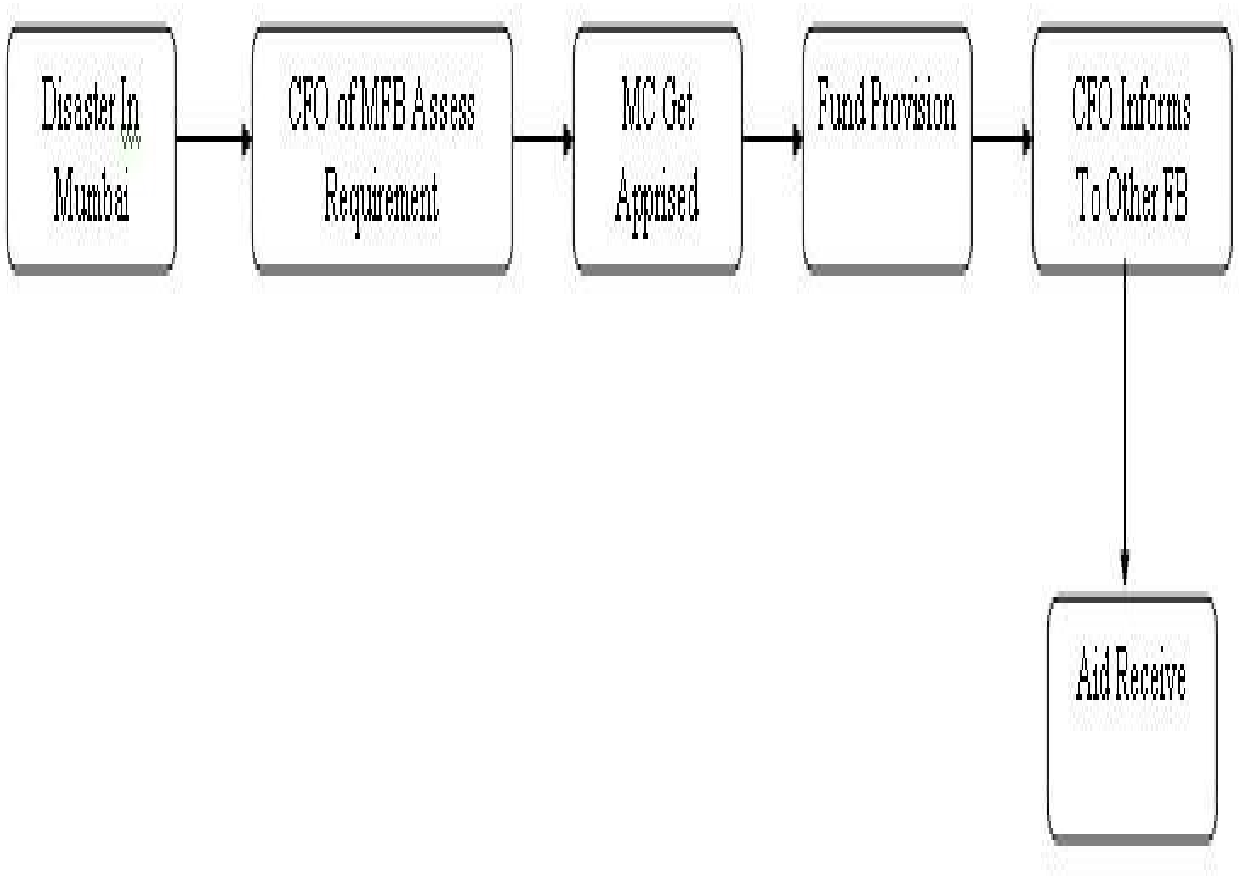
AIRCRAFT INCIDENT FLOW CHART



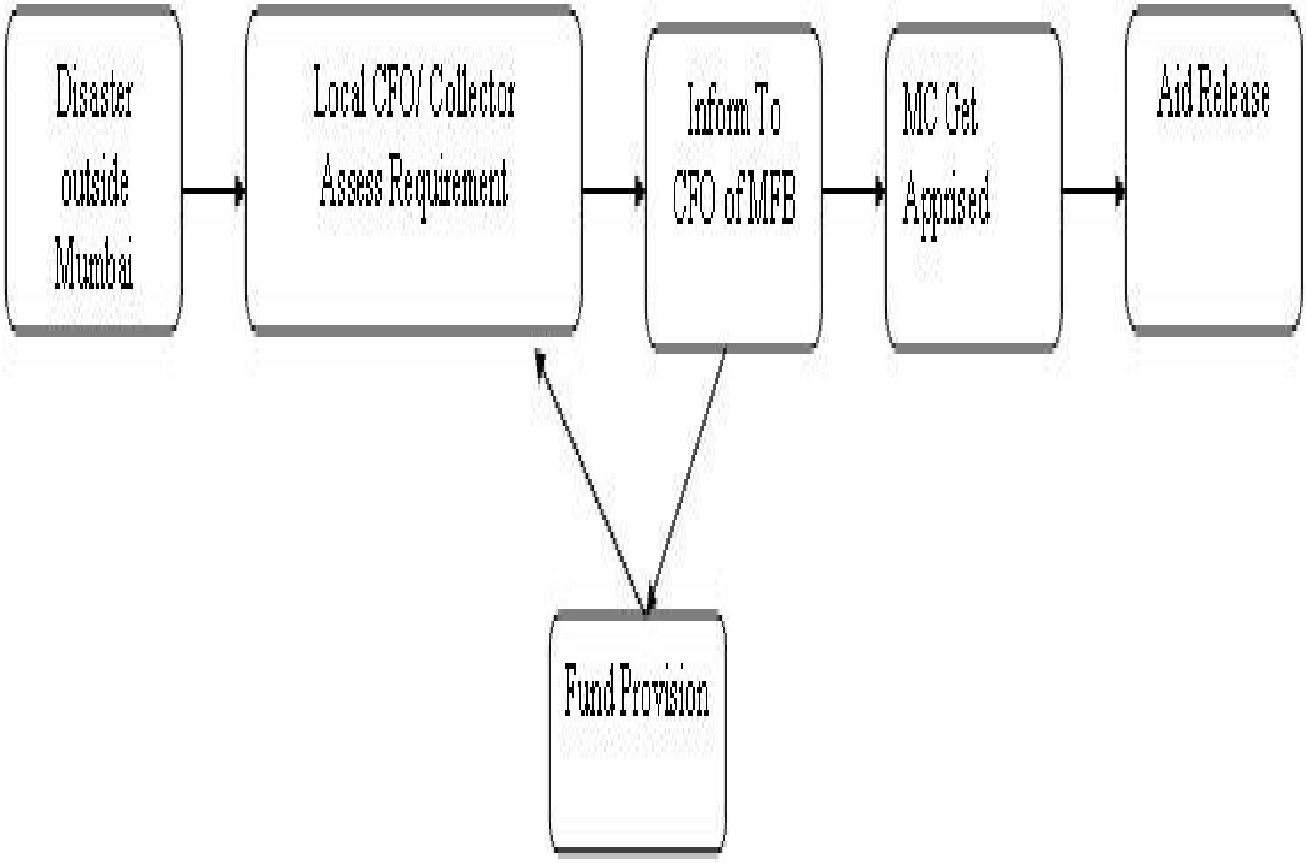
INCIDENT FLOW CHART FOR ORGANISATION HAVING FIRE STATION



ADDITIONAL HELP FROM OUTSIDE OF THE CITY



ADDITIONAL HELP TO NEIGHBOURING TOWNS



PUNISHMENT

All officers failing to perform above standard procedures, the following punishment will be initiated:

(i) First warning Memo
(ii) Second Warning Memo
(iii) Third warning Memo
(iv) Noting in the Service Record.

Staff members failing to perform above standard procedure, the following punishment will be initiated.

(i) First warning Memo
(ii) One day Para duty
(iii) One week Para duty
(iv) Noting in the Service Record.

b. **Appendix B -** Schedule of Fees

BRIGADE ROUTINE CIRCULAR NO- 16 DATE 08/07/2010

Sub: Revision of schedule of fees in respect of hiring of Fire Engine, Ambulance etc.

