Hand-Book

ON
FIRE SAFETY IN HIGH RISE
AND
SPECIAL TYPE OF BUILDINGS

- Profile of Mumbai Fire Brigade
  Other Related Associations
- Rules and Regulations
- Policies / References
- Guide Lines

PUBLICATION OF **PEATA (INDIA)** IN ASSOCIATION WITH MUMBAI FIRE BRIGADE

Practising Engineers Architects and Town Planners Association (India)
4 & 5, GR. FL., NAGREE TERRACES, SOONAWALA AGIARY MARG,
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Mumbai Fire Brigade
Municipal Corporation of Greater Mumbai
CITY H. Q. BYCULLA
SHAIKH HAFFIZUDDIN MARG,
BYCULLA, MUMBAI - 400 008.

HANDBOOK ON FIRE SAFETY IN HIGH RISE & SPECIAL TYPE OF BUILDINGS

Joint Committee

MUMBAI FIRE BRIGADE	P.E.A.T.A. (INDIA)
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SHRI R.A. CHAUDHARY Station Officer & Chief Foreman	**SHRI BHARAT C. SHAH** Chairman - Revenue Sub-Commitee

नंदू साटम

महानगरपालिका सभागृह,
महानगरपालिका मार्ग, मुंबई-४०० ००१.
दूरध्वनी कार्यालय : २६२ ०२५१/२६२ १०२०

क्रमांक :

दिनांक : ३०, जानेवारी १९९९

महापौर मुंबई

शुभ संदेश

प्रॅक्टीसिंग इंजिनिअर्स आर्किटेक्टस् अँड टाऊन प्लॅनर्स असो. (इंडिया) आणि मुंबई अग्निशमन दल ह्यांच्या संयुक्त विद्यमाने, उत्तुंग व विशेष इमारतीसाठी अग्नी सुरक्षा या विषयावर दोन दिवसांचे चर्चासत्र प्रदर्शनासह दि. ६ व ७ फेब्रुवारी १९९९ रोजी पाटकर सभागृह, चर्चगेट येथे आयोजित करण्यात आल्याचे व त्यानिमित्ताने एक मार्गदर्शक माहिती पुस्तिकेचे प्रकाशन आयोजित करण्यात आल्याचे वाचून आनंद वाटला.

या मुंबई शहरात दिवसेंदिवस गगनचुंबी इमारतींची संख्या वाढत असून, अशा इमारतींच्या बांधकामाच्या वेळी वास्तुविशारद आणि अभियंता यांनी योग्य ती आग प्रतिबंधात्मक उपाय योजना केल्यास, कधी या इमारतीमध्ये आगीसारखी दुर्घटना घडल्यावर अग्निशमन दलाला आग विझविण्यासाठी तातडीने प्रयत्न करता येतील व मोठ्या प्रमाणात होणारी हानी टळू शकेल. यादृष्टीने अत्यंत उपयुक्त अशी माहिती या पुस्तिकेमध्ये प्रसिद्ध करण्यात आली असून, ती अग्निशमन दलाचे कार्य अधिक कार्यक्षम करण्याच्या दृष्टीने निश्चितच विधायक ठरेल याबद्दल संदेह नाही.

''पिएटा'' व ''मुंबई अग्निशमन दल'' ह्यांच्या या सयुंक्त उपक्रमास मुंबईचा महापौर या नात्याने माझ्या हार्दिक शुभेच्छा.

(नंदू साटम)
महापौर

गोपाळ शेट्टी
उप-महापौर
बृहन्मुंबई महानगरपालिका
महापौर परिषद-सदस्य,
(पाणी पुरवठा व
मलनि:सारण)

बृहन्मुंबई महानगरपालिका

महानगरपालिका सभागृह,
महानगरपालिका मार्ग, मुंबई - ४०० ००१.
दूरध्वनी कार्यालय : २६२०२५१ वि.क्र. ३१४६
२६२०२३३, २६७५८५१

दिनांक : १ फेब्रुवारी १९९९

संदेश

प्रॅक्टीसिंग इंजिनिअर्स आर्किटेक्ट्स ॲन्ड टाऊन प्लॅनर्स असोसिएशन (इंडिया) ''पिएटा'' व मुंबई अग्निशमन दल यांनी संयुक्त विद्यामाने दि. ६ व ७ फेब्रुवारी १९९९ रोजी दोन दिवसांचे प्रदर्शनासह, चर्चासत्र आयोजीत करण्याचे ठरविले आहे. गगनचुंबी इमारतींची संख्या मुंबईत वाढत असल्याने ''अग्निशमन व सुरक्षा'' या अत्यंत महत्वाच्या विषयावर जनजागृतीसाठी अशा चर्चासत्रांची आवश्यकता आहे.

या चर्चासत्राच्या निमित्ताने प्रकाशित होणाऱ्या अभ्यासपूर्ण स्मरणिकेमुळे सर्व संबंधितांना त्यांच्या जबाबदारींची जाणीव होईल व आवश्यक जागरुकता निर्माण होईल असा मला विश्वास वाटतो.

''पिएटा'' व मुंबई अग्निशमन दल यांना या उपक्रमाबद्दल मुंबईचा उपमहापौर या नात्याने माझ्या हार्दिक शुभेच्छा.

धन्यवाद.

Shetty

गोपाळ शेट्टी
उप महापौर

GIRISH GOKHALE
MUNICIPAL COMMISSIONER

बृहन्मुंबई महानगरपालिका

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30th January, 1999

Seminar on Fire Safety in High Rise and Special Type of Buildings

I am happy to learn that the Practising Engineers Architects and Town Planners Association (INDIA) and Municipal Corporation of Greater Mumbai are jointly orgnising a two days' seminar on 6th & 7th February 1999 at Patkar Hall.

It is with great pleasure that I was appraised of the yet another Publication of Practising Engineers, Architects and Town Planners Association (India) in connection with "Fire Safety in High Rise and Special Type of Buildings" by means of a Hand Book prepared jointly by Mumbai Fire Brigade and office bearers of P.E.A.T.A. (India).

It is a very fine example of co-operation and continued dialogue between those who implement the rules and those affected by it. P.E.A.T.A. has been instrumental in publications of such useful Hand Books like "Building Proposal Manual" and other publications which reflect the consistent co-operative approach of P.E.A.T.A. and Authorities. The Hand Book will be very useful and serve the Professionals as well as Corporation Staff.

I wish the publication a success and hope that P.E.A.T.A. (India) may prepare many more such useful Hand Books.

(Girish Gokhale)

Shridhar Joshi
I.A.S.
ADDL. MUNICIPAL COMMISSIONER

MUNICIPAL CORPORATION OF GREATER MUMBAI
बृहन्मुंबई महानगरपालिका

OFFICE OF THE ADDITIONAL
MUNICIPAL COMMISSIONER,
MUNICIPAL HEAD OFFICES,
MAHAPALIKA MARG, FORT,
MUMBAI - 400 001, (INDIA)
Tel. No. : 262 08 09
Fax No. : 022-2626437

1st February 1999.

I am extremely happy to know that PEATA (India) in association with Mumbai Fire Brigade in organising a Seminar on "Fire Safety in high rise building and special type of Buildings."

Mumbai is the financial and commercial capital of India. People from all parts of the country come and prefer to stay here permanently especially because this city provides various avenues for generating income and has a well knit infrastructure in terms of roads, electricity, water supply etc. The population of this mega city is around 13 millions with an area merely of about 437 Sq. kms. Therefore, the innovative Architects, Engineers, Town Planners in the City have rightly recommended to have multi-storied and special type of buildings. This city can boast to have maximum high rise buildings in the country. High rise buildings are must for a city like Mumbai. However a special care has to be taken for fire safety in such buildings. The proposed seminar will provide a forum for indepth discussion on fire safety. Precautions to be taken while planning and designing a high rise or special type of buildings.

The hand book prepared by PEATA and Mumbai Fire Brigade giving various details on the matters related to fire safety will prove to be very useful and handy for practising Engineers, Architects, Town Planners, Govt. and Municipal Officers and general public.

I wish the Seminar a great success.

(Shridhar Joshi)

V. V. RAO

B.A., G.I. Fire, E. (Lond.), M.A.M., D.C.C. (U.K.)

FIRE BRIGADE H. Q. BYCULLA, MUMBAI - 400 008.

CHIEF FIRE OFFICER

No. : FBH / CFO / 99
Date : 30.01.1999

Dear Shri Phulkar,

We, in Mumbai Fire Brigade, are extremely glad to associate ourselves with PEATA for preparing the Hand-Book on "Fire Safety in High Rise and Special Type of Buildings" on the same subject at Patkar Hall, Nathibai Thackersey Marg, Mumbai on 6th and 7th February, 1999.

The Hand Book provides information on concepts and philosophy of fire safety, besides explaining various provisions in the Development Control Regulations, 1991. This effort will, no doubt, clarify various doubts and also serve as a guide for the Architects and Engineers in planning and designing buildings from the fire safety point or view.

I would also like to place on record my appreciation for the initiative taken by the PEATA in publishing this Hand-Book.

My best wishes for the success of PEATA in all its pursuits and endeavours for the good of our great Metropolis.

With regards,

Yours sincerely,

(V.V. Rao)

Shri Vijay V. Phulkar
President, PEATA
Mahim (West),
Mumbai - 400 016.

egn. No. Bom. 32/1966, GBBSD
he Society Regn. Act, 1860)
egn. No. F-1388 (Bom.)
lombay Public Trust Act, 1950)

FOUNDED IN 1965

Practising Engineers Architects and Town Planners Association (India)

& 5, GR. FL., NAGREE TERRACES, SOONAWALA AGIARY MARG, OFF M. M. CHHOTANI RD., MAHIM (W), MUMBAI - 400 016. Tel. : 444 5998 • 444 2897 Fax : 444 2983

PREFACE

Absolute safety from fire is not attainable in practice. The objective of this Hand-Book is to specify measures which will provide reasonable degree of safety from fire. The safety of life is prime importance. Due to rapid urbanisation lands in metropolitan cities are becoming scarce and expensive, and therefore for optimum utilisation of land, construction of High Rise Buildings has left no alternative. It is a fact that most developed countries suffered great losses due to fire inspite of use of most advance technology in fire fighting.

Recent survey reveals that there are 1400 High Rise Buildings in Mumbai. Even though most of the tall structures are located in south Mumbai, large number of skyscrapers are mushrooming in suburbs and in the vicinity of Mumbai. Fire safety in High Rise and Special buildings is absolutely important for protection of life and property. Time has come to give serious thought towards the design and construction of tower structures to achieve higher levels of fire safety. It is necessary for real estate developers, architects, planners, engineers, building mangers and actual users to be aware off and recognise the need of fire safety, to achieve an equitable state of fire safe structures under most adverse conditions. It is a fact that fire in high rise buildings can be only fought from inside than out side due to height of structure, and as such great care in planning & designing of fire safe structures has become need of time. In all the countries Fire safety Rules are made mandatory for High rise buildings, & Special Type of buildings.

With this Handbook an attempt is made to give relevant informations to all component agencies to assist them in discharging their respective roll. Separate regulations are incorporated in the D.C. Regulations 1991, for Greater Mumbai, vide regulation No.43 and additional fire protection requirements in Appendix VIII of the said D.C. Rules.

This Hand-Book is a compilation of all relevant informations of Rules, Regulations and policies decided by the Municipal Corporation of Gr. Mumbai, and Mumbai Fire Brigade. The procedure of obtaining clearances from the Chief Fire Officer for various types of buildings, alongwith checklist of documents to be submitted, are incorporated. Definitions of Terms and expressions, Tables of requirements for Fire Fighting Installations, Fire Resistance ratings as well as Fire Protection Requirements for various occupancies of High Rise and Special Type of buildings are provided for ready reference. Besides profile of Mumbai Fire Brigade and the

list of Fire Stations, information about General Insurance Corporation of India (G.I.C.), Loss Prevention Association of India Ltd., recommendations of Delhi Insurance Institute on Fire Insurance and Profile of Tariff Advisory Committee are also incorporated.

The Joint Committee has put in valiant efforts in preparing text of this Hand-Book. For more clearity interpretations are also explained by graphic illustrations. I am sure that this Hand-book will serve as a ready recknor to all concern, to great extent. I am aware that more clarities will be added to this exercise in the days to come.

I sincerly thank Shri V.V. Rao chief Fire Officer, Shri M.G. Sarkhot Jt. Chief Officer (Retd.) and other officers of Mumbai Fire Brigade for their support, encouragement and guidance in this exercise, without which this compilation could not be possible. Shri R.A. Chaudhary Stn. Officer and Chief Foreman is entitled for all praise for providing upto date informations and materials on profile of Mumbai Fire Brigade.

Besides other members of the joint committee, my apprecision goes particularly to Ar. Shri Ratan Bhalwankar who is also our zonal co-ordinator for preparing all graphic illustrations in this Hand Book. Ar. Shri Bharat Shah who is our co-editor of News Letter and Chairman of Revenue Sub-Committee is instrumental in providing all required matters on Fire Insurance & Profiles of various institutions. Our staff Shri Vishwanath Bobate helped me in general co-ordination and proof reading.

With immence pleasure, I am submitting PEATA's this work to all concern with assurance for many more useful & informative publications in future.

Mumbai
6th February, 1999

Sudhakar M. Dokhane
Imm. Past President & Editor

Regn. No. Bom. 32/1966, GBBSD
(The Society Regn. Act, 1860)
Regn. No. F-1388 (Bom.)
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FORE WARD

PEATA a 37 years old largest association of professionals, has always taken initiative in the welfare of the professionals and setting good practices in the interest of profession. The earlier publication "Green Book" explained the role of each of the component agencies of building industry as back as in 1985. The "Building Proposal Manual", Revised Building proposal Manual, Hand Book on Devlopment Control Regulations, Ready Recorner for revenue recoveries are some of the examples of PEATA'S joint excercises with the Brihan Mumbai Mahanagarpalika, shows the positive thinking of PEATA for the upkeepment of the profession and uniformity in administration. PEATA will be always remembered in future for these contributions. We in PEATA are always proud for inheriting this rich tradition.

This Hand Book on Fire Safety in High Rise and Special type of Buildings is further enriching the set tradition. It gives, complete information about profile of Mumbai Fire Brigade , their activities, Set up, history, the yeomen Services rendered by the department in the past, guidelines for planning & designing for fire Safety in High rise and Special type of buildings, manner of scrutiny etc. the essential requirements for professionals, in their day to day work.

PEATA has taken lead in organizing a Seminar on the subject jointly with the Mumbai Fire Brigade and as part of these activity this very informative "Handbook" on Fire Safety in High Rise and Special Type of Buildings" is being released, on the occasion.

Besides, PEATA's team, I shall be failing in my duties if I do not mention our gratitude towards to the officers of Mumbai Fire Brigade, Shri V.V. Rao, Chief Fire Officer, Shri M.G. Sarkhot - Jt. Chief Fire Officer (Retired), and others, for their untiring efforts in this exercise.

I am sure that this Hand Book will serve as a ready recorner to all the planners, architects, and every person connected to building industry. for years to come.

VIJAY PHULKAR
President

HANDBOOK ON FIRE SAFETY IN HIGH RISE & SPECIAL TYPE OF BUILDINGS

Joint Committee

MUMBAI FIRE BRIGADE	P.E.A.T.A. (INDIA)
SHRI V. V. RAO Chief Fire Officer	**SHRI SUDHAKAR M. DOKHANE** Imm. Past President & Editor
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INDEX

KNOW YOUR FIRE BRIGADE

Started as a part-time function of Police under the Government, the fire protection subject had passed on to the Municipality on 1st April, 1887 as a full-time subject. The Brigade was commanded by an Officer on deputation from the London Fire Brigade between 1890-1948. Since 1948, the Brigade is completely manned and controlled by Indians.

In the ancient days, the equipment comprised hand pumps and steam engines drawn by horses. The colloguial word 'Bamba' for steam engine is associated ever since with the Brigade. A Fire Station is even now called as "Bambakhana".

True to its cosmopolitan composition, Greater Mumbai is greatly diversified, from a large number of high-rise stone and concrete buildings ('concrete jungle') in the South to mainly wooden framed and closely-built century old residential and commercial premises in Kalbadevi, Mumbadevi, Bhuleshwar, Vadgadi, Bhat Bazar areas; from large number of textile mills in Central Bombay to a wide variety of medium and heavy industries in the Suburbs and Extended Suburbs. Greater Mumbai is full of slum areas including Dharavi which is classified as the world's largest slum. Perhaps, every conceivable fire situation is contained in Greater Mumbai, with its vast harbour, a massive airport complex at Santacruz and Sahar, Two large-size oil refineries, a gigantic fertiliser factory, Atomic Energy Establishment and Thermal Power Station at Trombay. About 2700 and odd Officers and men of the Brigade have to face and deal with a heavy workload and fire risk of serious nature spreading over 437 sq. kms. and covering a population of over 10.2 million.

The Brigade has 23 Fire Stations, with its Headquarters located at Byculla and suburban Headquarters at Marol, Andheri (E), commanded by a Chief Fire Officer. It is divided into Six Regions each being under the charge of a Deputy Chief Fire Officer. Each Region is further divided into Sub-Divisions comprising a certain number of Fire Stations. A Sub-Division is under the charge of an Assistant Divisional Officer, while a Fire Station is managed by a Station officer or Assistant Station Officer.

The Brigade has a Training Centre where all the recruit officers and firemen are trained and various Refresher Courses are conducted. The Training Centre, under the charge of a Divisional Officer, also undertakes training of personnel from industries if time permits. Further, Officers are also deputed to National Fire Service College and other countries for advanced training.

An independent maintenance workshop at Byculla caters to the needs of repairs and maintenance of all Auto vehicles and equipment. The Fire Fighting Workshop and Wireless Workshop is maintained by a Divisional Officer.

The Brigade Control Room is located at Byculla and under the charge of a Divisional Officer, handles about 25 emergency calls besides ambulance calls every day and is responsible for the minute to minute mobilisation of 2700 and odd personnel and more than 200 appliances.

The officers of the Brigade are on 24 hours continuous duty system where as staff is on 8 hours shift duty system. They are alert and maintain round the clock vigil so that any emergency, whether big or small, is responded to within 30 seconds. Notwithstanding the stresses and strains of odd-time emergency calls, the personnel also perform fire and rescue drills and carry out inspection and maintenance of appliances and equipment. These non-emergency duties extend over whole part of the day time.

JURISDICTION AND FUNCTIONS OF FIRE BRIGADE

The Mumbai Fire Brigade operates in the Municipal limits of Greater Mumbai. In exceptional cases, the Brigade responds to emergencies outside Greater Mumbai also but on payment of specified charges. The statutory duty of the Brigade is to save lives and property in case of fire. Nevertheless, in the interest of public welfare, special service which involve life-saving or rescue operations, humanitarian services and services urgently necessary in the public interest, are rendered. These services cover a wide range of incidents such as house collapses, train and motor accidents, drowning accidents, tree collapses, oil and acid spillages etc. Fire and special services of emergency nature are rendered free of charge. For non-emergency services, a prescribed fee is charged.

EMERGENCY CALL TO FIRE BRIGADE

Your Brigade is founded on the mottos of Valour, Abnegation and Sacrifice. It is geared to "Kill the fire before it kills". The main purpose of the Brigade is to help those in distress. People sometimes delay calling the Brigade because they think the fire is too small or they can extinguish it easily themselves or someone has already dialled 101. Play it safe! If you see a fire, howsoever small, call the Brigade without hesitation. It costs nothing and you may save a life and minimise national loss.

Dial 101 or 3085991, 2-3-4 when you need the services of the Brigade. A Duty Officer receives the call. Give him the detailed address, type of incident and the telephone number from which you are calling. The details are passed on to the concern Fire Station on wireless network of the Brigade. Within seconds, the Brigade is on its way !

AMBULANCE SERVICE

The Ambulance Service in the Brigade was established when ambulance vans were donated by Bai Jerbai Wadia and Sir Mangaldas Mehta, in 1920. Recognising the immense need and value of this service for the citizens, the Brigade converted this service as one of its permanent wings in 1941 and ever since became an integral part of the Brigade.

The Brigade Ambulances are located at various Fire Stations all over Greater Mumbai. The Ambulances, besides attending the emergency calls, also respond to street accidents and maternity calls free of charge. The ambulances are also available on hire for transfering patients. However, for conveying either dead bodies or patients suffering from infectious or communicable diseases, the Corporation has another exclusive fleet of Ambulances.

FIRE PREVENTION ACTIVITIES

The Fire Prevention activity of the Brigade has two aspects viz. Regulatory and Persuasive.

Regulatory:

By virtue of provisions under the Bombay Municipal Corporation Act, 1888, (Now M.M.C. Act), various trades and storages are licensable and all the factories are also required to obtain permits. Similarly, various storage activities are licensable under the Central Government and state Govt. Acts, such as Explosives Act, Petroleum Act, etc. Since, all these trades, storages, activities, etc. have inherent fire risk, the concerned licensing authorities refer the proposals to the Brigade for giving technical recommendations on the fire protection and fire prevention on each individual proposal. The Brigade officers inspect the premises and stipulate necessary fire protection and fire prevention requirements. On an average, around 10,000 proposals are received and disposed off every year.

Further, under the D.C. Regulations & Building Bye-laws the Municipal Corporation is the authority for permitting all construction activities including additions and alterations. The proposal for High Rise & Special Type of buildings are approved by the Corporation only after necessary clearance / N.O.C. from the Chief Fire Officer.

In order to ensure uniformity and also effectiveness, the Brigade has formulated Rules and Regulations in respect of various trades, storages and industrial processes. The contribution of the Brigade in formulating the fire protection and fire prevention requirements for incorporation in the National Building Codes and Building Bye-Laws and Development Control Rules for different Classes of

Municipalities in Maharashtra, were widely recognised and appreciated. The Fire Prevention Rules and Regulations formulated by the Brigade were, in many cases, subsequently adopted by the Indian Standards Institution, Central Government, State Government, etc. in the form of Standards, Codes of Practice, Legal provisions in the concerned Legislations, etc.

Persuasive :

The persuasive aspect of fire prevention is discharged by the Brigade in the form of fire prevention education, demonstrations, etc. Children from various schools, volunteers from Home Guards and Civil Defence., Trainees from All India Institute of Local Self Government visit the Fire Stations and Fire Brigade Headquarters for receiving information on fire prevention and also the Brigade. Lectures are also organised in various industrial and commercial establishments to promote the cause of fire prevention. On many occasions, group from service clubs such as Rotary Club. Lions Club are also given lectures on fire prevention methods. In furtherance of this aspect, Trainees from Industrial Establishments are also accepted by the Brigade Training Centre for training them in the subject of Fire Prevention.

All these activities receive concentrated and concerted efforts during the Annual Fire Prevention Week which is observed from 14th to 20th April. During this period, in additions to the above regular activities, the Brigade also organises talks and discussions on Radio and Television, shows slides on Television and in Cinema Theatres, arranges fire fighting and rescue drills, demonstrations, organises Seminars at times, fire prevention messages through hoardings and Press Release, Exhibitions, etc. All these activities in the area of Fire Prevention education have yielded definite results.

SAGA OF SACRIFICE

14th April, 1944: Fire Services Day

At 16.40 hours on 14th April 1944, Mumbai was rocked by two catastrophic explosions in a vessel s.s. "Port Stikins" berthed at No. 1, Victoria Dock. The ship contained nearly 1,200 tons of explosives, cotton bales & oil drums. The destruction was apalling. Prince's and Victria Docks, two of Mumbai's three principal basins, were full of blazing and drifting ships, while other sank near the berths to which they had been-moored. The approach channels to the docks were littered with obstructions, and a vast land area of various types of buildings, roads and railways was utterly devastated. Beyond this area fires raged caused by the wide dispersal of incendiary material from the fatal ship.

The disaster involved heavy loss of human life. The casualities amongst the personnel of various services and employments were as follows:-

	Killed or Missing	**Injured**
Bombay Port Trust	84	Not known
Bombay Fire Brigade Service	66	83
Personnel on ships in the Docks	41	123
Armed Personnel	15	30
Naval Personnel	7	160
Bombay Police	14	55
Others	4	25
	231	**476**

The magnitude of the explosion could be judged from the fact that a ship lying at the adjacent No. 2 berth - Victoria Dock, 400 feet long and of a deadweight of 4,000 tons, was lifted clear of a 50 feet high and dropped on land with the midship section across the quay and the bow overhanging the water. All buildings and ships in Prince's and Victoria Docks were set on Fire. An area of 100 acres adjacent to the docks was gutted.

Fire Engines disappeared from the face of the earth. Steel-framed buildings collapsed into tangled masses of fused steelwork and debris. Bulk grain stores continued to burn and smoulder for four months. Fragments of mangled steel weighing upto 100 tons travelled laterally at incredible velocities passing through whatever was in their paths. The bridges over the Dock entrances were irrepairably damaged. Hydraulic operating gear for dock gates bridges were buried beneath masses of cotton and debris. In Victoria Dock, 500 ton ship was sunk at

the inner end of the entrance and a 300-ton water boat was submerged just outside. Masses of superstructure, such as masts and rigging, completely blocked the entrance to the Dock. The water surface of both docks was solidly covered by a mass of floating cotton, damaged cargo, debris and corpses. It took three weeks to clear the debris. Small crafts such as tugs, lighters, water-boats had sunk. Transit sheds, warehouses, dock buildings, offices and other structures were razed to the ground and reduced to tangled heaps of rubble, steel and ashes which completely blocked all roads and railways, The Railway tracks were irrepairably damaged. Electric sub-stations were gutted. Hydraulic, electric and fresh water mains, sewers and storm water drains were damaged by the tremendous earth tremor caused by the explosions.

The actual seat of the explosions revealed two huge craters and hundreds of feet of shattered quay wall forming a vast beach reaching far out below the water in the dock.

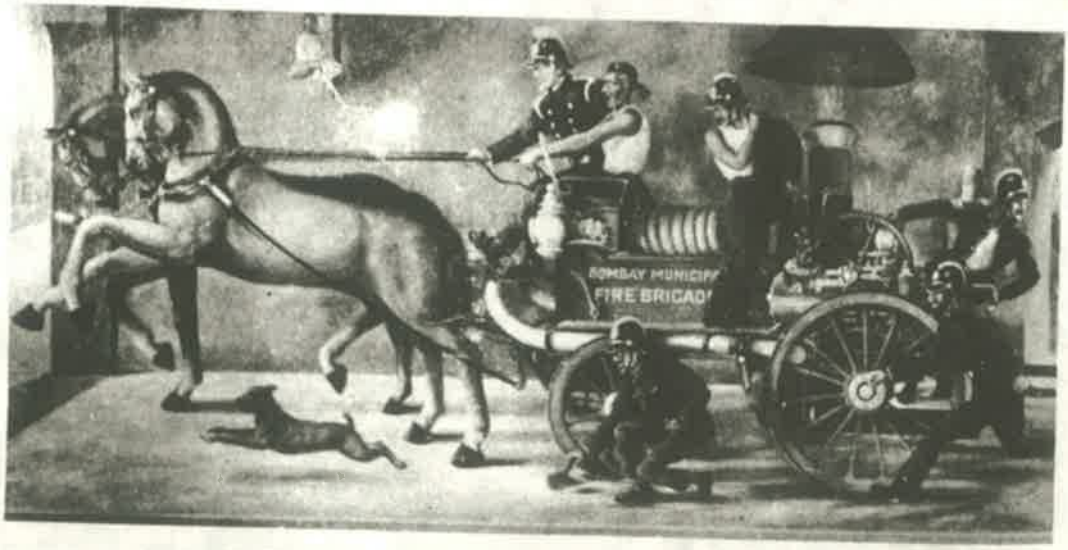
Ashore as the sun set the wind swept the flames towards the centre of the city in raging inferno visible for miles. As dawn of 15th April approached what was left of the Firemen were to arreast the wroughts and havoc that devastated the area. The authorities in power orderd a "Fire lane" to be dynamitted through the centre of the City and everything on the dock side to be conceded to the flames. This was an unbearable pain added to the injuries already caused by the explosion to the Firemen. The Officer Commanding Fire Services Mr. Norman Coombs who had enormous faith and confidence in his gallant Firemen vehemently refused to budge and the Firemen stood to their post so that the fire did not cross the 'Fire lane'. The heroism and devotion to duty of these Firemen were thus proved.

For weeks the fires burned in the devastated area but never crossed that 'lane' for the brave Firemen stood to their stead with no relief whatsoever ungrudgingly for days together 'Mumbai was saved.'

No exact toll of dead or injured will ever be known except for those 66 gallant personnel of Fire Service who laid down their lives and it is for their great act of bravery and devotion to duty that our great National salutes them to this day "14th April" every year and years to come. For those who gave their lives on duty died a glorious death. 'Death or glory" was the motto of these gallant men, and their sacrfice shall remain in memory forever. They brought honours and glory to the Bombay Fire Service. The services rendered by the Brigade will go down in the history in golden letters.

The officers and men did not die in an emotional heat of battle but laid down their lives in the cause of safety, welfare and prosperity of the citizens and the community at large of the city. In recognition, the citizens of Mumbai erected a Memorial Column at the Fire Brigade Headquarters at Byculla and the Government of India declared 14th April as "Fire Services Day" to be observed nation-wide every year. Thus, the city and the nation took pride in the Brigade, which established a memorable example for other Fire Services to emulate.

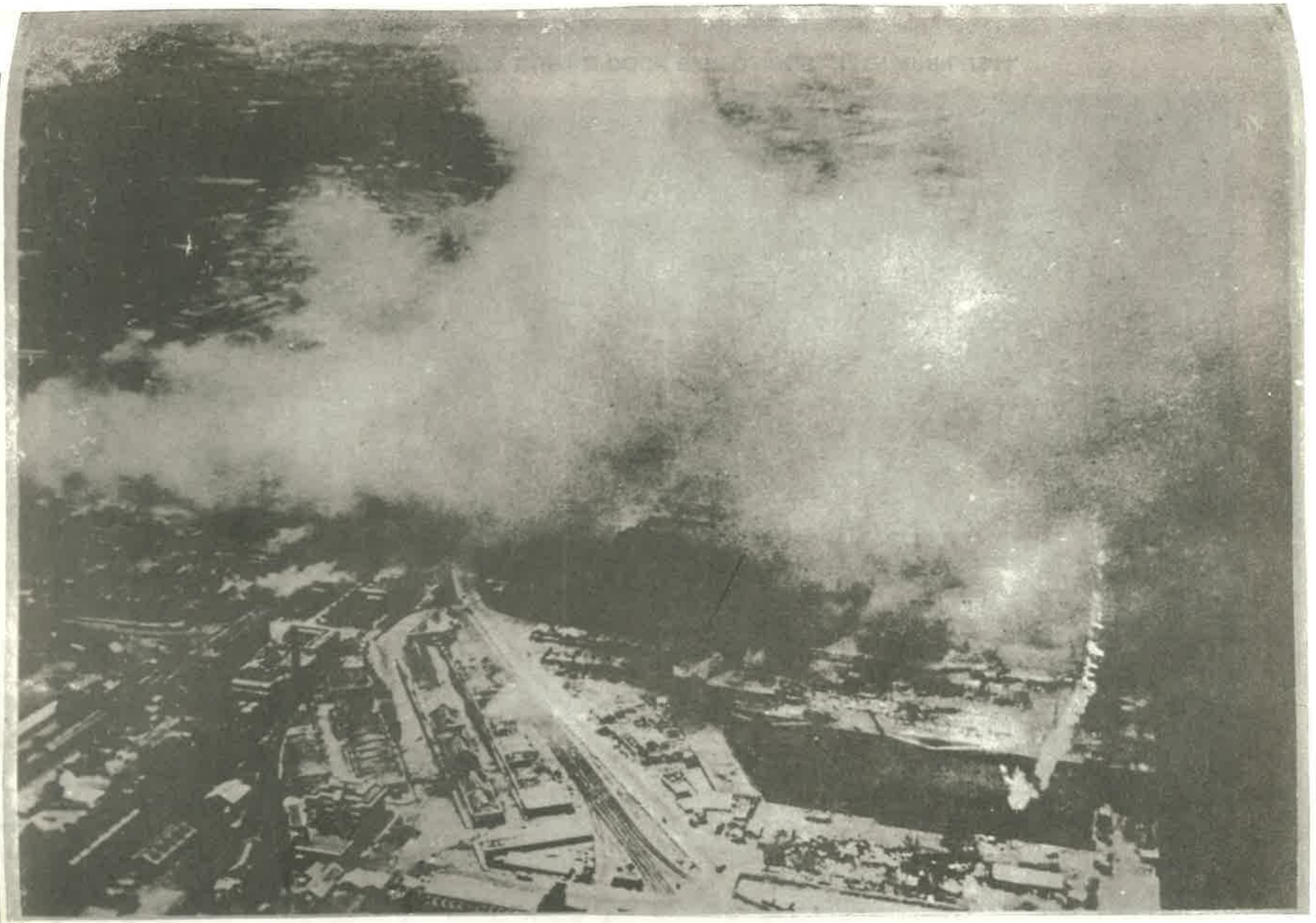
MEMORIAL COLUMN ERECTED AT BYCULLA HEADQUARTERS IN RECOGNITION OF THOSE WHO SACRIFICED THEIR LIVES ON DUTY ON 14TH APRIL 1944.



110 YEAR OLD HORSE DRIVEN STEAM FIRE ENGINE

RESCUE OPERATION OF AN UNFORTUNATE TRAPPED IN DEBRIS

HELPING HAND TO THOSE VICTIMISED IN COLLAPSE OF STRUCTURE



CATASTROPHIC EXPLOSIONS : VICTORIA DOCK : 14TH APRIL 1944.

PANIC IN THE VICINITY DURING DOCK EXPLOSIONS : 14TH APRIL 1944.

MUMBAI FIRE BRIGADE
CHRONOLOGY OF EVENTS

1777 : The Bombay Fire Brigade has the distinction of being the first organised fire Service to be established in India. The origin of Fire Service in Bombay could be traced back to as far as 1777.

Colonel Lee was allowed Rs. 4/- per day" for his trouble of superintending the fire-engines". These were hand-operated engines.

1803 : "Great Bombay Fire" broke out within the Fort and, after raging for the whole day, did not visibly abate until nearly a third part of the town within the walls had been consumed.

1855 : The Police Force was discharging the dual duties of maintaining Law and Order as also of fire-fighting.

1864 : A Commission was appointed to report on the organisation of a Fire Service. A Police Officer was sent to England to qualify himself as Captain of the New Steam Fire Brigade.

1865 : Fire Brigade was working jointly under the Goverment and the Municipality. The Brigade was using horse-drawn Steam Engines and Hand Engines.

1887 : On 1st April, the dual control of the Brigade ended and complete control transferred to the Municipality.

1888 : Bombay Municipal Corporation Act was enacted. Protection of life and property in case of fire became the obligatory duty of the Corporation.

1890 : Mr. W. Nicholls of the London Fire Brigade was appointed Chief Officer. The hegemony of Police ended and the management passed into the hands of a professional fire fighting officer.

1907 : The first petrol-driven Motor Fire Engine was received and commissioned.

1913 : Street Fire Alarm System with 50 posts was installed.

1920 : Motorisation of the Fire Brigade was completed and the last horse-drawn Steam Engine was decommissioned, Ambulance Service, comprising of 6 ambulances donated by Bai-Jerbai Wadia and Sir Mangaldas Mehta, was established.

1923 : An Indian was appointed in the officers cadre, which was, hitherto, a preserve of the British.

1940 : Auxiliary Fire Service was established to aid the Brigade to discharge the additional responsibilities due to Second World War.

1941 : The scheme of donated Ambulances was discontinued and the Fire Brigade Accident Ambulance Service was established.

1944 : In "Bombay - Dock Explosions", 66 Officers and men of Fire Brigade were killled while fighting fires. Many more were disabled. Inestimable loss of life and property was suffered by civilians.

1946 : Auxiliary Fire Service was disbanded, Annual Fire Drill Competitions were introduced.

1948 : Shri M.G. Pradhan was appointed Chief Fire Officer, the first Indian to hold this distinction. The Indianisation of the Brigade was completed.

1950 : Suburbs were amalgamated and the jurisdiction of the Brigade increased from 26 sq. miles to 112 sq. miles.

1957 : Extended Suburbs were amalgamated resulting in the increase of jurisdiction of 169 sq. miles.

1961 : V.H.F. Radio-Telephony communication system was commissioned.

1963 : Control Room set-up was reorganised. Consequent to the Chinese aggression, the adminstrative control of the Brigade was temporarily assumed by the Government of Maharashtra.

1968 : The admninistrative control was returned to the Corporation. The Government of India declared 14th April (the day of Great Bombay Dock Explosion) as FIRE SERVICES DAY which is observed all over the country every year.

1971 : Five Sub-Divisions, comprising the area of different fire stations were created.

1979 : A separate Emblem for the Brigade was approved and adopted.

1980 : Colours of the Brigade were presented at the hands of the Governor of Maharashtra.

1981 : A Welfare Centre was established at the Fire Brigade Head Quarters.

1983 : A turn table ladder of 50 meters (165 feet), the tallest ladder in the country for fire-fighting was commissioned.

1987 : Brigade celebrates 100 years of service under the control of the Municipal Corporation.

1988 : A separate Administrative office for Suburban was established at Marol Fire Station.

1991 : Historical 24 hours continous duty System was changed over to 8 hours shift duty system for staff members only (1.4.1991 to 1.1.1993 in phases). Officers continue to work in erstwhile duty system.

Special type water Tankers of 16 K.L. capacity were commissioned.

1993 : Aerial Ladder Platform for fire fighting and rescue was commissioned. A hydraulic platform of 60 meters height was also commissioned.

1998 : A separate section for periodical inspection of High Rise buildings is created.

THOSE WHO DIED AT THE ALTAR OF DUTY

MUMBAI FIRE BRIGADE

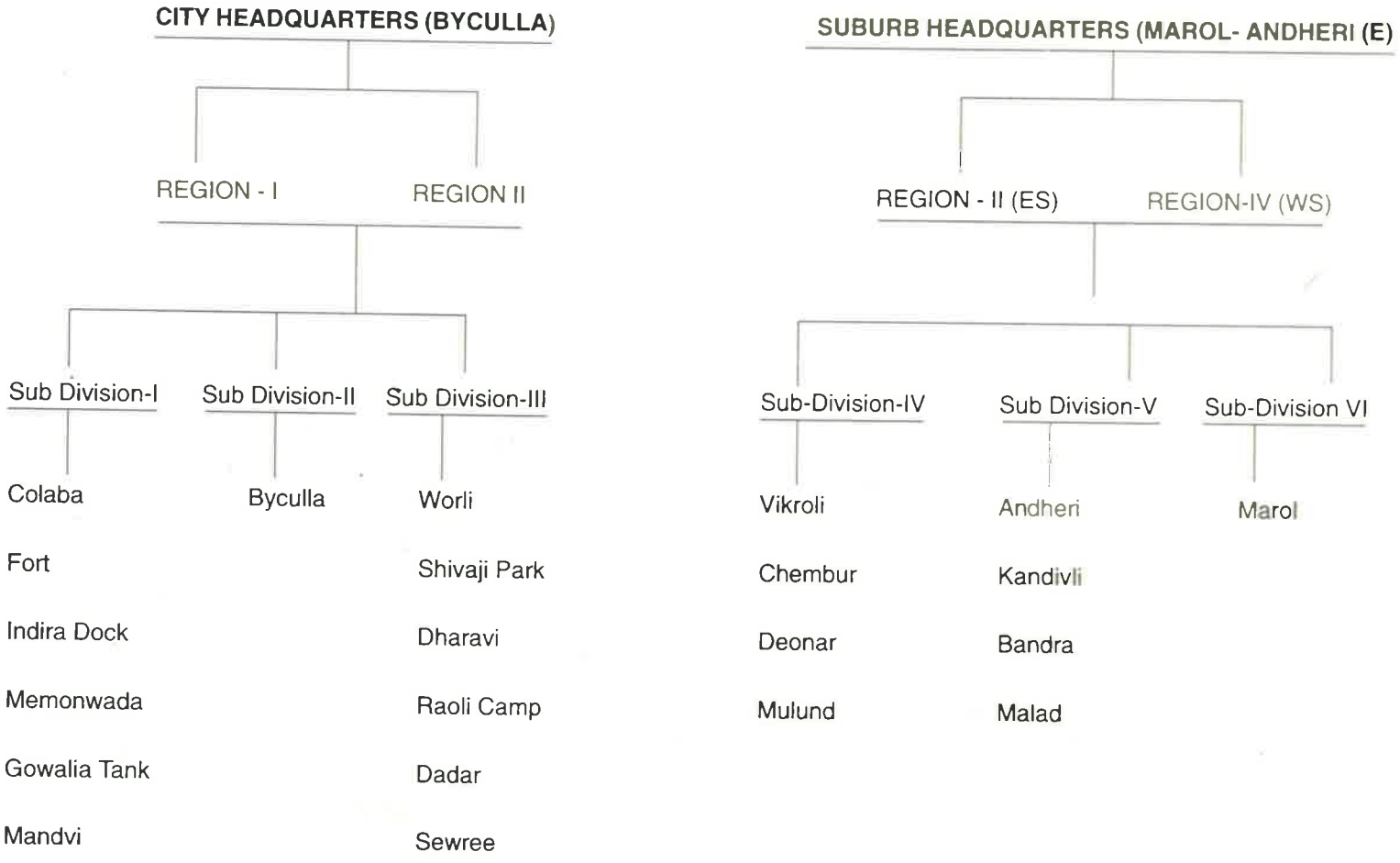
The 66 officers and men of the Brigade, who sacrificed their lives at the altar of duty while fighting the conflagrations of Dock Explosions (1944), have created a saga of sacrifice. These selfless sacrifices have become an inalienable part of the history of this Brigade and this Metropolis. Subsequently there have also been many instances of supreme sacrifices, which are listed below:

1.	Narayan Ramchandra Kawle, Fireman	15-12-1953	While performing Annual Fire Drill Competition.
2.	Shankar Kashiram Shinde Fireman	27-3-1963	While rescuing a drowned person at Juhu Beach
3.	Pundalik Sakharam Sawant, Leading Fireman	4-4-1969	Consequent to the participation in the Fire fighting operations in a Textile Mill.
4.	Suresh Ramchandra Parab Fireman	15-5-1970	While returning from Bhiwandi after fire fighting operations communal riots
5.	Rajaram Krishna Sawant Fireman	23-6-1971	While carrying out rescue operations at a house collapse incident at Nagdevi Street
6.	Arjun Mahadeo Bhosale Leading Fireman	15-1-1972	While fighting a fire in a High-rise building at Backbay Reclamation
7.	Shivaji Anand Pawar Fireman	15-1-1972	
8.	Harischandra Balkrishna Sawant	15-1-1972	
9.	Prabhakar Vishnu Bane Fireman	15-1-1972	
10.	Jairam Soma Pachkude Fireman	19-6-1979	Thrown away from a fire engine while responding to fire call,

11.	Nandkumar Vishnu Chitnis Dy. Chief Fire Officer	16-10-1980	While fighting a fire in an Industrial estate building, off Dr. E. Moses Road, Worli.
12.	Balaram Pandurang Chavan Station Officer	21-6-1981	During cooling down operations of a fire at Dontad Street, due
to			
13.	Suresh Angulya Vartak Fireman	21-6-1981	sudden collapse of a portion of the fire-ravaged building
14.	Sawlaram Dnandeo Rane Fireman	21-6-1981	as above
15.	Dinkar Rajaram Chavan Driver Operator	6-3-1983	In an accident of a fire engine while proceeding to perform Fire Drill Competition
16.	Harishchandra Daji Bhogle, Fireman	12-4-1983	While fighting a fire in Cutlery Market, Janjikar Street.
17.	Chandrakant Baburao Shinde Fireman	12-4-1983	
18.	Mayaram Eknath Pandhre	18-11-1998	While proceeding to Fire call in an accident of Arial Ladder platform

MUMBAI FIRE BRIGADE

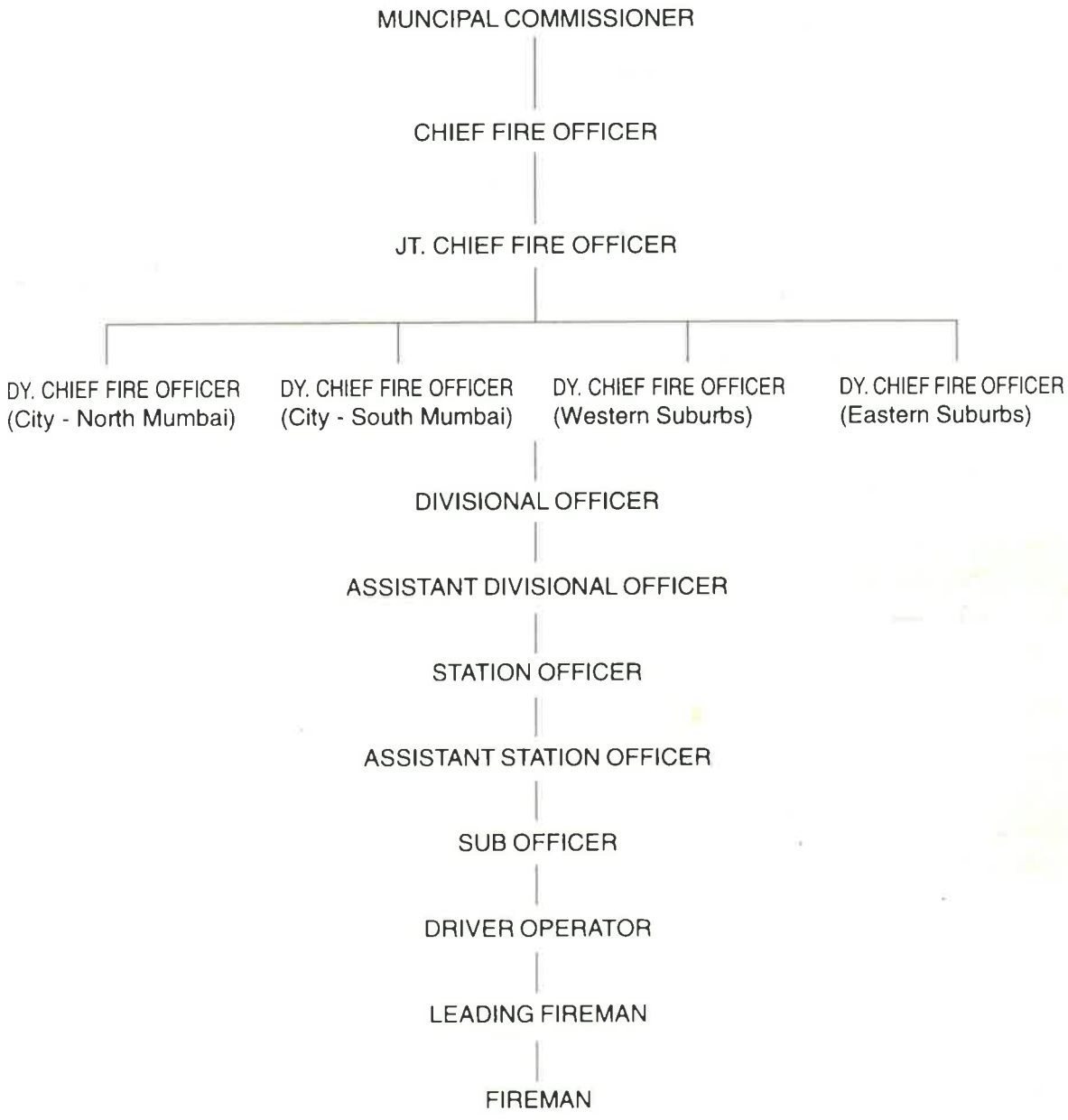
ADMINSTRATIVE SET-UP



MUNICIPAL CORPORATION OF GREATER MUMBAI

(Mumbai Fire Brigade)

ORGANIZATIONAL SET-UP OF MUMBAI FIRE BRIGADE



MUNICIPAL CORPORATION OF GREATER MUMBAI
MUMBAI FIRE BRIGADE

Chief Fire Officers

SR. NO.	NAME	PERIOD OF TENURE FROM	TO
1.	SHRI W. NICHOLS	1890	1911
2.	SHRI T.C. GREENOP	1911	1930
3.	SHRI N.COOMBS	1930	1948
4.	SHRI M.G. PRADHAN	1948	1955
5.	SHRI. S.G. VENGSARKAR	1955	1960
6.	SHRI. A.K.Y. SIDDIKI	1960	—
7.	SHRI. SYED MEHMUDSHAH	1961	—
8.	SHRI. S.G. VENGSARKAR	1961	1965
9.	SHRI. S. FREDILIS	1965	1972
10.	SHRI A.S. KULKARNI	1972	1977
11.	SHRI. G.S. SALVI	1977	1978
12.	SHRL. L.S.D. MEHERVANJEE	1978	1983
13.	SHRI. V.B. NIKAM	1983	1987
14.	SHRI. V.V. VAIDYA	1987	1988
15.	SHRI. N.A. KHATIB	1988	1989
16.	SHRI D.J. KULKARNI	1989	1996
17.	SHRI V.V. RAO	1997	

LIST OF FIRE STATIONS IN GR. MUMBAI WITH ADDRESS & TELEPHONE NOS.