Municipal Commissioner has accorded sanction vide MGC/F/1910 dated 5.6.2010 to revise the existing rates of schedule of fees and deposit in respect of fire engine, Snorkel, Ambulance etc. Revised rates will be effective from 8.7.2010. Details of revised schedule of fees are as follow:-

Sr.	Description	Existing Rate	Proposed Rate
1	2	3	4
1	For hiring of Fire Engine	**Fee:**Rs.3000/- for first 3 hours	**Fee:**Rs.4500/- for first 3 hours
	for stand by duty(Cost of repairing	or part thereof and Rs.1000/-	or part thereof and Rs.1500/-
	additional)	for each addl. hour or fraction	for each addl. hour or fraction
		thereof. (Exclusive of charges	thereof. (Exclusive of charges
		for the attendance of the staff)	for the attendance of the staff)
		Deposit: Rs.12000/- for first	**Deposit:** Rs.20000/- for first
		6 hours or part thereof	6 hours or part thereof
		(Including deposit for items	(Including deposit for items
		No.9) and Rs.6000/- for each	No.9) and Rs.9000/- for each
		addl.3 hours or fraction thereof	addl.3 hours or fraction thereof
2	For hiring of special fire	**Fee:** Rs.9000/- for first 3	**Fee:** Rs.15000/- for first 3
	engine such as T.T.L.D.L.	hours or part thereof and	hours or part thereof and
	30 & 37,Snorkel unit for	Rs.2500/- for each addl. hours	Rs.3750/- for each addl. hours
	special work or Garlanding (Cost of	or fraction thereof.(Exclusive of	or fraction thereof.(Exclusive of
	repairing additional)	charges for the attendance of	charges for the attendance of
		the staff)	the staff)
		Deposit: Rs.35000/- for first	**Deposit:** Rs.50000/- for first
		6 hoursor part thereof	6 hoursor part thereof
		(Including deposit for items	(Including deposit for items
		No.9) and Rs.6000/- for each	No.9) and Rs.8000/- for each
		addl. hour or fraction	addl. hour or fraction
		thereof.	thereof.
3	For hiring of fire engine for	**Fee:** Rs.17000/- for first 3	**Fee:** Rs.26000/- for first 3
	film shooting and any	hours or part thereof and	hours or part thereof and
	other commercial purpose	Rs.5000/- for each addl.hours	Rs.7500/- for each addl.hours
	(Cost of repairing	or fraction thereof.(Exclusive	or fraction thereof.(Exclusive
	additional)	of charges for the attendance	of charges for the attendance
		of the staff)	of the staff)
		Deposit : Rs.65000/- for first	**Deposit :** Rs.65000/- for first

		6 hoursor part thereof(Including deposit for items No.9) and Rs12000/- for each addl. hour or fraction thereof.	6 hoursor part thereof(Including deposit for items No.9) and Rs20000/- for each addl. hour or fraction thereof.
4	For hiring of fire escape (Cost of repairing additional)	**Fee:** Rs.1000/- for first 3 hours or part thereof and Rs.100/- for each addl. hour or fraction thereof.(Exclusive of charges for the attendance of the staff) **Deposit:** Rs.5000/- for first 6 hours or part thereof (Including deposit for items No.6).	Fire escape ladder is not available with Fire Brigade Deptt. Hence it is proposed **delete** this item from schedule of fee
		Note: Charges for the suplly of ladders when called for occassion of House collapse etc. have been waived with M.C.'s sanction No.SR/17477 of 3.1.1957.	**Note:** Charges for the suplly of ladders when called for occassion of House collapse etc. have been waived with M.C.'s sanction No.SR/17477 of 3.1.1957.
5	For hiring of fire engine/Education Van for demonstration at school.colege& any other place	Previous not proposed	**Fee**:Rs.2000/- for first 3 hours or part thereof and Rs.500/- for each addl. Hour or fraction thereof with charges of the attendance of Staff as per item no.9 **Deposit: Nil**
6	For hiring of Fire Portable Pump(Lukas) for dewatering and firre Fighting.	Previous not proposed	**Fee:**Rs.1000/- for first 3 hours or part thereof and Rs.300/- for each addl. Hour or fraction thereof with charges of the attendance of Staff as per item no.9 **Deposit: Nil**
7	For hiring of Rescue floating Boat for Demo & Training	Previous not proposed	**Fee:**Rs.2000/- for first 3 hours or part thereof and Rs.500/- for each addl. Hour or fraction thereof with charges of the attendance of Staff as per item no.9 **Deposit: Nil**
8	Hiring of hoses length with coupling 50 feet each.	**Fee:** Rs.100/- per length of hose o f 50 feet each for 6 hours or partthereof. **Deposit:** Rs.1000/-	**Fee:** Rs.500/- per length of hose o f 50 feet each for 6 hours or partthereof. **Deposit:** Rs.5000/-
9A	For providing service of officers and firemen charges to be recovered-	**Fee: 9(A)** 1.D.F.O. –1000/- 2.A.D.F.O. –750/-	**Fee: 9(A)** 1.D.F.O. –1500/- 2.A.D.F.O. –1125/-