SR. NO.	LOCALITY	ADDRESS & TEL. NO.
1)	**COLABA FIRE STATION**	Jn. of Shahid Bhagatsing Marg & Narayan A. Sawant Marg, Colaba, Mumbai - 400 005. Tel. : 204 3603
2)	**FORT FIRE STATION**	Rustam Sidhwa Marg, Fort, Mumbai - 400 001. Tel. : 261 1942
3)	**MEMONWADA FIRE STATION**	Jn. of Sardar Vallabhbhai Patel Marg & Memonwada Marg, Mumbai - 400 003 Tel. : 373 8818
4)	**GOWALIA TANK FIRE STATION**	Nana Chowk, August Kranti Maidan Mumbai - 400 007. Tel. : 380 6001
5)	**BYCULLA FIRE STATION**	Jn. of Bapurao Jagtap Marg & Shaikh Hafijuddin Marg, Byculla, Mumbai - 400 008. Tel. : 307 6111
6)	**WORLI FIRE STATION**	Jn. of Dr. Annie Besant Marg & Nariman Marg, Worli, Mumbai - 25. Tel No. 430 0178.
7)	**DADAR FIRE STATION**	Jn. of Babasaheb Ambedkar Marg & Mumbai Marathi Granth Sangralaya Marg, Mumbai - 400 014. Tel : 413 4200
8)	**SHIVAJI PARK FIRE STATION**	Prakash Kotnis Marg, Mahim, Mumbai - 400 016 Tel : 445 7203

SR. NO.	LOCALITY	ADDRESS & TEL. NO.
9)	**INDIRA DOCK FIRE STATION**	P.D.'Mello Marg, Karnak Bunder, Mumbai - 400 038 Tel : 261 1589
10)	**MANDAVI FIRE STATION**	Sardar Vallabhbhai Patel Marg, Vadi Bunder, Mumbai - 400 009. Tel : 371 6694
11)	**SEWREE FIRE STATION**	Barrister Nath Pai Marg, Near Cotton Green Railway Stn., Mumbai - 400 033 Tel : 377 5756
12)	**ANDHERI FIRE STATION**	Swami Vivekanand Marg, Irla Bridge, Tata Compound, Andheri (W), Mumbai - 400 058. Tel. : 620 5301
13)	**VIKROLI FIRE STATION**	Vikroli Park Site, Lal Bahadur Shastri Marg, Vokroli (W), Mumbai - 400 079 Tel.: 517 0730
14)	**CHEMBUR FIRE STATION**	Vithal Naryan Purav Marg, Chembur Naka, Near Vijay Talkies, Chembur, Mumbai - 400 071 Tel. : 522 4824
15)	**DHARAVI FIRE STATION**	12/E, Rajarshi Shahu Nagar, Dharavi Mumbai - 400 017. Tel. : 407 7868
16)	**DEONAR FIRE STATION**	5/4, Sector, New Municipal Colony, Gowandi, Deonar, Mumbai - 400 043. Tel. : 556 3391.

SR. NO.	LOCALITY	ADDRESS & TEL. NO.
17)	**MULUND FIRE STATION**	Jn. of Lal Bahadur Shastri Marg & Devi Dayal Marg, Mulund (W), Mumbai - 400 080 Tel : 538 7637
18)	**RAWLI CAMP FIRE STATION**	Bldg. No. 3, Sector - 'C' Sardar Nagar No. 4, Dr. Mukundrao Ambedkar Marg, Mumbai - 400 037. Tel. : 407 7841
19)	**KANDIVLI FIRE STATION**	Jn. of Swami Vivekanand Marg & Kamla Nehru Marg, Kandivli (W), Mumbai - 400 067. Tel. : 805 0101
20)	**MAROL FIRE STATION**	Jn. of Mathurdas Vasanji Marg & Marol Maroshi Road Andheri (E), Mumbai - 400 069. Tel : 821 0940 / 821 0941
21)	**MALAD FIRE STATION**	Chunilal Girdharlal Marg, Opp. Malvani Gate No. 1, Malad (W), Mumbai - 400 095 Tel: 807 1010
22)	**BANDRA FIRE STATION**	Near Bandra Reclamation Bandra (W), Mumbai - 400 050 Tel : 643 5206
23)	**NARIMAN POINT FIRE STATION**	Jagannathrao Bhosle Marg, Nariman Point, Near Sarang Bldg., Mumbai - 400 038 Tel : 288 2787

STATEMENT SHOWING THE DETAILS OF SPECIAL FIRE-FIGHTING AND RESCUE APPLIANCES. USED FOR HIGH-RISE BUILDINGS AVAILABLE WITH MUMBAI FIRE BRIGADE.

TYPES OF VEHICLE

Description	Hydraulic Platform			Aerial Ladder Platform		Turn Table Ladder		
	SCA 160 16 mtrs.	SS 300 30 mtrs.	SS 600 60 mtrs.	F 42 HDT 40 mtrs.	F 32 HDT 30 mtrs.	D L 30 30 mtrs.	D L 37 37 mtrs.	D L 50 50 mtrs.
Travelling length	9.27 mtrs.	13.48 mtrs.	12.00 mtrs.	11.7 mtrs.	10.00 mtrs.	9.45 mtrs.	9.95 mtrs.	11.40 mtrs.
Travelling width	2.49 mtrs.	2.44 mtrs	2.5 mtrs.	2.5 mtrs.	2.5 mtrs.	2.5 mtrs.	2.5 mtrs.	2.5 mtrs.
Travelling height	3.53 mtrs.	3.43 mtrs.	3.85 mtrs.	3.90 mtrs.	3.60 mtrs.	3.20 mtrs.	3.40 mtrs.	3.70 mtrs.
Width with Jacks extended	3.19 mtrs.	4.24 mtrs.	6.50 mtrs.	5.50 mtrs.	5.50 mtrs.	3.65 mtrs.	3.65 mtrs.	4.50 mtrs.
Cage floor height	16.00 mtrs.	30.00 mtrs.	60.00 mtrs.	40.00 mtrs.	30.00 mtrs.	30.00 mtrs.	37.00 mtrs.	50.00 mtrs.
Safe working loading in cage	340 kgs.	365 kgs.	400 kgs.	400 kgs.	400 kgs.	180 kgs.	180 kgs.	180 kgs.
Out reach maximum	9.00 mtrs.	15.75 mtrs.	22.00 mtrs.	19.50 mtrs	20.00 mtrs	27.00 mtrs	12.00 mtrs	17.00 mtrs.
Levelling capability	5°	5°	7.5°	9°	9°	7°	7°	6°
Max. Jack Plate pressure	9.41 kg/cm²	9.41 kg/cm²	8.85 kg/cm²	8.9 kg/cm²	8.9 kg/cm²	Not available	Not available	Not available
Turning circle dia	18 mtrs.	23 mtrs.	27 mtrs.	25 mtrs.	27 mtrs.	16 mtrs.	17.8 mtrs.	22 mtrs.
GVW of vehicles	13 tonnes	16.26 Tons	42.00 Tons	27.00 Tons	22.00 Tons	13.00 Tons	17.50 Tons	26.00 Tons

MUMBAI FIRE BRIGADE

LIST OF FIRE BRIGADE VEHICLES / APPLIANCES / PUMPS ETC.

Sr. No.	Type of Vehicle / Appliance	Nos.	Make	Models
1.	Fire Engines	50	Tata	1210, 1612
2.	Water Tankers 10 KL	4	Ashok Leyland	Comet
3.	Water Tankers 16 KL	16	Ashok Leyland	Hippo
4.	Turn-Table-Ladders	4	Magirus	DL30, DL37, DL50
5.	Hydraulic Platform; (–) 60 mtr	1	Scania Simon	P118 EL, 8 x 4 SS 600
6.	Hydraulic Platforms; (–) 30 mtr	2	British Leyland Simon	Super Mastiff, SS 300
			Ashok Leyland Simon	Hippo Haulage
7.	Hydraulic Platforms; (–) 16 mtr	4	Tata Simon	1516 / SCA 160
8.	Aerial Ladder Platforms; (–) 40 mtr.	3	Iveco Bronto Skylift	330 - 30 H F42 HDT
			Mercedes Benz, Bronto Skylift	2631/F 42 HDT 2000
			Ashok Leyland Bronto Skylift	Taurus 2516 F32 HDT 200
9.	Rescue Tenders	3	Magirus Tata	F6L413 RW2/1020SE RW1

Continue.....

Sr. No.	Type of Vehicle / Appliance	Nos.	Make	Models
10.	B.A. Vans	3	Tata	1210 E
11.	Control Post Van.	1	Tata	1210 E
12.	Ambulances	15	M&M Matador Isuzu	FJ460DP/ F307 WFR
13.	Hose Laying Lorries	3	Tata	608
14.	DCP-Cum-Foam Tenders	2	Tata	1616
15.	Cars	7	Ambassador	Mark IV/ Nova (Petrol & Diesel)
16.	Jeeps	23	M & M	MM 540 DP
17.	Mini Buses	2	Tata/ Allwyn Nishan	407 Cabstar
18.	Motor Lorries	2	Tata	1210
19.	Break Down Van	1	Ashok Leyland	3516
20.	Delivery Van	1	Tata	407
21.	High Pressure Pump Vans	3	M & M	FJ 460 DP
22.	Light Portable Pumps	35	Firex Kirloskar Tohatsu	 KPF 1600 V 75 DSM
23.	Portable High Pressure Pumps	14	Zeigler Magirus Rosenbaner	TS 8/8 — —
24.	Trailer Pumps	4	Autolog.	—

MUMBAI FIRE BRIGADE

LIST OF FIRE BREATHING APPARATUS SETS AND OTHER RESCUE EQUIPMENTS

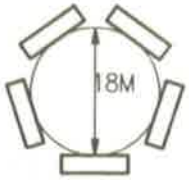
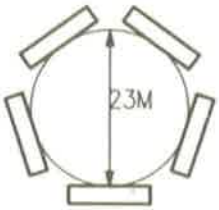
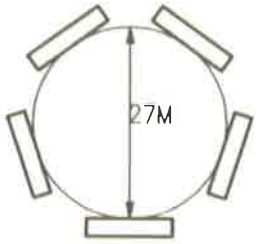
Sr. No.	Type of Vehicle / Appliance	Nos.	Make	Models
1.	Breathing Appartaus Sets	3	Drager	DA 58
		50	Drager	A 100
		30	Drager	A 100 X
		150	Drager	PA80P
		50	Drager	PA80A
		20	Drager	PA80 Quick P
		40	Drager	PA90
		110	Drager	PA94 Plus
		12	Drager	Savermark
2.	Hydraulic Rescue tools i.e. spreader, cutter, Ram and Power Packs	154	Lukas	—
3.	Electric Chain Saw Machines	25	Sharpex	—
		12	Jhonsord	2016 EL
4.	Electric Concrete / Steel cutter	8	Sharpex	—
5.	Jumping Sheet			
	a) Air cushion type	1	—	—
	b) Canvas Type	25	—	—
6.	Aluminised Fire proximity suit	6	—	—
7.	Chemical Protection Suit	100	—	—
8.	Self Rescue Gears			
	a) Saumatic Rescue Decent controller	3	Protecta	AG 432 - 32
	b) Working Seat System	31	Protecta	AH 600
	c) Fall Arrester System	3	Protecta	AD225/SI
	d) Cobra Fall Protection system	3	Protecta	AC 202/01
9.	Davy Safety Line - 30 mtrs	2	—	—
10.	Portable Generator 2 KVA	3	Birla Yamaha	AC2000

FIRE FIGHTING REQUIREMENTS

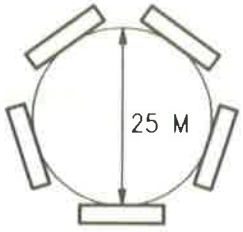
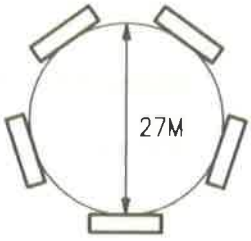
FIRE FIGHTING EQUIPMENTS FOR HIGH RISE BUILDINGS

TURNING CIRCLE DIAMETER OF FIRE FIGHTING VEHICLES

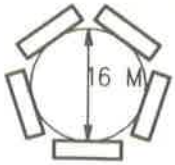
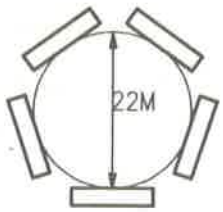
I HYDRAULIC PLATFORM

DESCRIPTION	SC160 16M	SC300 30M	SC600 60M
			
VEHICLE SIZE	9.27Mx2.49Mx3.53M	13.48Mx2.44Mx3.43M	12.0Mx2.5Mx3.85M

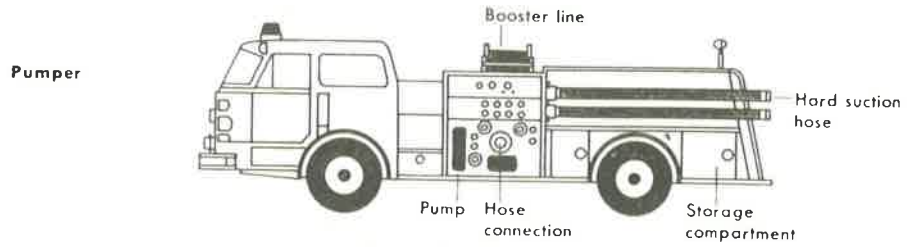
II AERIAL LADDER PLATFORM

DESCRIPTION	F 42 H D T 40M	F 32 H D T 30M
		
VEHICLE SIZE	11.7Mx2.5Mx3.9M	10.00Mx2.5Mx3.60M

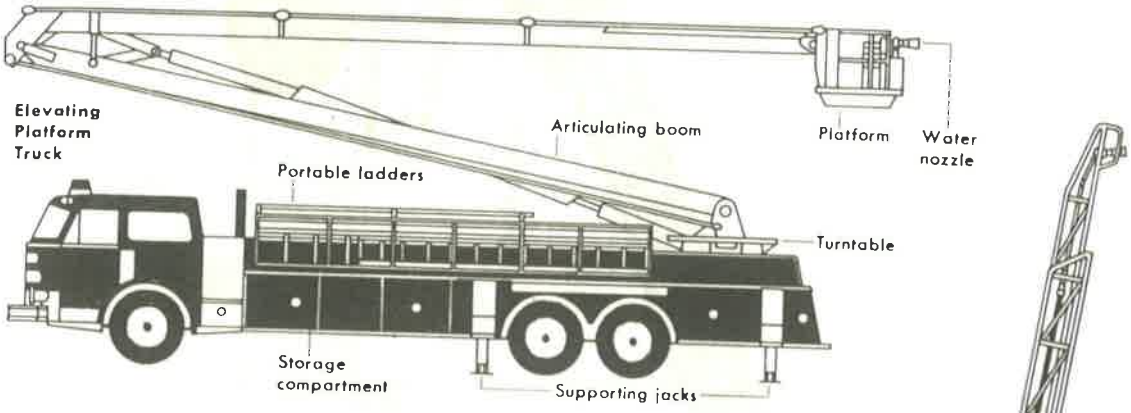
III TURN TABLE PLATFORM

DESCRIPTION	D L 30 30 M	D L 37 37 M	D L 50 50 M
			
VEHICLE SIZE	9.45Mx2.5Mx3.6M	9.95Mx2.50Mx3.40M	11.40Mx2.5Mx3.70M

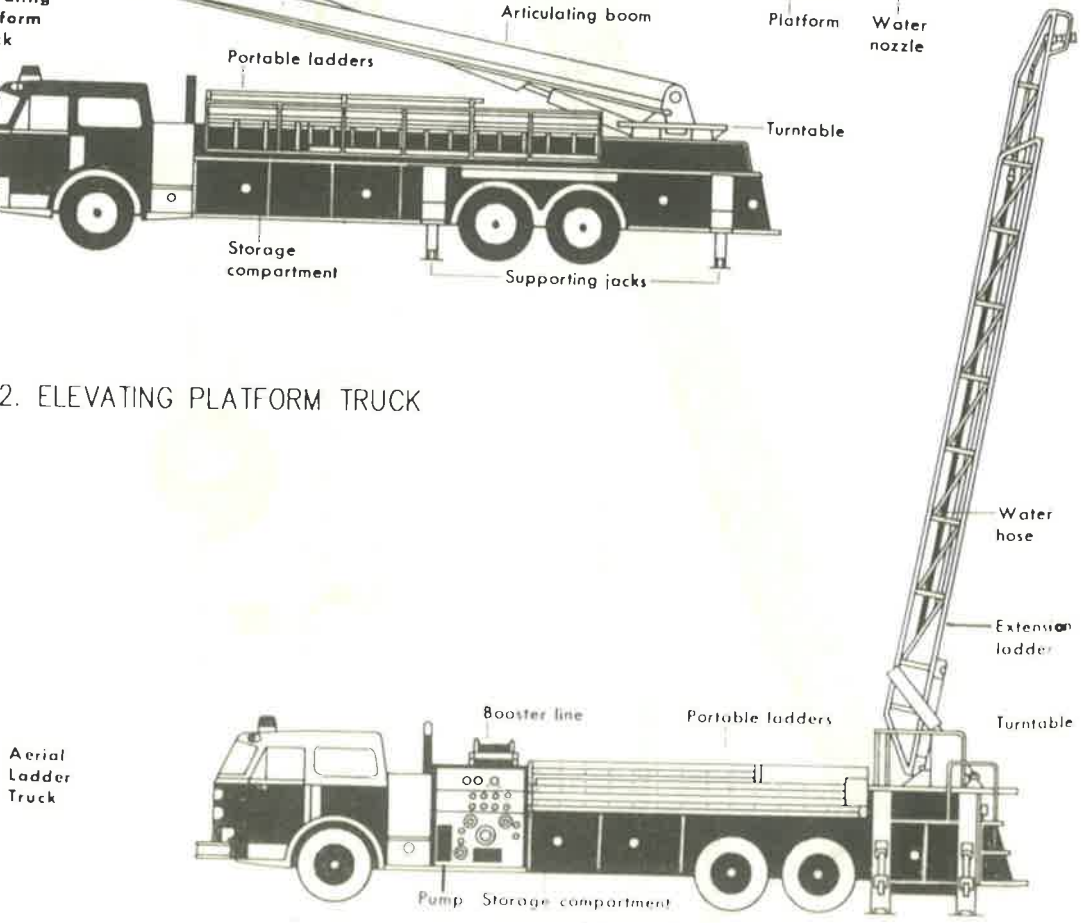
TYPES OF FIRE TRUCKS FOR FIRE FIGHTING



1. PUMPER



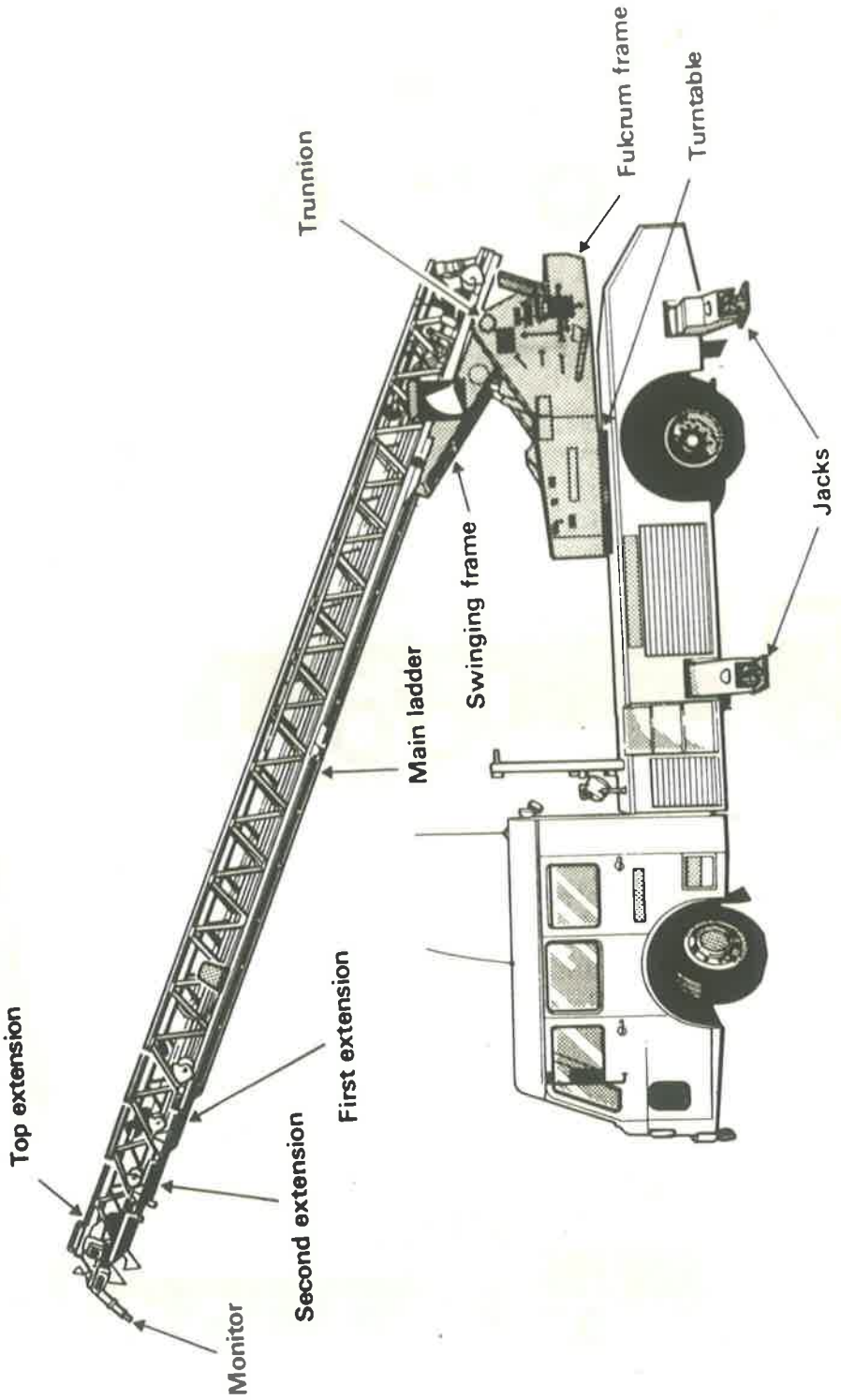
2. ELEVATING PLATFORM TRUCK



3. TURNTABLE LADDER

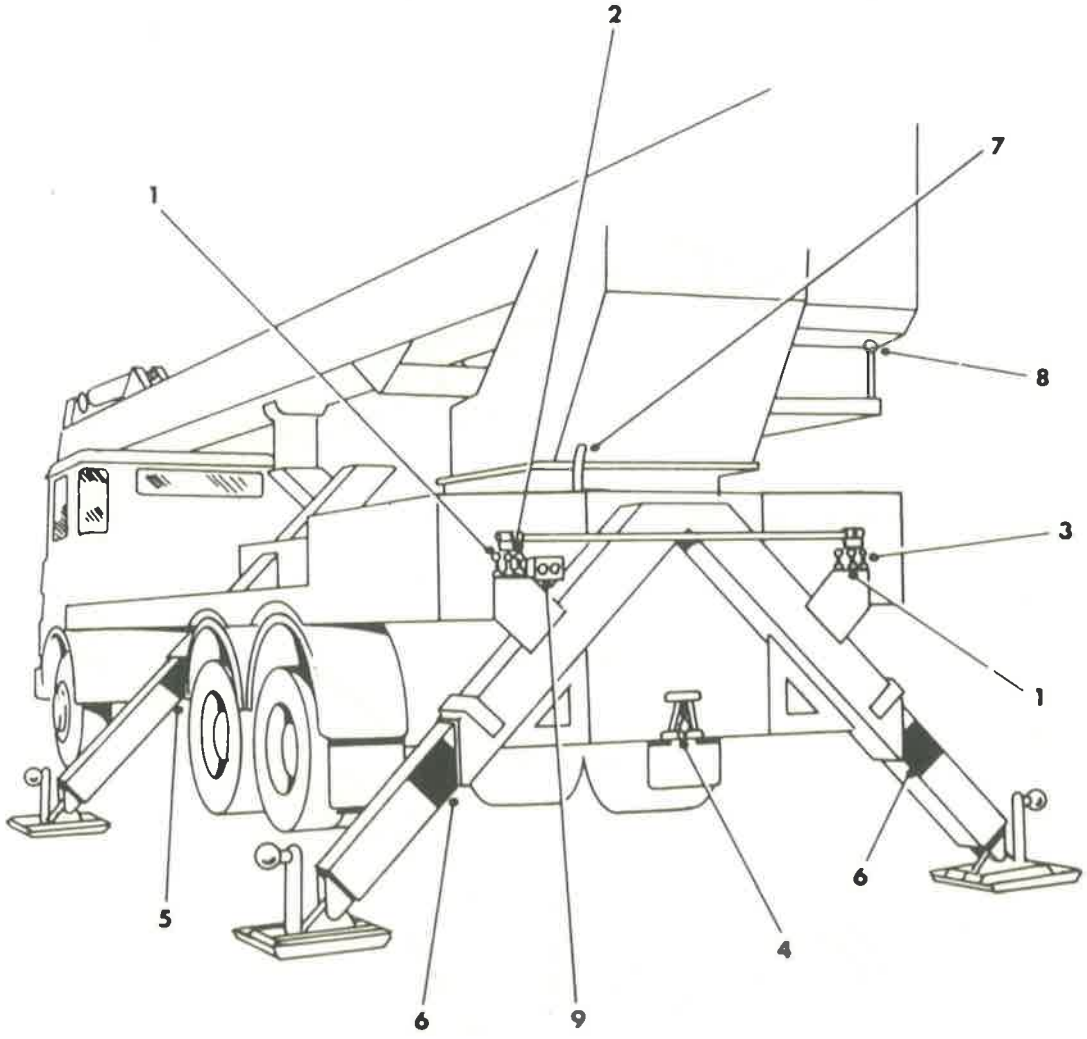
BHAL:DCR

PRINCIPAL FEATURES OF A TURNTABLE LADDER



BHAL: DCR

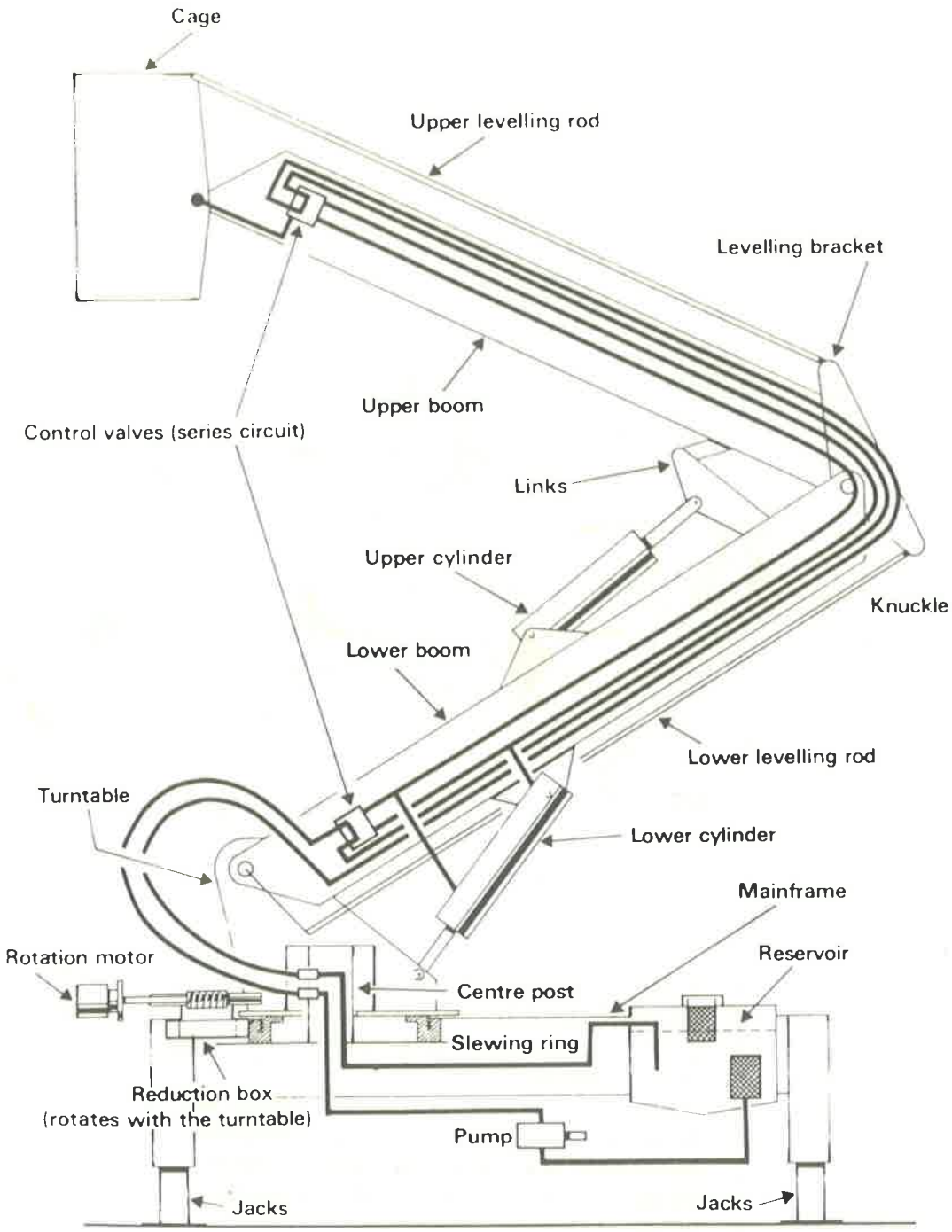
GENERAL SKETCH OF SIMON HYRDAULIC PLATFORM



1 Selector valve
2 Control valve for left hand jacks
3 Control valve for right hand jacks
4 Level indicator
5 Front jack spread indicating diamonds
6 Rear jack spread indicating diamonds
7 Turntable stowage position indicator
8 Power system ''energised'' indicator light
9 Filter indicator

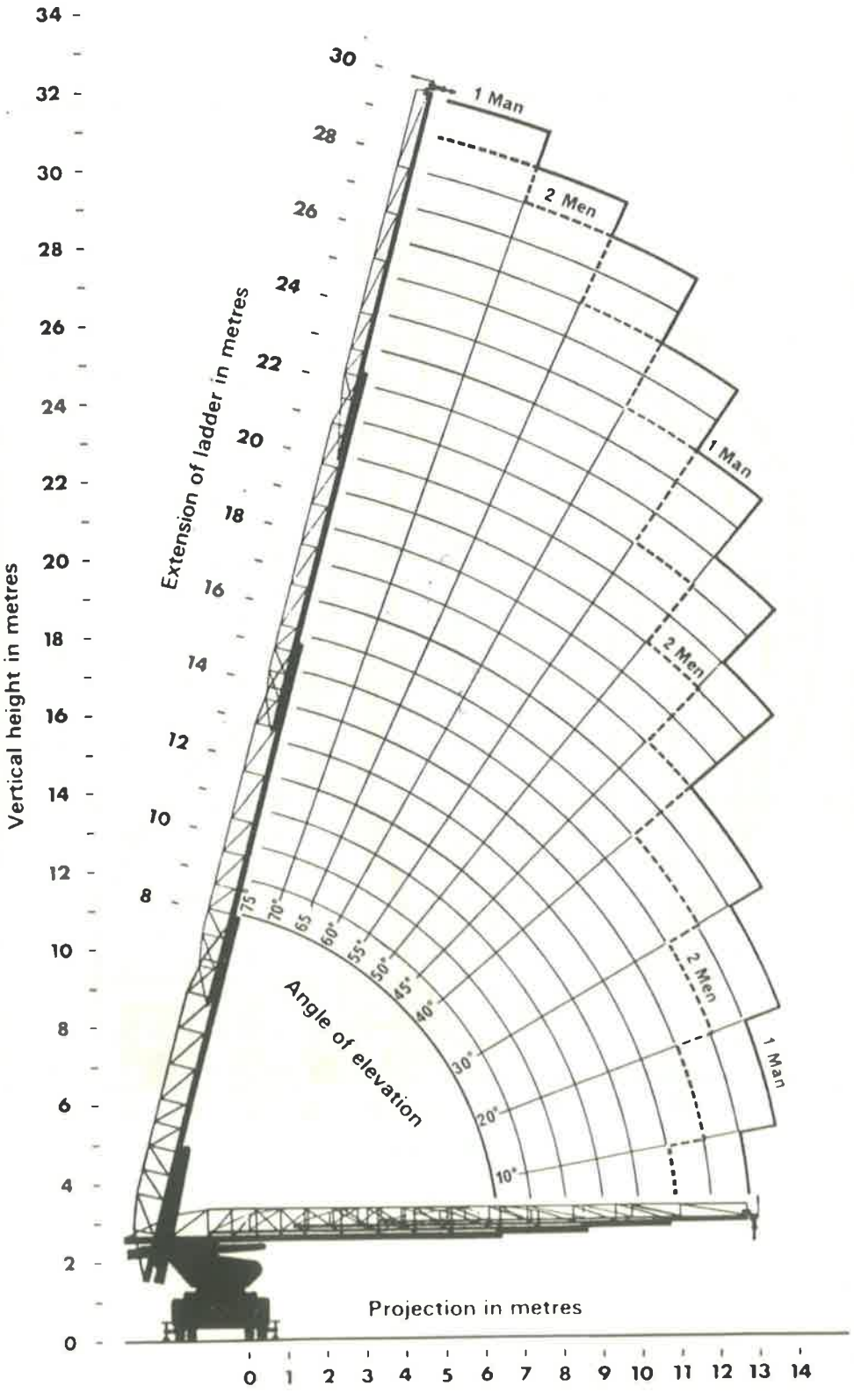
BHAL: DGR

GENERAL DIAGRAMMATIC SKETCH OF PARTS OF A HYDRAULIC PLATFORM



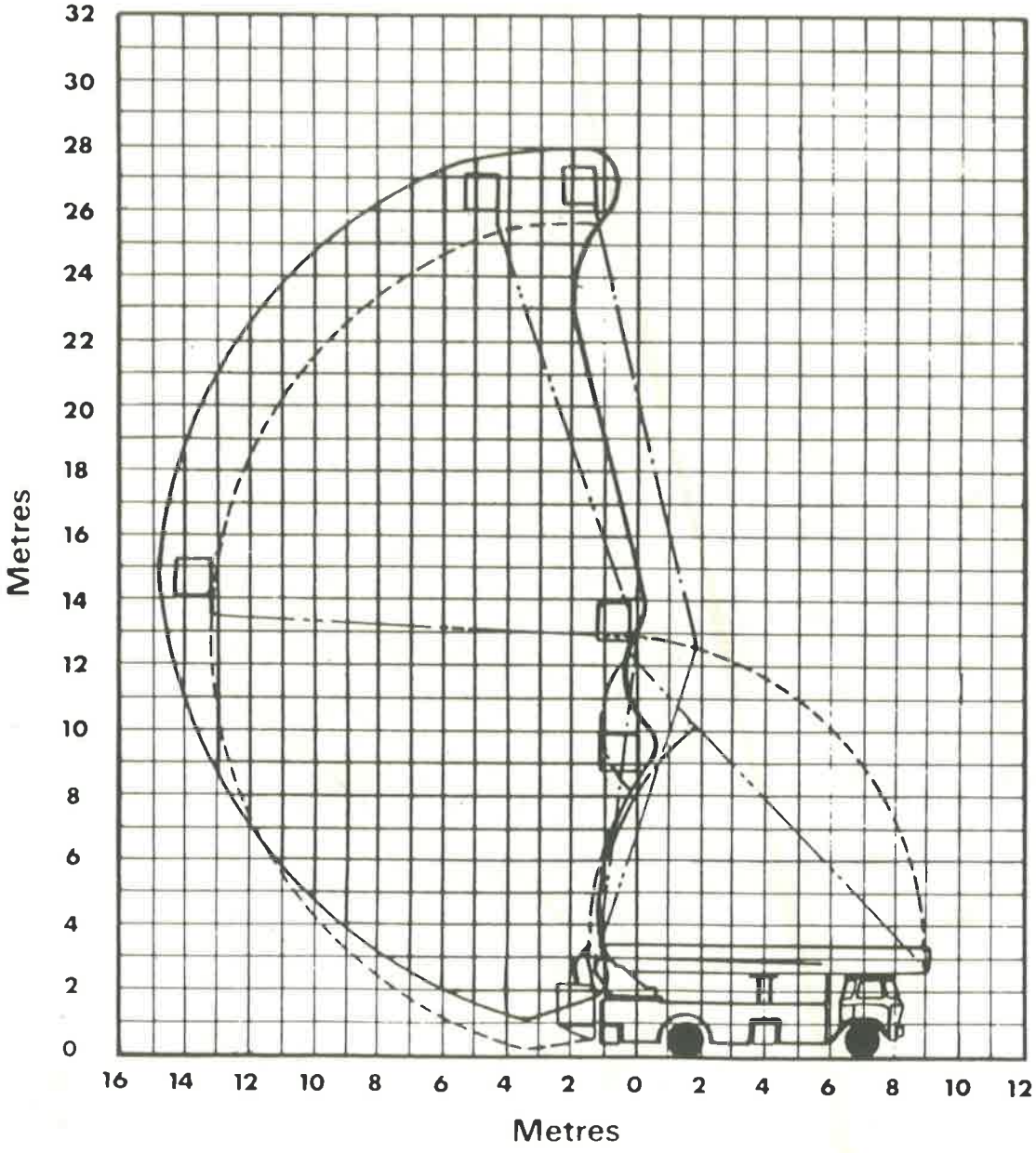
BHAL:DCR

OPERATIONAL RANGE OF A TURNTABLE LADDER



BHAL: DCR

OPERATIONAL RANGE OF HYDRAULIC PLATFORM



MUNICIPAL FIRE BRIGADE

(EXTRACT FROM BOMBAY MUNICIPAL CORPORATION ACT - 1888, CHAPTER - XIV)

Maintenance of firemen and of necessary fire engines, etc.

359

1) With a view to the discharge by the corporation of the duty of extinguishing fire and protecting life and property in case of fire, the Commissioner shall provide, in the schedule of municipal officers and servants from time to time prepared by him under section 79, for a force of firemen, with a proper number of officers over them to be called "the municipal fire-brigade", and shall furnish the said brigade with all such fire-engines, fire-escapes, horses, account rements, tools, implements and means of inter-communication as may be necessary for the efficient discharge of their duties.

2) A person may be appointed to be a member of the fire-brigade in addition to any other office or employment of such person.

Power to make regulations for fire-brigade

360

The Commission shall from time to time make regulations for

a) the training, discipline and good conduct of the men belonging to the fire-brigade.

b) their speedy attendance with engines, fire-escapes and all necessary implements on the occasion of any alarm of fire.

c) the maintenance of the said brigade generally in a due state of efficiency.

Powers of Chief Officer of Fire-brigade at a fire

361

1. On the occasion of a fire the chief or other officer in charge of the fire-brigade may, subject to such orders as the Commissioner may from time to time issue in this behalf, take the command of all municipal officers and servants present and of any other persons who voluntarily place their services at his disposal; and may —

a) remove, or order any fireman or other officer or person under his command to remove any persons who interfere by their presence with the operations of the fire-brigade;

b) take generally any measures that appear expedient for the protection of life and property, with power, by himself or by the persons under his command, to break into or through or take possession of, or pull down any premises for the purpose of putting an end to such fire, doing as little damage as possible;

c) cause the water to be shut off from the mains and pipes of any district in order to give a greater supply and pressure of water in the district in which the fire has occurred and utilize the water of any well or tank available for the purpose of extinguishing such fire.

2) The power conferred by clause (b) of sub-section (i) above shall include a power to enter on any vessel within the dock area of the port of Bombay.

Police and municipal officers and servants to aid the fire-brigade

362
It shall be the duty of all police officers and of all municipal officers and servants to aid the fire-brigade in the execution of their duties. They may close any street in or near which a fire is burning and remove any persons who interfere by their presence with the operations of the fire-brigade.

Damages done by fire-brigade to be deemed damaged by fire

363
Any damage occasioned by the fire-brigade in the due execution of their duties, or by any police or municipal officer or servant who aid the fire-brigade, shall be deemed to be damage by fire within the meaning of any policy of insurance against fire.

Reports of fires to be submitted

364
A report of every fire which occurs in the city shall be submitted by the chief or other officer in charge of the fire-brigade, not later than the day, following the fire, to the Commissioner, who shall make such further inquiry, if any, as he may deem necessary and shall furnish a weekly return of all fires which occur in the city to the standing committee.

DEFINITIONS OF TERMS AND EXPRESSIONS

(Ref. D.C.R. - 1991 & N.B.C. PART-IV)

1) Automatic Fire Detection and Alarm System :

Fire alarm system comprising components for automatically detecting a fire, initiating an alarm of fire and other actions as appropriate.

Note :- The system may also include manual fire alarm call.

2) Air-conditioning :

Means the process of treating air to control simultaneously its temperature, humidity, cleanliness and distribution to meet the requirements of an enclosed space.

3) Automatic sprinkle system :

Means an arrangement of pipes and sprinklers, automatically operated by heat and discharging water on fire, simultaneously setting an audible alarm.

4) Balcony :

Means a horizontal projection, including a parapet, hand-rail balustrade, to serve as a passage or sitting out place.

5) Basement or cellar :

Means the lower storey of a building below, or partly below ground level.

6) Buildings :

a) Assembly Building : Means a building or part thereof where groups of people congregate or gather for amusement, recreation, social, religious, patriotic, civil, travel and similar purposes. "Assembly buildings" include buildings of drama and cinema theatres, drive-in-theatres, assembly halls, city halls, town halls, auditoria, exhibition halls, museums, "mangal karyalayas," skating rinks, gymnasia, stadia, restaurants, eating or boarding houses, places of worship, dance halls, clubs, gymkhanas, road, air, sea or other public transportation stations, and recreation piers.

b) Hazardous building :
means building or part thereof used for –

(i) storage, handling manufacture or processing or processing of Radioactive substances or of highly combustible or explosive materials or products which are liable to burn with extreme rapidity and/or producing poisonous fumes or explosive emanations;

(ii) storage, handling, manufacture or processing of which involves highly corrosive, toxic or noxious alkalis, acids or other liquids, gases or chemical producing flames, fumes and explosive mixtures or which result in division of matter into fine particles capable of spontaneous ignition.

(c) "Industrial building" means a building or part thereof wherein products or material are fabricated, assembled or processed, such as assembly plants, laboratories, power plants, refineries, gas plants, mills, dairies and factories.

(d) "Mercantile building" means a building or part thereof used as shops, stores or markets for display and sale of wholesale or retail goods or merchandise, including office, storage and service facilities incidental thereto located in the same building.