	A) For attendance duties	3.Station Officer -500/-	3.Station Officer -750/-
	extinguishing the fire,	4.A.S.O. –300/-	4.A.S.O. – 450/-
	pumping out water	5.Sub-Officer -200/-	5.Sub-Officer - 300/-
	operation and house	6.Driver Operator-150/-	6.Driver Operator - 225/-
	collapse in out side of	7.Leading Fireman-120/-	7.Leading Fireman - 180/-
	city limit.	8. Fireman -100/-	8. Fireman - 150/-
		For the first 3 hours or part thereof	For the first 3 hours or part thereof
		50% of these charges for each	50% of these charges for each
		addl. hour or part thereof.	addl. hour or part thereof.
		Deposit: Nil	**Deposit: Nil**
9B	B) For less strenuous	**Fee: 9(B)**	**Fee: 9(B)**
	duties such as taking out	1.D.F.O. – 450/-	1.D.F.O. – 675/-
	valuable and personal	2.A.D.F.O. – 400/-	2.A.D.F.O. – 600/-
	effects etc. with the help	3.Station Officer - 350/-	3.Station Officer - 525/-
	of ladders for both inside	4.A.S.O. – 250/-	4.A.S.O. – 375/-
	and out side the city limit.	5.Sub-Officer - 150/-	5.Sub-Officer - 225/-
		6.Driver Operator- 120/-	6.Driver Operator- 180/-
		7.Leading Fireman- 100/-	7.Leading Fireman- 150/-
		8. Fireman - 80/-	8. Fireman - 120/-
		For the first 3 hours or part	For the first 3 hours or part
		thereof 50% of these charges	thereof 50% of these charges
		for each addl. hour or part	for each addl. hour or part
		thereof.	thereof.
		Deposit: Nil	**Deposit: Nil**
10	For tying in coupling to	**Fee:** Rs.100/- per pair.	**Fee:** Rs.500/- per pair.
	hose (Labour charges)		
	material to be supplied be		
	the party.	**Deposit :** Nil	**Deposit :** Nil
11	For hiring fire brigade		
	street accident ambulance		
	in case other than accident.	**Fee:** Rs.200/- for first hour	**Fee:** Rs.300/- for first hour
	A) Within the limit of	or part thereof and Rs.100/-	or part thereof and Rs.150/-
	Greater Mumbai.	for addl. succeeding ½ hour or	for addl. succeeding ½ hour or
		fraction thereof.	fraction thereof.
		Deposit: Nil	**Deposit:** Nil
	B) Out side the limit of	**Fee:** Rs.400/- for first hour or	**Fee:** Rs.600/- for first hour or
	Greater Mumbai.	part thereof and Rs.200/- for	part thereof and Rs.300/- for
		addl. succeeding ½ hour or	addl. succeeding ½ hour or
		fraction thereof.	fraction thereof.
		Deposit: Nil	**Deposit:** Nil
12	Training of fire fighting.	**Fee:** Rs.100/- per day training	**Fee:** Rs.250/- per day training