(e) "Multi-storeyed building" or "High-rise-building" means a building of a height of 24 meters or more above the average surrounding ground level.

(f) "Office building" (premises), means a building or premises or part thereof whose sole or principal use is for an office or for office purposes or clerical work. "Office purposes" includes the purpose of administration, clerical work, handling money, telephone, telegraph and computer operation; and "clerical work" includes writing, book-keeping, sorting papers, typing, filing, duplicating, punching cards or tapes, machine calculations, drawing of matter for publication and editorial preparation of matter for publication.

(g) "Special building" means –

(i) a building solely used for the purpose of a drama or cinema theatre, a drive-in-theatre, an assembly hall or auditorium, an exhibition hall, theatre museum, a stadium, a "mangal karyalaya" or where the built-up area of such a user exceeds 600 sq.m. in the case of mixed occupancies;

(ii) an industrial building;

(iii) a hazardous building;

(iv) a building of a wholesale establishment;

(v) a residential hotel building or centrally air-conditioned building which exceeds:-

(a) 15 m. in height or

(b) a total built-up are of 600 sq. m.

(h) "Storage building" means a building or part thereof used primarily for storage or shelter of goods, wares, merchanidse and includes a building used as a warehouse, cold storage, freight depot, transit shed, store house, public garage, hangar, truck terminal, grain elevator, barn and stable.

(i) "Unsafe building" means a building which –

(i) is structurally unsafe,

(ii) is insanitary,

(iii) is not provided with adequate mean of egress,

(iv) constitutes a fire hazard,

(v) is dangerous to human life,

(vi) in relation to its existing use, constitutes a hazard to safety or health or public welfare by reasons of inadequate maintenance, dilapidation or abandonment.

7) Combustible material:

Means that material which when burnt adds heat to a fire when tested for combustibility in accordance with the IS:3808-1966 Method of Test for Combustibility of Building Materials, National Building Code.

8) Corridor:

Means a common passage or circulation space including a common entrance hall.

9) Courtyard:

Means a space permanently open to the sky within the site around a structure and paved/concreted.

10) Downcomer :

Means a arrangement of fire fighting within the building by means of downcomer pipe connected to terrace tank through terrace pump, gate valve and non-return valve and having mains not less than 100 mm internal

diameter, with, landing valves on each floor/landing. It is also fitted with inlet connections at ground level for charging with water by pumping from fire service appliances and air release valve at roof level to release trapped air inside.

11) Dry Riser :

Means a arrangement of fire fighting within the building by means of vertical rising mains not less than 100 mm internal diameter with landing valves on each floor/landing which is normally dry but is capable of being charged with water usually by pumping from fire service appliances.

12) Draught lobby :

Means a lobby on entrance at floor level connected to a corridor on one side and to the open air on the other.

13) Enclosed staircase:

Means a staircase separated by fire resistant walls and doors from the rest of the building.

14) Escape route:

Means any well ventilated corridor, staircase or other circulation space, or any combination of the same, by means of which a safe place in the open air at ground level can be reached.

15) Exit:

Means a passage, channel or means of egress from any building, storey or floor area to a street or other open space of safety; horizontal, outside and vertical exits having meanings at (i), (ii) and (iii) respectively as under :–

(i) "Horizontal exit" means an exit which is a protected opening through or around a fire wall or a bridge connecting two or more buildings.

(ii) "Outside exit" means an exit from a building to a public way, to an open area leading to a public way or to an enclosed fire resistant passage leading to a public way.

(iii) "Vertical exit" means an exit used for ascending or descending between two or

more levels, including stairways, smoke-proof towers, ramps, escalators and fire escapes.

16) Fire and / or emergency alarm system:

Means an arrangement of call points or detectors, sounders and other equipment for the transmission and indication of alarm signals working automatically or manually in the case of fire or other emergency.

17) Fire Lift:

Means a special lift designed for the use of fire service personnel in the event of fire or other emergency.

18) Fire Proof Door: (F.R.D)

Means a door or shutter fitted to a wall opening, and constructed and erected with the requirement to check the transmission of heat and fire for a specified period.

19) Fire Pump :

Means a machine, driven by external power for transmitting energy to fluids by coupling the pump to a suitable engine or motor, which may have varying outputs/ capacity but shall be capable of having a pressure of 3.2 kg / cm^2 at the topmost level of a multistoreyed or high rise building.

20) Booster Fire Pump:

Means a mechanical/electrical device which boosts up the water pressure at the top level of a multistoreyed/high rise building and which is capable of a pressure of 3.2 kg / cm at the nearest point.

21) Fires Resistant:

Means the time during which a fire resistant material i.e. material having a certain degree of fire resistance, fulfils its function of contributing to the fire safety of a building when subjected to prescribed conditions of heat and load or restraint. The fire resistance test of structures shall be done in accordance with IS:3809-1966 Fire Resistance Test of Structure.

22) Fire Separation:

Means the distance in meters measured from any other building on the site or from

another site, or from the opposite side of a street or other public space to the building.

23) Fire service inlet:

Means a connection provided at the base of a building for pumping up water through in-built firefighting arrangements by fire service pumps in accordance with the recommendations of the Chief Fire Officer.

24) Fire Tower:

Means an enclosed staircase which can only be approached from the various floors through landings or lobbies separated from both the floor area and the staircase by fire-resisting doors and open to the outer air.

25) Hazardous material:

Means–

(i) radio active substances;

(ii) material which is highly combustible or explosive and/or which may produce poisonous fumes or explosive emanations, or storage, handling, processing or manufacturing of which may involve highly corrosive, toxic or noxious alkalis or acids or other liquids;

(iii) other liquids or chemicals producing flames, fumes, explosive, poisonous, irritant or corrosive gases or which may produce explosive mixtures of dust or fine particles capable of spontaneous ignition.

26) Height of a Building:

Means the vertical distance measured, in the case of flat roofs, from the average level of the ground around and contiguous to the building to the highest point of the building and, in the case of pitched roofs, upto the point where the external surface of the outer wall intersects the finished surface of the sloping roof, and, in the case of gables facing the road, the mind-point between the eaves level and the ridge.

27) Lift:

Means a mechanically guided car, platform or transport for persons and materials between two or more levels in a vertical or substantially vertical direction.

28) Loft:

Means an intermediate floor between two floors or a residual space in a pitched roof above normal level constructed for storage.

29) Mezzanine Floor:
Means an intermediate floor, not being a loft, between the floor and ceiling of any storey.

30) Pressurisation :
The establishment of a pressure difference accross a barrier to protect a stariway, lobby, escape route or room of a building from smoke penetration.

31) Pressurisation level :
The pressure difference between the presssurised space and the area served by the presssurised escape route.

32) Smoke-stop Door:
Means a door for preventing or checking the spread of smoke from one area to another.

33) Tower-like structure:
Means a structure in which the height of the tower-link portion is at least twice the width of the broader base.

34) Travel distance:
Means the distance from the remotest point on a floor of a building to a place of safety be it a vertical exit or an horizontal exit or an outside exit measured along the line of travel.

35) Ventilation :
Supply of outside air into, or the removal of inside air from an enclosed space.

36) Venting fire:
The process of inducing heat and smoke to leave a building as quickly as possible by such paths that lateral spread of fire and heat is checked, fire fighting operations are facilitated and minimum fire damage is caused.

37) Wet riser :
An arrangement for fire fighting within the building by means of vertical rising mains of not less than 100 mm internal diameter with landing valves on each floor / landing for fire fighting purposes and permanently charged with water from a pressurized supply.

REQUIREMENTS OF N.O.C. FROM CHIEF FIRE OFFICER

As per the provisions of D.C. Regulations 1991 (Rule 43) it is mandatory to obtain clearance/No objection Certificate from The Chief Fire Officer - Mumbai Fire Brigade for High Rise And Special type of buildings which are listed as under :

1) High Rise Buildings :

   a) Having height 24 mtrs and above

2) Low-Rise Buildings :

   a) Industrial Estate Buildings
   a) Service Industrial Estate Buildings.
   b) Industrial (factory) Buildings.
   c) Storage Buildings.
   d) Warehouse Buildings
   e) Cinema / Theatres
   f) Shopping Centres
   g) Residential Hotel Buildings

PROCEDURE :

The N.O.C. / Clearance from the Chief Fire Officer is required for above referred buildings at two different stages i.e. before approval of plans and before issue of Occupation permission, in the following manner:-

STAGE - I (Pre - Construction / Commencement clearance / N.O.C.)

The architect has to submit application with three sets of complete drawings to the Chief fire officer - Mumbai fire Brigade, before approval of plans by building proposal dept.

After receipt of the proposal the Chief Fire officer will call concern architect for the discussion if proposal needs any corrections and/or additional informations. Once proposal is scrutinised The chief Fire officer will ask the Client/Applicant to pay the Capitation Fees as per the rates fixed by the Fire Department at the respective Headquarters, i.e.:-

For proposals is island city : 'E' Ward office, Municipal Corporation of Gr. Mumbai, Sankli Street, Byculla Mumbai 400 008. 2) For poposals is Western and Eastern suburbs: Office of Mumbai Fire Brigade at Marol Fire Station Jn. of Mathurdas Vasanji Marg and Marol Maroshi Road, Andheri (East), Mumbai-400 069.

The capitation fees is charged on the total gross built up area proposed which includes areas of basements, stilts, staircases, lifts and lift lobbies, passages, balconies, cantilevers portions and refuge areas. The architect has to issue necessary area certificate in duplicate in proforma as per the format (appearing hereafter in the chapter of Revision of capitation Fees, wherein complete information on Capitation fees is given). The capitation fees is to be paid by either Demand Draft or Bank's pay order payable in favour of THE MUNICIPAL CORPORATION OF GREATER MUMBAI.

After receipt of payment of capitation fees, the Chief Fire officer will issue its first No objection Certificate together with plans approved by him from the fire protection requirements point of view. The N.O.C. issued by the chief Fire officer contains the description of proposed work in detail, instructions & conditions to be complied with by the Developer in the proposed construction.

This No Objection Certificate is a first clearence required from Fire Brigade department before approval of plans and commencement of work. This clearence/ N.O.C. is not the Development permission under M.R.T.P.Act. (commencement Certificate)

STAGE - II (Final N.O.C. From C.F.O.)

After the Construction of the building is completed and all the requirements of NOC of the Chief Fire office are complied with, the applicant has to approach to the office of the Chief Fire Officer for their Final N.O.C. After receipt of such application the concern officer from the department will inspect the premises to checkup the compliance of the requirements. The department will instruct to comply with the short commings if any and there after C.F.O. will issue Final N.O.C. for the completed building.

It is to be mentioned here that the Building proposal department will NOT issue the Occupation Certificate / B.C.C. to the building without the Final N.O.C./ Clearence from the Chief Fire officer.

It is advisable that the applicant should apply for final N.O.C. to the Chief Fire officer well in advance to avoid delay in obtaining Occupation Permission to the building from the concern Building proposal department, of the Corporation.

SUBMISSION OF PROPOSAL FOR N.O.C. FROM CHIEF FIRE OFFICER

For any High Rise and Special Type of Buildings, No Objection Certificate from C.F.O. is required at TWO STAGES namely :-

1) Stage - I

Prior to Approval of Plans.

2) Stage - II

After the Building work is completed and before issue of Occupation Permission / B.C.C.

STAGE - I : PRE - N.O.C. BEFORE THE APPROVAL OF PLANS

Following is the Check List and information for submission of proposal to the Chief Fire officer, for issue of stage-I clearance:-

1) Application to C.F.O. from the Architect / Licensed Surveyor.

2) 3 Sets of Plans with detailed Drawings of :-

a) Basement Plan if any with Users Proposed.

b) Ground Floor.

c) Upper Floor Plans with Refuge floor / area, wherever applicable.

d) Sectional Plan.

e) Lay out Plan showing position of Buildings, R.G., Internal Roads etc. (wherever applicable).

f) Architects, Licensed surveyor's Gross builtup Area Certificate in Proforma in duplicate.

NOTES : The plans also should be incorporated with following informations:-

a) access to fire appliances / vehicles with details of vehicular turning circle and clear motorable accessway around the building.

b) size (width) of main and alternate staircases along with the balcony approach, corridor, ventilated lobby approach;

c) location and details of lift enclosures;

d) location and size of fire lift;

e) smoke stop lobby door, where provided;

f) refuse chutes, refuse chamber', service duct', etc.

h) refuge area, if any:

i) details of airconditioning system with position of fire dampers, mechanical ventilation system, electrical services (with dimensions of electrical transforming sub-stations etc.) boilers, gas pipes meter rooms etc.

j) details of exits, including ramps, etc. for hospitals and special risks;

k) location of generator, transformer and switch gear room :

l) smoke exhaust system. if any;

m) details of fire alarm system:

n) location of centralised control, connecting all fire alarms, built-in fire protection arrangements and public address systems, etc.

o) location and dimensions of static water storage tank and pump room along with fire service inlets for mobile pump and water storage tank;

p) location and details of fixed fire protection installation such as sprinklers, wet hose reels,drenchers, carbon-dioxide (CO_2) installations, etc.;

q) location and details of first aid and fire fighting equipment / installation;

r) Marking of Fire Resistant Doors (F.R.D.);

s) Location of Hydrants;

t) Parking Lay out at Ground Floor level;

u) Parking Lay out and other uses if proposed in Basement; and

v) Entry & Exit ramps, its width and slope. (1:10) wherever provided.

The application with 3 sets of plans should be submitted to the Office of Chief Fire Officer, Mumbai Fire Brigade, Mumbai, at their respective Headquarters i.e. 1) For proposals in island city at 'E' ward office, Sankli Street, Byculla, Mumbai 400 008, and 2) for proposals of Wester and Eastern Suburbns at Marol Fire Station, Jn. of Mathuradas Visanji Marg and Marol Maroshi Road, Marol,Andheri (E), Mumbai - 400 069.

After receipt of such application, the designated Fire Officer will scrutinise the Plans. With corrections / rectifications of short comings if any and after the payment of capitation fees the C.F.O. will issues first N.O.C. Clearance, of stage-I.

NOTE : Please note that this N.O.C. (Stage-I) is not a Development Permission (C.C.) under M.R.T.P. Act for commencement of work of building

STAGE - II : FINAL N.O.C. BEFORE OCCUPATION PERMISSION / B.C.C.

After completion of the work and complying with the fire protection requirements, the Architect has to make necessary application to the Chief Fire Officer requesting for Final N.O.C. The application should accompany following documents :-

1) Application from Architect / Licensed Surveyor.

2) Following certificates / Reports (whichever applicable) :-

   a) Report with Certificate of installation of Fire Fighting Equipments from the Contractor and the Consultant appointed by the Owner / Developer confirming that the fire protection requirements and installation work carried out is to the satisfaction of the C.F.O.

   b) Architect's certificate in format for total gross built-up area, in-duplicate.

   c) Architect's certificate for the capacity of Fire fighting overhead and under ground water storage tanks.

   d) Certificate from Electrical Engineer regarding alernate arrangement / provision of electric supply for the operation of Fire pumps, Fire lifts etc, in case of emergency.

   e) Certificate from Lift Inspector regarding installation of FIRE LIFT.

After receipt of such application the site is inspected by the designated Fire Officer. With rectification of short comings if any, C.F.O. issues Final N.O.C. for the purpose of occupation permission / B.C.C. to the building.

NOTE : Please note that the Occupation Permission / Building Completion Certificate will NOT be issued by the concern building proposal department without final N.O.C. from C.F.O.

TIME LIMIT FOR ISSUE OF N.O.C. / CLEARANCE

If the proposal submitted is complete in all respects the chief Fire officer / department will issue its N.O.C. within FIFTEEN (15) working days.

GUIDE LINES FOR PLANNING & DESIGNING OF HIGH RISE AND SPECIAL BUILDINGS

(Ref: D.C.R. 1991)

The planning, designing and construction of any High Rise and Special type of building, wherever N.O.C. from C.F.O. is required shall be such so as to ensure safety from Fire for this purpose. Unless otherwise specified in Rule No. 43 and Appendix VIII of Development Control Rules - 1991 for Greater Bombay, the provisions of Part IV, "Fire Protection" of National Building Code shall apply.

1) OPEN SPACES

The open space requirement in general is govern by Rule No. 29 of D.C.R. - 1991. However Minimum open spaces required for different heights for this purpose as specified by C.F.O. are as under:-

TABLE

OPEN SPACES / COURTYARDS FOR HIGH RISE & SPECIAL BUILDINGS

Sr. No.	Height of Building	Open Spaces / Courtyards to be provided
1	Up to 24 meters (for special buildings)	6 meters on each side
2.	Above 24 meters and upto 34 meters	9 meters each on two opposite sides and 6 meters each on the other two opposte sides
3.	Above 34 meters and upto 44 meters	10 meters on each side
4.	Above 44 meters	12 meters on each side.

Note: In case of item no (3) of above table the open spaces / courtyards may be reduced to 6 meters on one side acceptable to the Chief Fire officer.

2) PAVED APPROACH / OPEN SPACE

a. The approach to the building on paved open space and all sides upto 6 mtrs. width shall confirm to the requirements of the C.F.O. Such open space shall be capable of taking the weight of fire engine as specified by the Chief Fire Officer.

b. The paved open space shall be free of any obstruction and shall be motorable.

3) **TRAVEL DISTANCE**

TABLE

	Users / Type of Building	Maximum Travel Distance to an Exit
a.	Residential, Educational, Institutional and Hazardous Occupancies.	22.5 Mtrs.
b.	Assembly, Business, Mercantile, Industrial and Storage.	30 Mtrs.

Notes :

a) Travel Distance to an Exit from the dead end of corridor shall not exceed half the distance specified above.

b) When more than one Exit is required on a Floor the exits shall be as remote from each other as possible.

4) **STAIRCASES**

For high rise and special buildings a minimum of TWO staircases shall be provided, and atleast one of them opening directly to the exterior or to an interior open space or to any open space of safety.

Except in the following cases where a SINGLE staircase will be acceptable:-

a) Highrise Residential Buildings: If

i) the staircase is located on the external wall and naturally ventilated to the outside area directly;

ii) the flight of the staircase is not less than 1.5 meter width;

iii) the travel distance is 22.5 meters or less, and

iv) the principal use of the building is for RESIDENTIAL purposes and agrigate area of the other occupancies, if any, does not exceed 250 sq. mtrs, and all of them have been, located on ground floor only.

b) Special Building : If-

i) the staircase is located on the external wall and naturally ventilated to the outside area directly;

ii) the flight of the staircase is not less than 2 meters width;

iii) the total floor area of each floor does not exceed 300 sq. mtrs. and height is not more than 10 meters.

iv) it is not "Assembly" or "Hazardous" building;

v) the Fire Escape stairs are provided, and

vi) any additional fire safety measures stipulated by the chief Fire Officer, are complied with.

5) NUMBER AND WIDTH OF EXITS

The width of an exit, stairway / corridor to be provided at each floor in occupation of various types shall be as shown in columns 3 and 5 of Table hereunder.

EXTRACT OF TABLE 21 OF D.C.R. 1991

WIDTHOF EXITS FOR VARIOUS OCCUPANIES

Serial No.	Type of Occupancy	Stairway / Corridor Minimum width in meters
1.	Residentail Dwellings	1.1
	— Row Houses	0.75
	— Hotels	1.5
2.	Educational	
	— upto 24 m. high	1.5
	— over 24 m. high	2.0
3.	Institutional i.e.Hospitals	
	upto to 10 beds	1.5
	over 10 beds	2.0

4.	Assembly	
	— fixed seats or loose seats and dance floor	2.0
	— no seating facilities and dining rooms	2.0
5.	Mercantile —	
	— street floor and basement	1.5
	— upper sales floors	1.5
6.	Business, Industrial	1.5
7.	Storage	1.5
8.	Hazardous	1.5

6) **CORRIDORS**

The height of Corridors shall not be less than 2.4. Mtrs., where Stairways discharge through corridors.

7) **SMOKE STOP DOOR**

Where there is more than one Staircase serving a building there shall be at least one-smoke -stopdoor in the space between the staircases.

8) **REFUSE AREA / FLOOR**

Please refer detailed Guide Lines and Norms for providing Refuge Area which are provided in separate chapter hereafter.

9) **EXTERNAL WINDOWS**

The area of the openable external windows on a floor shall be not be less than 2.5 percent of the floor area.

10) **LIFTS AND LIFT MACHINE ROOMS**

a. The walls enclosing the lift shafts shall have a fire resistance of not less than 2 hours. Shafts shall have permanent vents at the top not less than 0.2 sq.m in clear area. Lift motor rooms should preferably be sited at the top of the shaft and shall be separated from lift shafts by the enclosing wall of the shaft or by the floor of the motor rooms.

b. Landing doors in lift enclosures shall open into the ventilated or pressurised corridor / lobby and shall have fire resistance of not less than One hour.

c. The number of lifts in one lift bank shall not exceed Four. The shaft for the fire lift in a lift bank shall be separated from each other by a brick masonry or R.C.C. wall of fire resistance of not less than Two hours. Lift car doors shall have fire resistance of not less than One hour.

d. If the lift shaft and lift lobby are in the core of the building, a positive pressure of not less than 2.5 mm. and not more than 3 mm. water gauge by an electrically operated blower shall be maintained in the lift shaft. The mechanism for pressurising the lift shaft and lift lobby shall be so installed that they shall operate automatically when the automatic fire alarm operates. The mechanism shall have facilities to operate manually.

e. Exit from the lift lobby, if located in the core of the building, shall be through a self closing smoke stop door of a Half-Hour fire resistance.

f. The lift machine room shall be separate and no other machinery shall be installed therein.

g. Lifts shall not normally communicate with the basement. However, lifts may be permitted to reach the basement level provided the lift lobby at each basement level is pressurised and separated from the rest of the basement areas, by a smoke-actuated fire resisting door of two hours' fire resistance. These doors can also be kept in hold-open position by an electro-magnetic device to be linked with a smoke detector.

11) **FIRE LIFTS**

The following provisions shall be made for a fire lift :-

a. To enable fire services personnel to reach the upper floors with minimum delay, one or more of the lifts shall be so designed as to be available for the exclusive use of such personnel in an emergency and be directly accessible to every dwelling / lettable floor space of each floor.

b. The lift-shall have a floor area of not less than 1.4 sq.m. with a minimum dimension of 1.12 m. It shall have a loading capacity of not less than 545 kg. (8 persons lift) with automatic closing doors.

c. There shall be an alternate electric supply from a generator of an adequate capacity apart from the electric supply in the building and the cables shall run in a route safe from fire, i.e. within the lift shaft. In case of failure of

normal electric supply, it shall automatically trip over to alternate supply. For apartment buildings, this change over of supply could be done through a manually operated change-over switch.

d. The operation of a fire lift shall be by a simple toggle or two button switch situated in a glass fronted box adjacent to the lift at the entrance level. When the switch is on, landing call-points will become inoperative and the lift will be on car control only or on priority control device. When the switch is off, the lift will return to normal working. This lift can be used by the occupants in normal times.

e. The words 'FIRE LIFT' shall be conspicuously displayed in fluorescent paint on the lift landing doors at each floor level.

f. Collapsible gates shall not be permitted for lifts. The lifts shall have solid doors with fire resistance not less than ONE hour.

g. The speed of The Fire Lift shall be such that it can reach to the top floor from ground level within ONE MINUTE.