		course per candidate (For	course per candidate (For
		Elementary course) and	Elementary course) and
		Rs.150/- per day for monthly	Rs.500/- per day for monthly
		training course per candidate	training course per candidate
		(For officer cadre).	(For officer cadre).
		Deposit: Nil	**Deposit:** Nil
13	Training of Driver Operators	**Presently Not availble**	**Fee: A.** Rs. 350/- per day training course per candidate(If the vehicle is arrange by them) **B.** Rs.700/- per day training course per candidate (If the vehicle is provided by Fire Brigade)
			B. Rs.700/- per day training course per candidate(if vehicle is provided by Fire Brigade)
14	Fees for medical exami-	**Fee:** Rs.50/- per candiadate.	**Fee:** Rs.250/- per candiadate.
	nation by fire Brigade		
	surgeon of the candidate to		
	be accepted for training.		
		Deposit: Nil	**Deposit:** Nil
15	Daily testing of private Fire	**Fee:** Rs.500/- per annum.	**Fee:** Rs.500/- per annum.
	Alram.		
		Deposit: Nil	**Deposit:** Nil
16	Valcanising of hose	**Fee:** Rs.50/- per patch of 25	**Fee:** Rs.250/- per patch of 25
		sq.cms. double the charges if	sq.cms. double the charges if
		the patch is both from inside	the patch is both from inside
		and outside.	and outside.
		Deposit: Nil	**Deposit:** Nil
17	Pumping out poisonous	**Fee :** Rs.300/-per blower for	**Fee :** Rs.1000/-per blower for
	gases by exhaust blower.	6 hours or part thereof.	6 hours or part thereof.
		Charges for hire of services of	Charges for hire of services of
		crew to be recovered as per	crew to be recovered as per
		item No.(9 B) above.	item No.(9 B) above.
		Deposit: Nil	**Deposit:** Nil
18	Destruction of films	**Fee :**Rs.10/-per reel & Rs.5/-	**Fee :**Rs.50/-per reel & Rs.25/-
	(Cinema)by fire &granting	per roll of films, subject to	per roll of films, subject to
	a certificate.	minimum aggregate charges of	minimum aggregate charges of
		Rs.750/- per destruction.	Rs.2000/- per destruction.
		Deposit: Nil	**Deposit:** Nil
19	Giving lectures on Fire	**Fee :** Rs.1000/- per lecture of	**Fee :** Rs.3000/- per lecture of
	Prevention etc. at the	about 1 to 1 ½ hours duration	about 1 to 1 ½ hours duration
	Institution in Greater	(out of the amount 50%paid	(out of the amount 50%paid
	Mumbai.other than	to the officer)	to the officer)
	educational institution like		
	school & college(Inclusive		

	of expenses on	**Deposit:** Nil	**Deposit:** Nil
	conveyance.)		
20	Issuing a copy of fire	**Fee :** 1. Residence	**Fee :** 1. Residence
	report or other service	A) Hutment & Lowrise	A) Hutment & Lowrise
	reports.	structure–Rs.150/- per copy.	structure–Rs.250/- per copy.
		B) Highrise structure Rs.300/-	B) Highrise structure Rs.500/-
		per copy	per copy
		C) Commercial,industrial &	C) Commercial,industrial &
		special building Rs.600/-	special building Rs.1200/-
		per copy.	per copy.
		Deposit: Nil	**Deposit:** Nil
21	Capitation Fees:	**Fee:** Proposed separately .	**Fee:** Proposed separately .
	Rules for fire protection		
	and fire requirement for	**Deposit:** Nil	**Deposit:** Nil
	highrise buildings .		
22	The charges for	**Fee:** If the pandal is erected	**Fee:** If the pandal is erected
	performing marriage	in the station premises for	in the station premises for
	ceremony of employee	performing marriage ceremony	performing marriage ceremony
	himself or of family	Rs.200/- are to be recovered or	Rs.350/- are to be recovered or
	members.	if the marriage ceremony is	if the marriage ceremony is
		performed out side the station	performed out side the station
		premises but some religious	premises but some religious
		ceremony is performed in the	ceremony is performed in the
		quarters then Rs.250/- to be	quarters then Rs.400/- to be
		recovered from the employee	recovered from the employee
		Rs.200/- for electric charges	Rs.350/- for electric charges
		plus Rs.25/- for water charges	plus Rs.50/- for water charges
		plus Rs.50/- for erecting mandap	plus Rs.75/- for erecting mandap
		Deposit: Nil	**Deposit:** Nil
23	Refilling of Air-	**Fee:**	**Fee:**
	Compressed cylinders of	A) Rs.250/- per cylinder for	A) Rs.400/- per cylinder for
	breathing apparatus.	Govt. body and fire service	Govt. body and fire service
		etc.	etc.
		B) Rs.500/- per cylinder for	B) Rs.800/- per cylinder for
		private firms.	private firms.
		Deposit : Nil	**Deposit :** Nil
24	Charges levied & fine imposed under R.T.I. Act2005	**A) Issuing certified copy of Inspection Report**	**A) Issuing certified copy of Inspection Report**
		A) Hutment & Lowrise	A) Hutment & Lowrise
		structure–Rs.50/- per copy.	structure–Rs.100/- per copy.
		B) Highrise structure Rs.100/-	B) Highrise structure Rs.200/-
		per copy	per copy
		C) Commercial,industrial &	C) Commercial,industrial &
		special building Rs150/-	special building Rs.300/-