12. **BASEMENTS**

a. Each basement shall be separately ventilated. Vents with cross, sectional area (aggregate) not less than 2.5 per cent of the floor area spread evenly around the perimeter of the basement shall be provided in the form of grills or breakable stall boards lights or pavement lights or by way of shafts. Alternatively, a system of air inlets shall be provided at basement floor level and smoke outlets at basement ceiling level. Inlets and outlets, may be terminated at ground level with stall boards or pavement lights as before but ducts to convey fresh air to the basement floor level shall have to be laid. Stall boards and pavement lights should be in positions easily accessible to the Fire Brigade personnel and rescue teams and clearly marked 'SMOKE OUTLET' or 'AIR INLET' with an indication of area served at or near the opening.

b. The staircase of basements shall (a) be of enclosed type having fire resistance of not less than Two Hours; (b) be situated at the periphery of the basement to be entered at ground level only from the open air and in such a position that smoke from any fire in the basement shall not enter any exit serving the ground and upper storeys of the building; and (c) communicate with the basement through a lobby provided with fire-resisting self-closing doors of One Hour fire resistance. If the travel distance exceeds 18.50 m. additional staircase at proper places shall be provided.

c. Intake ducts may serve all basement levels but each basement and basement compartment shall have separate smoke outlet duct or ducts.

d. Mechanical extractors for smoke-venting system from lower basement levels shall also be provided. The system shall be of such design as to operate on actuation of heat sensitive detectors or sprinklers if installed and shall have a considerably higher performance than the standard units. The system should also have an arrangement to start it manually and shall be designed to function at a temperature not less than 550°C.

e. Kitchens working on gas fuel, department stores and shops shall not be permitted in basements.

Note: For designing of 2nd Basement please refer graphic illustration.

13) FLOOR SPACE DIVISION (FIRE SECTIONS)

If the undivided floor space on a floor exceeds 750 sq. m. it shall be separated into compartments each not exceeding 750 sq.m. by means of fire walls of not less than Two Hours fire resistance. In extended buildings, fire walls should be erected at distances not exceeding 40m. For floors with sprinklers, the area mentioned above may be increased by 50 percent.

14) SERVICE DUCTS

a. Service ducts shall be enclosed by walls having a fire resistance of not less than Two Hours. Doors for inspection or access shall also have a fire resistance of not less than Two Hours.

b. If the cross sectional area of a duct exceeds 1 sq. m. it shall be sealed where it passes a floor with non-combustible light material. The seal within the duct may be pierced for any service pipe or ventilation trunk and shall fit as closely as possible around any such pipe or trunk.

c. A permanent vent shall be provided at the top of the service shaft of cross-sectional, area not less than 460 sq. cm. or 6.25 cm for each 900 sq. cm of the area of the shaft, whichever is more.

15) ELECTRIC METER ROOM

Electric Meter Room of adequate size and capacity shall be provided on the Ground Floor / stilt floor on ground, directly abutting to the exterior openspace, with Fire Resistance Door/s (FRD)

REFUGE AREA
GUIDELINES AND NORMS FOR PROVIDING REFUGE AREA IN HIGH-RISE RESIDENTIAL BUILDINGS

(Ref : Circular No. FBM/593/94 dt.21.9.1993)

The guidelines and norms mentioned below are applicable to only high-rise residential buildings. They are not applicable for high-rise non-residential buildings.

1. **CLASSIFICATION :**

A high-rise building with height 24 mtrs and above having residential occupancy from first floor to top-most floor, irrespective of the occupancy on ground / stilt floor), will be deemed as residential building for this purpose. Only car parking can be considered at first floor level on stilts, if proposed but no other occupancy. However, the staircase/s and means of escape shall be effectively separated from the other occupancy at ground floor level and first floor levels, as the case may be to the satisfaction of Chief Fire Officer.

2. **NUMBER OF REFUGE AREAS :**

a) A high-rise building, having only two floors immediately above 24 meters height, shall be exempted from provisions of a separate refuge area. In this case, the Terrace Floor shall be treated as refuge area and necessary facilities such as emergency lighting, drinking water etc. shall be provided and the access door/s from the enclosed staircase/s to the terrace floor shall be of half hour fire resistance and self-closing type.

b) A high-rise building, which does not fall under the category mentioned at (a) above, shall be provided with refuge area in the floor immediately above 24.00 meters and on every Seventh floor thereafter. If there are six floors or less above the floor where a refuge area is provided, the terrace floor shall be treated as refuge area.

3. **SIZE OF REFUGE AREA :**

The refuge area shall be provided at the rate of 4% (Four percent) of the total builtup area of the floors above 24 meters, and its area shall not be less than 15 sq.mtrs. and shall not be more than 50% of the total built-up area of the floor where it is provided.

Where the Total Built up area means :-

a) the total built up area of all the floors, including balconies and service areas immediately above 24 meters and upto the next six floors or upto such number of floors, if there are less then six floors and

b) in a similar manner a refuge area, shall be provided after every 6 (six) floors above.

4. **MANNER OF PROVIDING REFUGE AREA :**

a) Refuge area shall be provided on a floor within the building line. However, the first refuge area to be provided on the floor immediately above 24 meters height may be allowed as cantilevered projection. The refuge area at other levels shall necessarily be located within the building line.

b) In case of cantilevered protection, it shall be provided with railing/parapet of 1.10 meters height on open sides and shall be of sound construction.

c) Where the refuge area is provided on a floor within the building line, it shall be located in such a manner that at least one side of the refuge area shall be exposed to open air. The exposed side/s shall not be enclosed, except with a parapet wall of height not of exceeding 1.10 meters. The access to the refuge area shall be gained directly from the enclosed type staircase/s only, and through half hour fire resistant self-closing door/s.

d) In case of buildings having more than one wing, the refuge area/s shall be provided independently for each wing. However, common refuge area between two wings, can be provided if the same is connected in a safe manner to the staircases serving both the wings of the building.

e) The location of the refuge area shall be so planned that all the occupants of the particular floor, where refuge area is provided should be able to reach naturally ventilated lobby or the corridor to the refuge area.

f) Refuge area shall be seggregated by brick masonry partition wall of 9" thickness and acess to the refuge area from the rest of floor shall be gained through half-hour fire resistant self closing door.

g) There shall not be any opening into the refuge area from occupied premises.

h) Where lifts are provided adjacent to the refuge area, the lift/s shall not be permitted to be opened into the refuge area.

i) Open type staircase shall not open on the refuge area.

5) **HEIGHT OF THE REFUGE AREA :**

The clear height of the refuge area shall not be less than 1.80 meters or more than 2.20 meters below the beam / drop pardi.

6) **USER OF REFUGE AREA :**

a) The refuge area/s shall be earmarked exclusively for the use of Occupants as temporary shelter and for the use of Fire Brigade Department or any other organisation dealing with fire or other emergencies when occurs in the building and also for exercises / drills, if conducted by the Fire Brigade Department.

b) The refuge area/s shall not be allowed to be used for any other purpose and it shall be the responsibility of the owner/occupier to maintain the same clean and free of encumbrances and encroachments at all times.

c) The entrance door /s to the refuge area/s shall be painted or fixed with a sign painted in luminous paint mentioning 'REFUGE AREA IN CASE OF EMERGENCY'.

7. **FACILITIES TO BE PROVIDED ON THE REFUGE AREA :**

a) Adequate drinking water facilities shall be provided.

b) Adequate emergency lighting facility connected to the electric circuits of staircase, corridor / passage etc. shall be provided.

Note : In case of representation, the Chief Fire Officer for reasons may reopen the cases where refuge floor/s have been stipulated in case of high-rise residential buildings and on an review, may accept refuge area, on the basis of the above guidelines and norms, instead of the refuge floor stipulated earlier.

REVISION OF RATES OF CAPITATION FEES FOR HIGH-RISE BUILDINGS AND CERTAIN SPECIFIED BUILDINGS FOR C.F.O. N.O.C.

(Ref. No. AMC/C/701 dated 23-5-1997)

Levy of Revised Capitation Fees has come into effect from 29-5-1997

Sr. No.	Type of Building	Previous Rates	Revised Rates.
1.	High rise Buildings: having height 24 Meters and above	Rs. 5/- per Sq. Mtr. subject to minimum Rs. 25,000/- Per Building.	Rs. 10/- Sq. Mtr. Subject to minimum of Rs. 50,000/- per Building.
2.	Low Rise Buildings :		
	i] Industrial Estate Bldgs. ii] Service Industrial Bldgs. iii] Industrial (Factory) Bldgs. vi] Storage Bldgs. v] Warehouse Bldgs. vi] Cinema / Theatres vii] Shopping Centres. Viii] Residential Hotel Buildings	Nil	Rs.5/- per Sq. Mtr. subject to minimum of Rs. 25,000/- Per Building.

Guidelines for levy of capitation fees

1) **HIGHRISE BUILDINGS**

i) In this case, capitation fee will be levied irrespective of occupancy i.e. Residential, Commercial, Institutional, Residential Hotel or any other such occupancy permitted in residential & commercial zones.

ii) The area calculation for the purpose of levy of capitation fees will be on Gross built-up area which includes area of basements, stilts, staircases, lifts, lobbies, passages, balconies, cantilevered portions, Refuge area and same should be certified by the concerned Architect/Licensed Surveyor. The total built-up area calculation on the above basis will have no relation with usual F.S.I. or built-up area calculations shown in the approved plans.

iii) In case of a building, which is partly high-rise and partly low-rise, capitation fee will be levied on the entire building as per the present practice, since both the high-rise and low-rise wings are contiguous and form part of one building.

iv) Capitation fee will be levied only, as is the present practice, when N.O.C. is required to be issued by the Fire Brigade Department, whether it is an existing Building or a building proposed to be newly-built.

v) (a) In case of High-rise Buildings, on which the capitation fee has not been levied earlier (Permissions have been granted prior to the levy of capitation fee came into force on 7.2.75) and only if any additions are proposed to be made, the entire area of the building will be levied for the capitation fee at the revised rate i.e. Rs. 10/- sq. mtr. subject to a minimum of Rs. 50,000/-

(b) However, if only internal alterations are proposed to be carried out, without addition in the gross built-up area, capitation fee will Not be levied.

vi) (a) In case of existing Highrise Buildings for which the capitation fee has been already been levied and collected at the then existing rate, and if any additional area proposed to be built, the capitation fee will be levied at the revised rate on the additional area i.e. the difference between the total area of the building minus the actual Gross built-up area for which the N.O.C. of the Fire Brigade Debarment has been issued earlier. In this case, since party has paid the capitation fee, as payable at then rate, including the minimum amount payable, the revised minimum capitalion fees will not be made applicable.

(b) However, if only internal alterations are proposed to be carried out, without any additions in the gross built-up area, capitation fee will Not be levied.

vii) If case of an existing Low-rise Building, which will become High-rise Building due to proposed additional construction, capitation fee will be levied on the total area of building as per the current rate, subject to the revised minimum amount Rs. 50,000/- per building.

viii) If only the construction of loft and/or mezzanine floor is proposed to be constructed in an existing high rise building, whether capitation fee has been paid earlier or not, capitation fee will NOT be levied on these areas.

2) **INDUSTRIAL BUILDINGS, STORAGE BUILDINGS, WAREHOUSES, CINEMA/THEATRES, ETC.**

i) In the case of these buildings, capitation fee will be levied on the basis of

occupancy i.e. user and not on the basis of height. Hence, the capitation fee will be levied, irrespective of the height of the building.

ii) Capitation fee will be levied only when N.O.C. is required to be issued by the Fire Brigade Department, whether it is an existing building or a building proposed to be newly built.

iii) The method of calculating the area, for the purpose of capitation fee, will be the same as prescribed at para (ii) of 1 above for high-rise buildings.

iv) The capitation fee will be leviable on an existing building, where the use is proposed to be changed to an user on which capitation fee is required to be paid.

v) (a) In case of an existing building where any additions are proposed to be made, the entire area of the building will be considered for capitation fee.

(b) However, if only internal alterations are proposed to be carried out, without any addition in the gross built-up area, capitation fee will Not be levied.

3) **BUILDINGS OF MIXED OCCUPANCY :**

(a) If the aggregate area of the occupancy / occupancies attracting the levy of Capitation Fee is less than 600 sq. mtrs. capitation fee will Not be levied.

(b) If such aggregate area is 600 sq. mtrs. or more, capitation fee will be levied on the entire area of a building.

4) **COMPARTMENTED BUILDINGS :**

(i.e. Marol co-operative Industrial Estate, Industrial buildings at Charkop, Kandivli (West) etc.)

a) If the compartment is proposed to be newly built or additions and/or alterations are proposed to an existing compartment capitation fees will be levied to the concerned compartment irrespective of the other compartments being contiguous and forming part of the same building.

b) If only the construction of loft and / or mezzanine floor is proposed to be constructed in an existing building, whether capitation fee has been paid earlier or not, capitation fee will Not be levied on these areas.

c) If N.O.C. of the Fire Brigade Department has already been issued, prior to 29.5.97 for the construction or to carry out additions and/or alterations, capitation fee will Not be levied for granting N.O.C. for occupation or for carrying out internal alterations without any change in the gross built-up

area. However, if additional construction is proposed on such buildings capitation fee will be levied on the entire building.

5) **REFUNDS :**

i) **IN CASE OF HIGH-RISE BUILDINGS :**

a) If the proposal is dropped completely, only 50% of the capitation fee paid will be refundable.

b) If lesser area is built, whereby the building becomes a low rise building and does not attract the levy of capitation fee, only 50% of the capitation fee paid will be refundable.

c) If lesser area is built, but the building remains to be a high rise building, any part of the capitation fee paid will not be refundable.

ii) **IN CASE OF OTHER BUILDINGS :**

a) If the proposal is dropped completely, only 50% of the capitation fee paid will be refundable.

b) If less area is built and still attracts capitation fee, any part of the capitation fee paid will not be refundable.

c) If lesser area is built and, by virtue of which, the building does not attract the levy of capitation fee, only 50% of the capitation fee paid will be refundable.

6) **EXEMPTION :**

There will be no exemption from payment of capitation fee. irrespective of the ownership of the building, including the buildings of the Municipal Corporation of Greater Mumbai.

7) **INTERPRETATION :**

Chief Fire Officer will be appropriate authority for interpretation or clarification for the purpose of levy of capitation fee or otherwise.

8) **APPEAL :**

In case of appeal regarding the interpretation the final arbitrating authority will be the concerned Dy. Municipal Commissioner.

Note :
The Certificate regarding the gross built-up area shall be furnished in duplicate by the Architect / Licensed Surveyor as per proforma appearing hereafter :-

CERTIFICATE FOR GROSS BUILTUP AREA

(PROFORMA)

To,

The Chief Fire Officer,
Mumbai Fire Brigade,
'E' Ward Municipal Office Bldg.,
Shaikh Hafizuddin Marg,
Byculla, Mumbai - 400 008.

Dated _____

Sub : Payment of Capitation Fee.

Sir,

This is to certify that the gross built-up area of the building, which is under your consideration for issue of N.O.C. and located on plot bearing CS / CTS / No _____ of Division / Village _____ at _____ Road, in _____ Ward, is _____ Sq. Mtrs. (rounded off to the next Sq. Mtr.)

The gross built-up area certified above includes all the areas of basements, stilts, staircases, lifts, lobbies, passages, balconies, cantilevered portion and refuge areas.
You are now requested to accept the capitation fee and issue N.O.C. We are sending herewith a Demand Draft / Pay order bearing No. _____ dated _____ issued by _____ (Bank and Branch) in favour of the Municipal Corporation of Greater Mumbai, for an amount of Rs. _____ (@ Rs. 5.00/- Rs. 10.00 per sq. mtr. subject to a minimum of Rs. 25.000. 00/ Rs. 50,000,00 as the case may be.)

The receipt for the above amount may please be issued in the favour of

_____

Thanking you,

Yours faithfully,

(Architect / Licensed Surveyor)

Notes : i) Certificate on letter head of Architect / Licensed Surveyor
ii) Certificate to be submitted in duplicate.

FIRE PROTECTION REQUIREMENTS

(Extract from D.C.R-1991)

(Regulation No. 43 of D.C.R.)

(1) The planning design and construction of any building shall be such as to ensure safety from fire. For this purpose, unless otherwise specified in these Regulations the provisions of Part-IV : Fire Protection Chapter, National Building Code shall apply.

For multi-storeyed, high rise and special buildings, additional provisions relating to fire protection contained in Appendix VIII shall also apply. The approach to the building and open spaces on all sides upto 6 m. width and their layout shall conform to the requirements of the Chief Fire Officer. They shall be free of any obstruction and shall be motorable.

EXITS :

(2) Exits. – Every building meant for human occupancy shall be provided with exits sufficient to permit safe escape of its occupants in case fire or other emergency for which the exits shall conform to the following :-

(i) Types – Exits should be horizontal or vertical. A horizontal exit may be a door-way, a corridor, a passage-way to an internal or external stairway or to an adjoining building, a ramp, a verandah, or a terrace which has access to the street or to the roof of a building. A vertical exit may be a staircase or a ramp, but not a lift.

(ii) General requirements - Exits from all the parts of the building, except those not accessible for general public use, shall-

(a) provide continuous egress to the exterior of the building or to an exterior open space leading to the street;

(b) be so arranged that, except in a residential building, they can be reached without having to cross another occupied unit;

(c) be free of obstruction;

(d) be adequately illuminated;

(e) be clearly visible, with the routes reaching them clearly marked and signs posted to guide any person to the floor concerned;

(f) be fitted, if necessary, with fire fighting equipment suitably located but not as to obstruct the passage, clearly marked and with its location clearly indicated on both sides of the exit way;

(g) be fitted with a fire alarm device, if it is either a multi-storeyed, high-use or a special building so as to ensure its prompt evacuation;

(h) remain unaffected by any alteration of any part of the building so far as their number, width, capacity and protection thereof is concerned;

(i) be so located that the travel distance on the floor does not exceed the following limits :-

(i) Residential educational, institutional and hazardous occupancies; 22.5 m.

(ii) Assembly, business, mercantile, industrial and storage buildings : 30 m.

Note – The travel distance to an exist from the dead end of a corridor shall not exceed half the distance specified above.

When more than one exit is required on a floor, the exits shall be as remote from each other as possible;

Provided that for multi-storeyed high rise and special buildings, a minimum of two enclosed type staircases shall be provided, at least one of them opening directly to the exterior to an interior open space or to any open place of safety.

(Regulation No. 44 of D.C.R.)

(33) Requirements of Individual Exits at each Floor. – The detailed requirements of individual exits at each floor are given below :–

(1) **Corridors–** (a) Exit corridors shall be of a width not less than total required width of exit doorways leading from them in the direction of travel to the exterior/stairway.

(b) Where stairways discharge through corridors, the height of the corridors shall not be less than 2.4 m.

(c) Where there is more than one staircase serving a building, there shall be at least one smokestop door in the space between the staircases.

(2) **Doorways**– (a) Every exit doorway shall open into an enclosed starway, a horizontal exit or a corridor or passageway providing continuous and protected

means of egress;

(b) An exit doorway shall open outwards i.e. away from the room, but shall not obstruct the travel along any exit. No door, when opened, shall reduce the required width of a starway or landing to less than 90 cm.

(c) An exit door shall not open immediately upon a flight to stairs; a landing equal to atleast the width of the door shall be provided in the stairway at each doorway; the level of the landing shall be the same as that of the floor which it serves.

(d) Exit doorways shall be openable from the side which they serve, without the use of a key.

(3) **Revolving doors.**– (a) Revolving doors shall not be used as required exits except in residential, business and mercantile occupancies, they shall not constitute more than half the total required door width.

b) When revolving doors are considered as required exitways–

(i) the multiplier in Table 21 shall be increased by 331/3 per cent, and;

(ii) revolving doors shall not be located at the foot of a stairway. Any stairway served by a revolving door shall discharge through a lobby or foyer.

(4) **Internal stairways.**– (a) Stairways shall be constructed of non-combustible materials throughout.

(b) Any interior staircase shall be constructed as a self-contained unit with atleast one side adjacent to an external wall and shall be completely closed.

(c) A staircase shall not be arranged around a lift shaft unless the later is entirely enclosed by a material of fire resistance rating as that for type of construction itself. For multi-storeyed, high rise and special buildings, the staircase location shall be to the satisfaction of the Chief Fire Officer.

(d) In multi-storeyed, high rise and special buildings, access to main staircases shall be gained through atleast half-an-hour fire-resisting automatic closing doors, placed in the enclosing walls of the staircases. They shall be swing type doors opening in the direction of the escape.

(e) No living space, store or other space, involving fire risk, shall open directly into a staircase.

(f) The external exit door of a staircase enclosure at ground level shall open directly to the open space or should be accessible without passing through any door other than a door provided to form a draught lobby.

(g) In multi-storeyed high rise and special buildings, exit signs with arrows indicating the escape route shall be provided at a height of 1.5 m. from the floor level on the wall and shall be painted with fluorescent paint. All exit way signs should be flush with the wall and so designed that no mechanical damage to them can result from the moving of furniture or other heavy equipment.

(h) Where a building has a single staircase, it shall terminate at the ground floor level, and the access to the basement shall be by a separate staircase. Where the building is served by more than one staircase, one of the staircases may lead to the basement level, by either a ventilated lobby or a cut-off screen wall without opening, having a fire resistance of not less than 2 hours with discharge point at two different ends or through enclosures. It shall also be cut off from the basement area at various basement levels by a protected and ventilated lobby/lobbies.

(5) **Fire Escape or External Stairs.**– Multi-storeyed, high rise and special buildings shall be provided with fire escape stairs, which will be free of F.S.I., and they should conform to the following :-

(a) They shall not be taken into account in calculating the evacuation time of a building.

(b) All of them shall be directly connected to the ground.

(c) Entrance to them shall be separate and remote from the internal staircase.

(d) Routes to the fire escape shall be free of obstruction at all times, except for doorway leading to the fire escape, which shall have the required fire resistance.

(e) They shall be constructed of non-combustible materials.

(f) They shall have a straight flight not less than 75 cm. wide with 15 cm. treads and risers. not more than 19 cm. The number or risers shall be limited to 16 per flight.

(g) They shall be provided with handrails at a height not less than 90 cm. above the tread.

(6) **Ramp–**

(a) All the requirements of sub regulation (4) of this Regulation shall apply to any rampas they apply to a staircase.

(b) Ramps shall lead directly to outside open spaces at ground level or courtyards or other safe places.

(c) In a multistoreyed, high rise and special building, access to ramps from any floor shall be through a smoke-stop door.

(7) **Refuge Area.–**

(a) In multi-storeyed and high rise buildings, at least one refuge area shall be provided on the floor immediately above 24 cm. meters.

(b) It shall be on the external walls as a cantilevered projection or in any other manner.

(c) It shall have a minimum area of 15 sq. m. and a minimum width of 3.0 m.