		per copy.	per copy.
		B) Issuing certified copy of NOC	**B) Issuing certified copy of NOC**
		A) Hutment & Lowrise	A) Hutment & Lowrise
		structure–Rs.150/- per copy.	structure–Rs.300/- per copy.
		B) Highrise structure Rs.300/-	B) Highrise structure Rs.600/-
		per copy(As per R.T.I. Act charges of xerox will be recovered if required NOC plan copy)	per copy(As per R.T.I. Act charges of xerox will be recovered if required NOC plan copy)
		C) Commercial,industrial &	C) Commercial,industrial &
		special building Rs.600/-	special building Rs.1200/-
		per copy.(As per R.T.I. Act charges of xerox will be recovered if required NOC plan copy)	per copy.(As per R.T.I. Act charges of xerox will be recovered if required NOC plan copy)
		C) Issuing certified copy of fire report to third party	**C) Issuing certified copy of fire report to third party**
		A) Hutment & Lowrise	A) Hutment & Lowrise
		structure–Rs.150/- per copy.	structure–Rs.250/- per copy.
		B) Highrise structure Rs.300/-	B) Highrise structure Rs.750/-
		per copy	per copy
		C) Commercial,industrial &	C) Commercial,industrial &
		special building Rs.600/-	special building Rs.1000/-
		per copy.	per copy.

-Sd-

Chief Fire Officer
Mumbai Fire Brigade

c. Appendix C – Public Health Institution

Ward	Health Posts including RCH	Dispen sary	Mun Mat Home	PPC	Mun Hosp	Govt Hosp & ESIS	Pvt Trust Hosp	Pvt. Nursing Home	Cemet-ries	DRK Chowk-ies	PNDT Centres	Blood Banks BMC+Govt +Pvt
A	2	7	0	0	1	4	1	17	0	0	32	3
B	2	4	0	0	0	0	5	0	2	0	14	0
C	3	5	1	0	0	0	1	2	5	0	9	0
D	5	6	0	0	0	0	3	78	3	2	76	0
E	6	12	1	1	4	4	2	17	3	0	35	5
F/S	7	9	1	1	2	1	3	35	5	1	39	3
F/N	7	7	1	1	2	1	4	47	11	2	75	1

G/S	6+1	13	1	1	0	2	1	38	7	-	38	0
G/N	8	10	1	1	0	0	4	78	7	3	71	2
H/E	7+1	6	1	1	1	1	2	38	8	2	53	2
H/W	6	8	0	1	1	1	6	48	13	3	75	4
K/E	11+1	10	3	2	0	1	3	97	7	3	98	8
K/W	9+1	4	1	0	1	0	4	110	17	4	120	5
P/S	6	10	1	1	1	1	0	57	3		54	1
P/N	10+1	5	2	2	2	0	4	103	20	-	67	1
R/S	7+1	6	2	1	2	1	2	84	7	-	71	0
R/C	8+1	6	2	1	0	0	1	131	3	3	73	0
R/N	4+1	3	0	1	0	1	2	53	13	0	32	1
L	12+1	9	1	1	1	0	0	56	8	2	61	0
M/E	9+2	5	2	2	1	2	0	47	14	-	26	0
M/W	7	4	1	1	1	0	3	54	8	2	54	0
N	10	2	1	1	2	0	3	106	6	3	59	3
S	10+3	8	2	2	1	2	2	65	10	3	72	2
T	6+1	3	1	0	2	1	3	85	4	-	71	4
Total	**168+15**		**26**		**25**	**23**			**184**	**33**	**1377**	**48**