(d) It shall not be counted in F. S. I.

(Rule No. 45 of D.C.R.)

Structural Safety and Services. – (1) Structural design. – The structural design of foundations, elements made of masonry, timber, plain concrete, reinforced concrete, prestressed concrete and structural steel shall conform to the provisions of Part VI Structural Design Section-1 Loads, Sections 2-Foundation, Section 3-Wood, Section 4-Masonry, Section 5-Concrete, Section-6 Steel, Code of India.

(Rule No. 47 of D.C.R.)

Building Services -

(1) Electrical installations-The planning, design and installation of electrical installation, air-conditioning and heating work shall conform to the provisions of Part VIII Building Services. Section 2-Electrical Installations. Section 3-Air conditioning and Heating, National Building, National Building Code of India.

(2) Lifts – (a) Planning and design-The planning and design of lifts including their number, type and capacity depending on the occupancy of the building height shall be in accordance with Section 5-Installation of Lifts and Escalators, National Building Code of India.

(b) **Maintenance.–**

(i) The lift installation should receive regular cleaning, lubrication adjustment and adequate servicing by authorised competent persons at such intervals as the type of equipment and frequency of service demand. In order that the lift installation is maintained at all times in a safe condition, a proper maintenance schedule shall be drawn up in consultation with the lift manufacturer and rigidly followed. A log book to record all items relation to general servicing and inspection shall be maintained. The electrical circuit diagram of the lift for reference by persons responsible for the maintenance and replacement, where necessary to the satisfaction of the competent authority (Lift Inspector of the Government of Maharashtrta).

(ii) Any accident arising out of operation of maintenance of the lifts shall be duly reported to the competent authority, i.e. Lift Inspector of the Government of Maharashtra.

ADDITIONAL FIRE PROTECTION REQUIREMENTS FOR MULTI-STOREYED HIGH RISE AND SPECIAL BUILDINGS

(APPENDIX VIII :Regulation 43: DCR-91)

1. **General** — (1) In addition to the provisions of Part IV Fire Protection National Building Code of India, the Chief Fire Officer may insist on suitable provisions in multi storeyed, high rise and special buildings or premises from the fire safety and fire-fighting point of view depending on their occupancy and height.

2. **Construction** — (1) **Building materials :-**

   (i) Load bearing elements of construction and elements of construction for which the required fire resistance is one hour or more shall be of non-combustible material. Interior finish materials (wall panellings, floor coverings etc.) may be permitted of materials having their rating for flame spread and smoke developed not exceeding a very low flame spread limit in accordance with IS : 1642, 1960 (Class I). Ceiling linkings shall be non-combustible or of plasterboard.

   (ii) Stairways and corridors shall not contain combustible materials.

(2) Structural members such as supports and load bearing walls shall have fire resistance rating of 3 hours, transoms and ceilings at least 2 hours.

(3) Internal walls and partitions separating corridors from areas on floors that are used for any purpose other than circulation shall have a fire resistance of not less than one hour. There shall be no openings in such walls other than for doors or delivery hatches with fire resistance not less than half an hour. Fire sections (fire walls) sub-dividing the building to prevent fire spread, shall have a fire resistance, rating not less than two hours.

(4) Facades excluding windows and doors shall consist of non-combustible building materials. The minimum distance between the top of the opening on a lower floor and the sill of that on the floor above it shall be 0.9 m., so that the fire would have to travel at least 0.9 m. between storeys.

3. **Staircase enclosures.** — (1) The internal enclosing walls of staircases shall be of brick or R.C.C. construction with a fire resistance of not less than two hours. All enclosed staircases shall be reached via a ventilated lobby and shall have access through self-closing doors of at least half an hour fire resistance. These shall be single swing doors opening in the direction of the escape. The door shall be fitted with check section door closers. The floor landing of staircases shall not form part of common corridor.

(2) The staircase enclosure on the external wall of a building shall be ventilated to the atmosphere at each landing or mid-landing.

(3) A permanent vent at the top equal to 5 percent of the cross sectional area of the enclosure and openable sashes at each landing level with area not less than 0.5 sq.m. on the external wall shall be provided. The roof of the shaft shall be at least 1 m. above the surrounding roof. There shall be no glazing or glass bricks in any internal enclosing wall of a staircase. If the staircase is in the core of the building and cannot be ventilated at each landing, a positive pressure of 5 mm. water gauge by an electrically operated blower shall be maintained.

(4) The mechanism for pressuring the staircase shaft shall be so installed that it operates automatically and also manually when the automatic fire alarm operates.

4. **Lift enclosures** — (1) The walls enclosing the lift shafts shall have a fire resistance of not less than two hours. Shafts shall have permanent vents at the top not less than 0.2 sq.m. in clear area. Lift motor rooms should preferably be sited at the top of the shaft and shall be separated from lift shafts by the enclosing wall of the shaft or by the floor of the motor rooms.

(2) Landing doors in lift enclosures shall open into the ventilated or pressurised corridor/ lobby and shall have fire resistance of not less than one hour.

(3) The number of lifts in one lift bank shall not exceed four. The shaft for the fire lift in a lift bank shall be separated from each other by a brick masonry or R.C.C. wall of fire resistance of not less than two hours. Lift car doors shall have fire resistance of not less than one hour.

(4) If the lift shaft and lift lobby are in the core of the building a positive pressure of not less than 2.5 mm. and not more than 3 mm. water gauge by an electrically operated blower shall be maintained in the lift lobby and positive pressure of not less than 5 mm water gauge shall be maintained in the lift shaft. The mechanism for pressurising the lift shaft and lift lobby shall be so installed that they shall operate automatically when the automatic fire alarm operates. The mechanism shall have facilities to operate manually.

(5) Exit from the lift lobby, if located in the core of the building, shall be through a self closing smoke stop door of a half-hour fire resistance.

(6) The lift machine room shall be separate and no other machinery shall be installed therein.

(7) Lifts shall not normally communicate with the basement. However, one of the lifts may be permitted to reach the basement level provided the lift lobby at each

basement level is pressurised and separated from the rest of the basement areas, by a smoke-actuated fire resisting door of two hours' fire resistance. These doors can also be kept in hold-open position by an electro-magnetic device to be linked with a smoke detector.

5. **External windows** — The area of the openable external windows on a floor shall be not less than 2½ percent of the floor area.

6. **Fire lifts** — The following provisions shall be made for a fire lift :-

(a) To enable fire services personnel to reach the upper floors with minimum delay, one or more of the lifts shall be so designed as to be available for the exclusive use of such personnel in an emergency and be directly accessible to every dwelling/lettable floor space of each floor.

(b) The lift shall have a floor area of not less than 1.4 sq.m. with a minimum dimension of 1.12 m. It shall have a loading capacity of not less than 545 kg. (8 persons lift) with automatic closing doors.

(c) There shall be an alternate electric supply from a generator of an adequate capacity apart from the electric supply in the building and the cables shall run in a route safe from fire, i.e. within the lift shaft. In case of failure of normal electric supply, it shall automatically trip over to alternate supply. For apartment buildings, this change over of supply could be done through a manually operated change-over switch.

(d) The operation of a fire lift shall be by a simple toggle or two button switch situated in a glass fronted box adjacent to the lift at the entrance level. When the switch is on, landing call-points will become inoperative and the lift will be on car control only or on priority control device. When the switch is off, the lift will return to normal working. This lift can be used by the occupants in normal times.

(e) The words 'FIRE LIFTS' shall be conspicuously displayed in fluorescent paint on the lift landing doors at each floor level.

(f) Collapsible gates shall not be permitted for lifts; the lifts shall have solid doors with fire resistance of at least one hour.

(g) The speed of the fire lift shall be such that it can reach the top floor from ground level within one minute.

7. **Basements —**

(1) Each basement shall be separately ventilated. Vents with cross, sectional area (aggregate) not less than 2.5 percent of the floor area spread evenly around the perimeter of the basement shall be provided in the form of grills or breakable stall-boards lights or pavement lights or by way of shafts. Alternatively, a system of air inlets shall be provided at basement floor level and smoke outlets at basement ceiling level. Inlets and outlets may be terminated at ground level with stallboards or pavment lights as before but ducts to convey fresh air to the basement floor level shall have to be laid. Stallboards and pavment lights should be in positions easily accessible to the Fire Brigade personnel and rescue teams and clearly marked 'SMOKE OUTLET' or 'AIR INLET' with an indication of area served at or near the opening.

(2) The staircase of basements shall (a) be of enclosed type having fire resistance of not less than two hours ; (b) be situated at the periphery of the basement to be entered at ground level only from the open air and in such a position that smoke from any fire in the basement shall not enter any exit serving the ground and upper storeys of the building ; and (c) communicate with the basement through a lobby provided with fire-resisting self-closing doors of one hour fire resistance. If the travel distance exceeds 18.50 m., additional staircases at proper places shall be provided.

(3) Intake ducts may serve all basement levels but each basement and basement compartment shall have separate smoke outlet duct or ducts.

(4) Mechanical extractors for smoke-venting system from lower basement levels shall also be provided. The system shall be of such design as to operate on actuation of heat sensitive detectors or sprinklers if installed and shall have a considerably higher performance than the standard units. The system also have an arrangement to start it manually and shall be designed to function at a temperature not less than 550^{0} C.

(5) Kitchens working on gas fuel, department stores and shops shall not be permitted in basements.

8. **Floor space division (Fire sections)** — If the undivided floor space on a floor exceeds 750 sq.m. it shall be separated into compartments each not exceeding 750 sq.m. by means of fire walls of not less than two hours fire resistance. In extended buildings, fire walls should be erected at distances not exceeding 40 m. For floors with sprinklers, the area mentioned above may be increased by 50 percent.

9. **Service ducts.** — (1) Service ducts shall be enclosed by walls having a fire resistance of not less than two hours. Doors for inspection or access shall also have a fire resistance of not less than two hours.

(2) If the cross sectional area of a duct exceeds 1 sq.m. it shall be sealed where it passes a floor with non-combustible light material. The seal within the duct may be pierced for any service pipe or ventilation trunk and shall fit as closely as possible around any such pipe or trunk.

(3) A permanent vent shall be provided at the top of the service shaft of cross-sectional, area not less than 460 sq. cm. or 6.25 cm. for each 900 sq.cm. of the area of the shaft, whichever is more.

10. **Refuse chutes and refuse chambers** — (1) Hoppers under refuse chutes shall be situated in a well ventilated position and the chutes shall be continued upwards with an outlet above roof level and with an enclosure wall of non-combustible material with fire resistance of not less then two hours. The hoppers shall not be located within the staircase enclose.

(2) Inspection panels and hopper (charging station) openings shall be fitted with light fitting metal doors, covers, having a fire resistance of not less than one hour. Flap doors/covers i.e. push-in or lift-up type shall not be permitted.

(3) Refuse chutes shall not be provided in staircase walls and air conditioning shafts, etc.

(4) Refuse chambers shall have walls and floors or roofs constructed of non-combustible and impervious material and shall have a fire resistance of not less than two hours. They shall be located at a safe distance from exit routes.

11. **Building Services.** — (1) **Electrical Services** — (a) The electric distribution cables/ wiring shall be laid in a separate duct. The duct shall be sealed at every alternate floor with non-combustible materials having the same fire resistance as that of the duct.

(b) Water mains, telephone lines, inter-com lines, gas pipes or any other service line shall not be laid in the duct for electric cables.

(c) Separate circuits for water pumps, lifts, staircase and corridor lighting and blowers for the pressurising system shall be provided directly from the main switch gear panel and these circuits shall be laid in separate conduit pipes so that a fire in one circuit will not affect the others. Master switches controlling essential services circuits shall be clearly labelled.

(d) The inspection panel doors and any other opening in the shaft shall be provided with air-tight fire doors having a fire resistance of not less than two hours.

(e) Medium and low voltage wiring running in shafts, and within a false ceiling, shall run in metal conduits.

(f) An independent and well-ventilated service room shall be provided on the ground floor with direct access from outside or from the corridor for the purpose of termination of electric supply from the licensees' service and alternative supply cables. The doors provided for the service room shall have fire resistance of not less than two hours.

(g) If the licensees agree to provide meters on upper floors, the licensees' cables shall be segregated from consumers' cables by a partition in the duct. Meter rooms on upper floors shall not open into staircase enclosures and shall be ventilated directly to open air outside.

(h) PVC cables should have an additional sheathing or protection provided by compounds sprayed on after installation.

(2) **Town gas/L.P. Gas supply pipes** — These pipes shall be run in shafts exclusively for thie purpose and shall be on external walls, away from the staircases. There shall be no interconnection between these shafts and the rest of the floors, Gas meters shall be housed in a suitable constructed metal cupboard located in a well ventilated space at ground level.

(3) **Staircase and Corridor Lightings.** — (a) The staircase and corridor lighting shall be on separate circuits and shall be independently connected so that they could be operated by one switch installation on the ground floor easily accessible to fire-fighting staff at any time irrespective of the position of the individual control of the light points, if any.

(b) Staircase and corridor lighting shall also be connected to alternate supply as defined in sub-Regulation (4). However, for assembly and institutional buildings less than 24 m. when the alternate source of supply may be provided by battery continuously trickle-charged from the electric mains.

(c) Double throw switches should be installed to ensure that the lighting in the staircase and the corridor do not get connected to two sources of supply simultaneously. A double throw switch shall be installed in the service room to terminate the stand-by-supply.

(d) Emergency lights shall be provided in the staircases/corridors for multi-storeyed high-rise and special buildings.

(4) **Alternate source of electric supply.** — A stand-by electric generator shall be installed to supply power to staircase and corridor lighting circuits, fire lifts, the stand-by fire pump, pressurisation fans and blowers, smoke extraction and damper systems in case of failure of normal electric supply. The generator shall be capable of taking starting current of all the machine and circuits stated above simultaneously. If the stand-by pump is driven by diesel, engine, the generator supply need not be connected to the stand-by pump.

(5) **Transformers** —

(a) If transformers are housed in a basement, they shall be necessarily in the first basement in a separate fire resisting room of four hours rating, at the periphery of the basement. The rooms shall be protected by carbondioxide or BCF fixed installation system to protect transformers. The entrance to the room shall be provided with a steel door of two hours' fire rating. A curb (sill) of a suitable height shall be provided at the entrance in order to prevent the flow of oil from a ruptured transformer into other parts of the basement. Direct access to the transformer room shall be provided preferably from outside. The switch gears shall be housed in a separate room separated from the transformer bays by a fire resisting wall with fire resistance of not less than four hours.

(b) If housed in basement, the transformer shall be protected by an automatic high pressure water spray system (emulsifying).

(c) Transformers housed at ground floor level shall be cut-off from the other portion of the premises by fire resisting walls of four hours' fire resistance.

(d) They shall not be housed on upper floors.

(e) A tank of RCC construction of capacity capable of accommodating the entire oil of the transformers shall be provided at lower level, to collect the oil from the catch-pit in an emergency. The pipe connecting the catch-pit to the tank shall be of non-combustible construction and shall be provided with a flame-arrester.

(6) **Air-conditioning** —

(a) Escape routes like staircases, common corridors, lift lobbies etc. shall not be used as return air passages.

(b) The ducting shall be constructed of substantial guage metal in accordance with IS : 655-1963 Metal Air Ducts (Revised).

(c) Wherever the ducts pass through fire-walls or floors, the opening around the ducts shall be sealed with fire-resisting materials such as asbestos rope or verniculite concrete glass wool.

(d) As far as possible, metallic ducts shall be used even for the return air instead of space above the false ceiling.

(e) The materials used for insulating the duct system (inside or outside) shall be of non-combustible materials such as glass wool, spun glass neoprene facing.

(f) Area more than 750 sq.m. on an individual floor shall be segregated by a fire-wall and automatic fire dampers for isolation shall be provided where the ducts pass through fire walls. The fire dumpers shall be capable of operating manually.

(g) Air ducts serving main floor areas, corridor, etc. shall not pass through the staircase enclosure.

(h) The air handling units shall be as far as possible be separate for each floor and air ducts for every floor shall be separate and in no way interconnected with the ducting of any other floors.

(i) Automatic fire dampers shall be provided at the inlet of the fresh air duct and the return air duct of each compartment on every floor. They shall be so arranged as to close by gravity in the direction of the air movement and to remain tightly closed upon operation of a smoke detector.

(j) If the air handling unit serves more then one floor, the requirements given above shall be complied with in addition to the conditions given below :-

  (i) Proper arrangements by way of automatic fire dampers working on smoke detectors for isolating all ducting at every floor from the main riser shall be made.
  (ii) When the automatic fire alarm operates, the respective air handling units of the airconditioning system shall automatically be switched off.

(k) The air filters of the air-handling units shall be of non-combustible materials.

(l) The air handling unit room shall not be used for storage of any combustible materials.

(m) Inspection panels shall be provided in main trunking to facilitate the cleaning of the duct of accumulated dust and to obtain access for maintenance of fire dampers.

(n) No combustible material shall be fixed nearer than 15 cm. to any duct unless such duct is properly enclosed and protected with non- combustible material (glass wool or spun glass with neoprene facing enclosed and wrapped with aluminium sheeting) at least 3.2 mm. thick and which does not readily conduct heat.

(o) Materials used for false ceilings, runners and suspenders shall be of non-combustible type.

(7) **Boiler room** — Boiler and boiler rooms shall conform to the Indian Boilers Act. The following additional aspects should be taken into account in the location of boiler/ boiler room :-

(a) Boilers shall not be allowed in a lower basement but may be allowed in basement at first level and away from the escape routes.

(b) The boilers shall be installed in a fire-resisting room of 4 hours' fire resistance rating situated on the periphery of the basement. Catch-pit shall be provided at the low level.

(c) Entry to this room shall be provided with a composite door of two hours' fire resistance.

(d) The boiler room shall be provided with fresh air inlets and smoke exhausts directly to the atmosphere.

(e) The furnace oil tank for the boiler, if located in the adjoining room, shall be separated by-fire resisting walls 4 hours' rating. The entrance to this room shall be provided with double composite doors. A kerb of suitable height shall be provided at the entrance in order to prevent the flow of oil into the boilder room in case of tank rupture.

(f) Foam inlets shall be provided on the external walls of the building near the ground level to enable the fire services to use foam in case of fire.

12. Provision of First Aid and Fire-fighting Appliances —

(1) First-aid fire fighting equipment shall be provided on all floors including basements, lift rooms, etc. in accordance with IS : 2217-1963 Recommendations for providing First-Aid Fire Fighting Arrangements in Public Buildings.

(2) The fire fighting appliances shall be distributed over the building in accordance with IS : 2190 - 1971 Code of Practice for Selection, Installation and

Maintenance of Portable First-Aid-Fire Appliances.

13. Fixed fire-Fighting Installations —

(1) Buildings shall be protected by wet riser, wet riser-cum-down comer, automatic sprinkler, installation, height pressure water spray or foam generating system as prescribed in sub-regulation (2) to (7) below :-

(2) The wet riser/riser-cum-down comers' installation with capacity of water storage tanks and fire pumps shall conform to the requirements specified in Table 24 hereunder.

Note 1 —
Any of the above categories may incorporate an automatic sprinkle/adrencher system, if the risk is such that it requires such protective methods.

Note 2 —
A minimum of two hydrants shall be provided within a courtyard.

Note 3 —
Wet riser - cum - down comer is an arrangement for fire fighting within the building by means of vertical rising mains of not let than 10 cm. internal dia. with hydrant and hose reel on each floor landing connected to an overhead water/storage tank for fire fighting purpose, through a booster pump, check valve and a non-return valve near the tank, end and a fire pump, gate and non-return valve over the underground static tank A fire service inlet at ground level fitted with a non-return valve shall also be provided to the rising main for charging it by a fire service pump in case of failure of static fire pumps over the underground static tanks.

Note 4.–
The performance of pumps specified above shall be at R. P. M. not exceeding 2,000.

Note 5.–
The above quantities of water shall be exclusively for fire fighting and shall not be utilised for domestic/or other use. The layout of underground static water tank shall be as per sketch attached.

Note 6.–
The size of the riser in non-residential buildings over 24 m. high shall be 15 cm (internal dia) with twin hydrant outlets and hose reel on each floor.

Note 7.–
A facility to boost water pressure in the rise directly from the mobile pump shall also be provided to the wet riser system with suitable fire service inlets (collecting head with two 63 mm inlets for 10 cm rising main and four 63 mm inlets with check valves for 15 cm. diarising main) and a non-return valve and a gate valve.

Note 8.–
Hose Reel– The Internal diameter of rubber hose reel shall be a minimum of 19 mm. A shut-off branch with a nozzle of 4.8 m. size shall be provided.

(3) **Wet Riser Installations.**– They shall conform to IS: 3644-1966 Code of Practice for Installations of Internal Fire Hydrants in multistoreyed or high-rise buildings. In addition, the wet riser shall be designed for Zonal distribution ensuring that unduly high pressure does not develop in risers and hose pipes.

In addition to wet riser, wet riser cum down comer, first aid hose reels shall be installed on the floors of buildings above 24 m. and shall conform to IS:884-1969 Specifications for First Aid Hose Reel for Fire Fighting (Fixed Installation). The first aid hose reel shall be connected to one of the female couplings of twin couplings of landing valve directly to the wet riser in the case of single outlet of the wet riser installations by mean of adapter:–

(i) **Static Water Storage Tank.** – (i)A satisfactory supply of water for the purpose of fire fighting shall always be available in the form of an underground static storage tank with capacity specified for each building with arrangements of replenishment storage water supply should easily be accessible to fire engines. Provision of suitable number of manholes shall be made available for immersion, repairs and inspection of suction hose etc. The covering slab shall be able to withstand a vehicular load of 18 tonnes. The domestic suction tank connected to the static water storage tank shall have an overflow capable of discharging 2250 litres per minute to a visible drain point from which by a separate conduit the overflow shall be conveyed to a storm drain.

(ii) To prevent stagnation of water in the static water storage tank, the suction tank of the domestic water supply shall be fed only through an overflow arrangement to maintain the level therein at the minimum specified capacity.

(iii) The static water storage tank shall be provided with a fire brigade breaching with four 63 mm dia. (two of 63 mm dia for pump with capacity 1400 liter / minute) instantenous male inlets arranged in valve

box at a suitable point at street level and connected to the static tank by a suitable fixed pipe of not less than 15 cm. dia. to discharge water into the tank when required at a rate of 2250 liters per minute.

(iv) Typical layout of wet riser-cum-down comer are shown in graphic illustration.

(v) **Automatic Sprinklers.**– Auto-sprinklers shall be installed-

(a) in basements used as car parks except in apartment buildings and residential hotels if the area exceeds 500 sq. m.

(b) in basements of multistoreyed and high rise-buildings used as car parks and for permissible essential services ancillary to a particular occupancy;

(c) in any room or other compartment of a building exceeding 500 sq. m.

(d) in department stores or shops in an area exceeding total of 750 sq. m.

(e) in all non-domestic floors of mixed occupancy considered to consitute a hazard and not provided with staricase independent of the remainder of a building;

(f) in godowns and warehouses as considered necessary;

(g) in dressing rooms, scenery decks, stages and stage basements of theatres.

(5) **Automatic High Pressure Water Spray (emulsifying).**– This system shall be provided for protection of indoor transformers of a substation in a basement area.

(6) **Foam Generating System.**– This system shall be provided for protection of boiler rooms with ancilary storage of furnace oils in basement.

(7) **Carbon-dioxide (CO_2) Fire Extinguishing System.**– Fixed CO_2 fire extingushing installation be provided as per IS:6382-1971 Code of Practice for Design and Installation of Fixed CO_2 Fire Extingushing System on premises where water or foam cannot be used for extingushing fire because of the special nature of the contents of the buildings/areas to be protected. Where possible, BCF installation may be provided instead of CO_2 installation.

14. **Fire Alarm, System.**– All buildings mentioned below shall be equipped with fire alarm systems as given below :-

(i) Special buildings above 15 m. in height and Business and Industrial buildings above 24 m. in height.– (a) Such buildings shall be equipped with a manually-operated electrical fire alarm system with one or more call boxes located at each floor. The call boxes shall be so located that one or the other of them shall be accessible to all occupants of the floor without having to travel more than 22.5 m.

(b) The calls boxes shall be of the 'break-glass' type without any moving parts where the call is transmitted automatically to the control room without any other action on the part of the person operating the call box.

(c) All call boxes shall be wired in a closed circuit to a control panel in the control room located as given in this rule so that the floor number where the call box is actuated is clearly indicated on the control panel. The circuit shall also include one or more batteries with a capacity of 48 hours normal working at full load. The battery shall be arranged to be continuously trickle-charged from the electric mains. The circuit may be connected to an alternate source of electric supplyas in sub-regulation (4) in Regulation 11 in this Appendix.

(d) The call boxes shall be arranged to sound one or more sounders so as to ensure that all occupants of the building are warned whenever any call box is actuated.

(e) The call boxes shall be so installed that they do not obstruct the exit-ways and yet their location can easily be noticed from either direction. The base of the call box shall be at a height of 1 m. from the floor level.

(ii) All other buildings exceeding 24 m. height excluding those mentioned in clause (i) Above.–

These buildings shall, in addition to the manually-operated electrical fire alarm system, be equipped with an automatic fire alarm system. The latter shall be addition to any automatic fire-extinghishing system in any particular occupancy in accordance with these rules. The detectors for the automatic fire alarm shall conform to the relevant IS Specification Heat Smoke Sensitive Type Fire Detector and th system shall be installed in accordance with IS:2189-1976 Code of Practice for Automatic Fire Alarm System of any other relevant Indian Standard, prescribed from time to time:

Provided that no automatic detector shall be required in any room or portion of a building which is equipped with an approved installation of automatic sprinklers.

15. **Lightning Protection of Buildings**.– The lightning protection systems for buildings shall be in accordance with the provisions of Part III, National Building Code of India.

16. **Control Room.**– For all buildings mentioned in Regulation 14 in this Appendix except residential buildings, there shall be a control room on the entrance floor of the building with communication system (suitable public address system) to all floor planers along with the details of fire fighting equipment and installations shall be maintained in the control room. The control room shall also have facilities to detect a fire on any floor through indicator boards connecting fire detecting and alarm systems on all floors. The staff in charge of the control room shall be responsible for the maitenance of the various services and fire fighting equipment and installations. Control room shall be manned round the clock.

17. **Fire drills and fire orders.**– Fire notices/orders shall be prepared indicating the requirements of fire fighting and evacuation of the building in the event of fire or other emergency. Occupants shall be throughly familiarised with their contents and action needed in the event of any emergency. Such notices should be displayed prominently

18. With the approval of Government, The Commissioner, in consultation with the Chief Fire Officer, may, from time to time, add to, alter or amend the provisions in this Appendix.

TABLE 24 FIRE FIGHTING INSTALLATION REQUIREMENTS

Serial No.	Type of the Building / Occupancy	Requirements				
		Water Supply			Pump Capacity	
	static tank	Type of Installation Tank	Underground static tank	Terrace Tank	Near the underground	Terrace Level
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.	Residential buildings below 15 in Ht.	Nil	Nil	Nil	Nil	Nil
2.	Residential buildings -					
	a) Above 24 m. and not exceeding 35 mm with shopping area upto 250 sq.m and restricting the shopping area to the ground floor only.	Wet riser-cum-down comer	50,000 litres	20,000 litres	1,400 litres per minute giving a pressure not less than 3.2 kg./cm.^{2} at the topmost hydrant	900 litres per minute giving a pressure not less than 2.1 kg/cm.^{2} at the topmost hydrant.
	b) Above 24 m and not exceeding 35 m. with shopping area exceeding 250 sq. m	Wet riser-cum-down comer	1,00,000 litres	20,000 litres	1,400 liters per minute giving a pressure not less than 3.2 kg./cm^2 at the topmost hydrant	900 liters per minute giving a pressure not less than 2,1 kg/cm^2 at the topmost hydrant.
	c) Exceeding 24 m but not exceeding 45 m	Wet riser-cum-down comer	50,000 litres	20,000 litres	1,400 liters per minute giving a pressure not less than 3,2 kg./cm^2 at the topmost hydrant	450 liters per minute giving a pressure not less than 2,1 kg/cm^2 at the topmost hydrant.
3.	Non-residential buildings					
	a) Upto 15 m in height exceeding 24 m. in height	Nil	50,000 litres	Nil	Nil	Nil
	b) Above 15 m. but not exceeding 24 m.in height except educational buildings	Wet riser-cum-down comer	50,000 litres	10,000 litres	1,350 liters per minute giving a pressure not less than 3,2 kg./cm^2 at the topmost hydrant	450 liters per minute giving a pressure not less than 2,1 kg/cm^2 at the topmost hydrant.
	c) Above 15 m. but not exceeding 24 m.in height educational buildings	Wet riser-cum-down comer	Nil	10,000 litres	Nil	Nil
	d) Above 24 m but not exceeding 45 m.	Wet riser-cum-down comer	75,000 litres	20,000 litres	2,400 litres per minute giving a pressure not less than 3.2 kg./cm^2	450 liters per minute giving a pressure not less than 2,1 kg/cm^2 at the topmost hydrant.

PLANNING REQUIREMENTS AND GUIDELINES FOR STAR CATEGORY HIGH RISE RESIDENTIAL HOTEL BUILDINGS

1. **ACCESS :**

Entrance gates of not less than 4.5 mtrs. width each shall be provided to the site at the locations marked on the plan by C.F.O. Archways, if any provided to the entrance gates shall have height clearance of not less than 4.6 mtrs.

2. **COURTYARDS / OPEN SPACES**

i) Countryards upto a distance as specified from the building line shall be sufficiently hardened to bear the load of fire engines weighing upto 28 m. tonnes each. The same shall be in one plane.

ii) No encroachment shall be permitted on these paved courtyards.

3. **CANOPY :**

The height of the entrance canopy shall not be less than 5.15 mtrs.

4. **RAMPS :**

The ramps provided to the basement level shall have gradient not be steeper than 1:10.

5. **CAR PARKING :**

i) Car Parking shall be restricted at Ground Floor and in the basement, unless permitted elsewhere.

6. **BASEMENT :**

i) In case the staircases have been provided to the basement, either directly entering from outside or from the occupied areas on ground floor, shall be as per the directives of C.F.O.

ii) All the basement staircases shall be of enclosed type and shall have half an hour fire resistance self closing door placed in the enclosed walls of the staircase.

ii) Natural ventilation to the basement shall be provided through ventilation trenches / ventilation cutouts. In addition, mechanical ventilation shall be provided to the basement, as per rules.

7. **STAIRCASES :**

i) The layout of the staircases shall be of enclosed type throughout their height and shall be approached at each floor level through half an hour fire resistance self closing door (45 mm thickness) placed in the enclosed walls of the staircase. The width of the flight shall not be less than 1.5 mtrs.

ii) Permanent vent at the top equal to 5% of the cross sectional area of the staircase shall be provided.

iii) Openable Sashes or R.C.C. grills with clear opening of not less than 0.5 sq. mtr. per landing on the external wall of the staircase shall be provided.

iv) All the staircases of the building upto the level where direct ventilation is not available, shall be pressurised with positive air pressure of 5 mm water Guage.

8 **GUEST ROOM ENTRANCE DOORS :**

Guest Room doors shall be of solid core having fire resistance of not less than half an hour (solid wood of 45 mm thickness).

9. **FIRE LIFT AND OTHER LIFTS :**

i) Walls enclosing lift shafts shall have fire resistance of not less than two hours.

ii) Shafts shall have permanent vent of not less than 0.2 sq. mtr. in clear area immediately under the machine room.

iii) Landing doors and lift car doors shall be of steel shuttered with fire resistance of one hour. No collapsible doors / shutters shall be permitted.

iv) All the lifts shall be converted into Fire Lifts and these shall be as per the specifications laid down under the regulations and shall be provided with grounding switches.

v) Except few of the lifts leading to the basement, all the passenger / service lifts shall terminate at ground floor level only. The lift lobbies of the lifts terminating at basement level shall be pressurised with positive air pressure of 5 mm Water Guage.

10. ELECTRIC CABLE SHAFTS AND ELECTRIC METER ROOM

i) Electric cable shafts shall be exclusively used for electric cables and shall not open in the staircase enclosure.

ii) Inspection door for the shaft, if provided, shall have two hours fire resistance.

iii) Electric Meter Rooms shall be provided at ground floor level. They shall be adequately Ventilated.

iv) Electrical shafts shall be sealed at each floor level with non-combustible material such as vermiculite concrete.

11. OTHER SHAFTS AND SERVICE DUCTS :

i) Other shafts and service ducts shall be sealed at each floor level with
non-combustible material such as vermiculite concrete.

ii) Door openings if any provided to these ducts shall have fire resistance of not less than two hours.

12. A. C. SYSTEM

i) The A.C. system shall be of chilled water type.

ii) As far as possible, guest rooms shall be provided with separate coil units.

iii) Escape routes like staircases, common corridors, lift lobbies, etc. shall not be used as return air passages.

iv) The A.C. ducts shall be constructed of substantial metal gauge in accordance to I.S. : 655:1963 for Metal Air Ducts (revised).

v) Wherever ducts pass through walls, the opening around the duct shall be sealed with fire resisting material such as asbestos rope or

vermiculite concrete.

vi) For return air metal ducts shall be used.

vii) The materials used for insulating the duct (inside or outside) shall be of
non-combustible material such as glass wool, spunglass with neoprene facing etc.

viii) A.H.Us. shall be separate for each floor / areas, and they shall not be in any way interconnected with the ducting of any other floors or areas.

ix) Air filter of A. H. U. shall be of non-combustible materials.

x) A. H. U. rooms shall not be used for storage of any combustbile material.

xi) The materials used for false ceiling and its runners and suspenders shall be of
non-combustible type.

13. ELECTRIC GENERATOR ROOM

i) Electric generator room if located in the basement shall be provided with adequate ventilation and also with independent exhaust system directly connected to the outside air. Separate wall of the generator room shall have fire resistance of not less than four hours.

ii) Entrance doors of the Generator Room shall have fire resistance of not less than one hour.

iii) Door sill of 15 cms. height shall be provided for the doors of the Generator Room.

14. TRANSFORMER ROOM :

i) The electric transformer shall be of dry type.

ii) Separating wall of the transformer room shall have four hours fire resistance.

iii) Adequate ventilation through the side ventilators shall be provided to the transformer room.

iv) Entrance door to the transformer room shall have one hour fire resistance.

15. **KITCHEN ROOM :**

The kitchen room shall be adequately ventilated and the cooking areas in the kitchen shall be provided with metalic hoods connected with exhaust ducting. These hoods shall be provided with grease filters.

16. **EXIT SIGNS :**

Luminous exit signs shall be provided on all the floors including basement showing the direction of escape.

17. **EMERGENCY ESCAPE ROUTE SIGNS :**

Emergency exit route plans, framed in glass, shall displayed at the back of each entrance / exit door including guest rooms and after every 10 mtrs. in each common corridor / passage on all the floors including basement.

18. **FIRE ALARM SYSTEM :**

The building shall be provided with manual fire alarm system with main control panel at ground floor level and pill boxes and hooters at each upper floor level, as well as basement. The Layout of the fire alarm system shall be in accordance to the I.S. Specifications/T.A.C. standards.

19. **AUTOMATIC SMOKE DETECTION AND FIRE ALARM SYSTEM :**

The entire building including basement shall be provided with automatic smoke detection system with main console panel at ground floor level.

20. **RATE OF RISE DETECTORS :**

Rate of rise detectors shall be installed in the hot areas i.e. kitchen, pantry, electric generator room and the transformer room and the same shall be connected to main console at ground floor level.

21. **PUBLIC ADDRESS SYSTEM :**

The entire building shall be provided with P.A. SYSTEM and shall be connected to console panel at ground floor level. The P.A. System shall be so designed that in case of emergency, instructions can be given

either floor or zone wise or for the entire building.

22. **ESCAPE ROUTES :**

a. Combustible lining or any material which evolves toxic gases when heated orburning shall not be permitted in common corridors, staircases and all the escape routes.

b. Carpets, if provided in common corridors, shall be treated with fire retardant rating for one hour.

23. **FIRE FIGHTING REQUIREMENTS :**

i) **UNDERGROUND WATER STORAGE TANK.**

An underground water storage tank of capacity as per the requirement of C.F.O. shall be provided at ground level or at basement at location approved by C.F.O. and it shall be as per the design specified in the rules with baffle wall and fire brigade collecting head shall be connected to the wet risers, automatic sprinkler system and couryard hydrant system.

ii) **WET RISER.**

Wet riser of required internal diameter of G.I."C". class pipe shall be provided at midlanding in the duct adjoining each staircase with hydrant outlets and hose reel on each floor in notches in such a way as not to reduce the width of the staircase, pressure reducing discs or shall be provided at lower level so as not exceed pressure of 5.5 Kgs/sq.cm. A Fire service inlet on the external face of the building near the static tank directly fronting the court yards shall be provided to connect the mobile pump of the fire service to the wet riser. The wet riser shall be extended upto basement. The wet riser system shall be of pressurised type and automatic in operation.

iii) **AUTOMATIC SPRINKLER SYSTEM**

a. The entire building including basement shall be provided with automatic sprinker system as per the relevant BIS / TAC standards.

b. Car parking area in the basement shall be zonalised as required by C.F.O. On the entire periphery or each zone, water curtain system shall be provided by locating medium Velocity water sprays, serve as fire separation between two zones in case of emergency.

iv) **FIRE PUMP, SPRINKLER PUMP AND JOCKEY PUMP**

a. Wet riser shall be connected to a fire pump at ground level of capacity not less than 1800 litres / min. capable of giving a pressure of not less than 3.2 kgs./sq. cms. at the topmost hydrant. A separated jockey pump shall be provided for maintaining the system pressurised at all times.

b. Separate sprinkler pump alongwith jockey pump shall be provided for the automatic sprinkler system.

c. Electric supply (normal) to these pumps shall be on independent circuit.

v. **EXTERNAL HYDRANTS.**

Required number of hydrants shall be provided within the confines of the site on the wet risers.

vi. **ALTERNATE SOURCE OF POWER SUPPLY**

An alternate source of L.V./H.V. supply from a separate sub station with appropriate change over switch shall be provided for fire pump sprinkler pump, jockey pumps, fire lifts, staircase and corridor lighting circuits, manual fire alarm system, smoke detection system and the electric fans for pressurising the staircase in the core, it shall be housed in a separate cabin.

vii **PORTABLE FIRE EXTINGUISHERS**

a. One dry chemical powder type fire extinguisher of 5 kgs. capacity having ISI certification mark and two buckets filled with dry, clean sand shall be kept in Electric Meter Room as well as in Lift Machine Room

b. Dry chemical powder type fire extinguishers of 10 kgs. capacity having ISI certification mark and buckets filled with dry, clean and shall be kept spread over the entire basement, as specified by C.F.O.

24. REFUGE AREA :

Refuge areas shall be provided as per the requirements of the Chief Fire Officer, with the following facilities:-

i.) Entrance door to the refuge area shall be painted or fixed with a sign painted in luminous paint mentioning "REFUGE AREA IN CASE OF EMERGENCY".

ii) Adequate drinking water facilities shall be provided in the refuge area.

iii) Adequate emergency lighting facility connected to the electric circuits of staircase, corridor / passages etc. shall be provided.

Note : Please refer guide lines and norms for providing refuge area, in this book.

25. **FIRE OFFICER :**

A qualified Fire Officer, with minimum academic qualification of 12th Standard, with Science subjects and the minimum technical qualifications of Diploma from the National Fire Service College or its equivalent shall be appointed on full time basis for looking after the fire prevention, evacuation, escapes, repairs, maintenance and upkeep of the fire protection and fire fighting equipment, as also to train the security staff and selected persons using the premises.

The qualified Fire Officer, as mentioned above shall be appointed simultaneously with the occupation of the premises and the selection of the Officer shall be made in consultation with the Chief Fire Officer, Mumbai Fire Brigade.

Note : The above requirements are general and shall be modified / amended by the C.F.O. as per the merit of respective proposal.

GUIDE LINES FOR CINEMA / THEATRE REQUIREMENTS

Over and above general requirements of Fire Safety for High Rise and Special Type of Buildings following additional requirements are applicable to Cinema / Theatre which are termed as Assembly Buildings :

1) The requirements of Cinematograph Act and Rules shall be complied with in respect of the Staircases, Exits, Escape Routes, Lighting etc. in the Cinema / Theatre.

2) The necessary N.O.C. from P.W.D. Department shall be obtained.

3) Accoustic and thermal insulation shall be of non-combustible materials.

4) All the electrical wiring shall be in metal conduit continuously bonded to earth.

5) Air-condition system shall be of chilled water type.

6) A.C. ducting shall be of substantial metal gauge as per Indian standard specifications.

7) Insulation of the ducting shall be of non-combustible materials.

8) Air handling units in the cinema theatre portion shall be exclusive and independent. It should not serve any other accommodations.

9) The wet riser-cum-down commer shall be provided to the cinema theatre with hydrant outlet with a box containing one hose length of 15 mtrs. of 2½" diameter along with the branch pipe shall be provided near the screen of the cinema theatre.

10) Two soda acid type fire extinguisher of 9 ltrs. capacity each with I.S.I. certification mark and four buckets filled with dry clean sand shall also be provided near the screen of the cinema theatre.

11) One dry chemical powder type fire extinguisher of 5 kgs, capacity with I.C.I. certification mark and two buckets filled with dry clean sand shall be provided in the corridor in front of the projection room.

12) Suspenders to false ceiling shall be of non-combustible materials.

13) Flooring shall be of non-combustible materials.

14) P.V.C. flooring shall not be provided.

REQUIRED FIRE RESISTANCE FOR BUILDING MATERIAL / CONSTRUCTION

(Ref : Appendix VIII - D.C.R. 1991)

Sr. No.	Description	Rating of Fire Resistance
1	STAIRCASE	
	Walls	3 hrs.
	Ceiling	2 hrs.
2	CORRIDORS	
	Walls	1 hrs.
	Doors	1 hrs.
3	STAIRCASE ENCLOSURE	
	Walls	2 hrs.
	Doors	1/2 hrs.
4	LIFT ENCLOSURES	
	Walls	2 hrs.
	Landing Doors	1 hrs.
	Closing Smoke Stop Doors	½ hrs.
	Basement F.R. Doors	2 hrs.
	Self Closing Doors	1 hrs.
5	FIRE LIFT	
	Automatic Gates	1 Hrs.
6	FLOOR SPACE DIVISION (FIRE SEC.)	
	Walls	2 Hrs.
7	SERVICE DUCTS	
	Walls	2 Hrs.
	Doors	2 Hrs.
8	REFUSE CHUTES & REFUSE CHAMBERS	
	Roof	2 Hrs.
	Doors	1 Hrs.
	Walls / Floors	2 Hrs.

9	BUILDING SERVICE / ELECTRICAL SERVICES	
	Doors	2 Hrs.
10	TRANSFORMERS	
	In first basement	
	Doors	2 Hrs.
	Walls	4 Hrs

Notes : i) For Construction purpose Non-Combustible materials should be used.

ii) For more details, Part IV "Fire Protection" of National Building code of India may please be referred.

CONCEPTS IN THE DESIGN FOR FIRE SAFETY IN TALL BUILDINGS

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Introduction

With rapid growth of urban centres and the advancement of technology in the construction of tall structures, there has been considerable focus on the design for the safety in tall buildings.

Within the economic and environmental sphere of most modern urban metropolis, the pressure for building taller and taller buildings to maximise land use increases by the day. At the same time, the dictates of building economics demand that maximum area at every floor of tall buildings be convertible to profitable real estate.

The critical problem of the fire safety in tall buildings is related to the height of tall buildings. Converted to aspects affecting life safety, height in tall buildings places specific demands on time. In reality, the time factor concerns the rate of spread of fire and smoke, the time involved in evacuation, rescue, fire fighting and preservation of the building structure and envelope.

Thus, an effective concept should be resolved around the idea of reducing the amount of time required for occupants to secure safety. The normal concept is through the provision of 'protected' areas. Each floor of a tall building, when designed as compartment floors, serves the purpose of fire separation, Protected exit staircases may serve as safe areas together with its primary function as as escape route. Perhaps height of tall buildings.

Tall buildings may be effectively subdivided into vertical 'for zones'. By the result of reducing effective height, the rate of spread of fire and smoke may be reduced, more time may be available for evacuation and fire fighting and less time may be required for evacuees to arrive at safe areas of refuge. The building layout may also be designed in such a way that, dependency on fire management and evacuation procedures may be greatly reduced, thus reducing the dependency on direct human intervention in guaranteeing the safety for occupants. There is therefore a constant need to devise means by which tall buildings can be designed to be as fire-safe as possible.

The Singapore Practice

The progression from a colonised state to that of a developed nation also means that Singapore had its foundations rooted in the practice and administrative traditions of the past. Many of its current laws and regulations correspond with the standards propounded by the more developed nations. It is only recently and with confidence achieved through experience that Singapore began to re-organise some of its practices. The Fire Code is document which Singapore is constantly reviewing and revising, to focus its requirements closely with the demands of industry, the practice and implementation procedures and in response to the local climatic conditions.

The demands of fire safety provisions in tall buildings is closely related to the means of escape procedures, the time factor, demands on protection of occupants and building structure, and the availability of means for internal/ external firefighting and rescue. Thus, requirements become much more stringent as buildings increase in height. The following paragraphs outline those provisions which are required to be provided for buildings particularly because of the height factor.

Buildings of up to 4 Storeys

These are considered as low-rise developments. Evacuees should be able to enter and discharge from exit staircases with considerable ease. While exist staircases are required to be protected, entry into such exist staircases my be direct, without the need to resist smokestop lobbies (fig. 1). Protection of elements of structure normally do not exceed one hour. Fire-fighting and rescue is expected to be engaged from the outside through access openings distributed along the perimeter of the building envelope.

Automatic sprinkler protection of the building is not required except when the size limit of compartmentation has been exceeded. A maximum of up to 3 storey levels per compartment is permitted.

Building exceeding 4 storeys but not exceeding 24 metres in habitable height.

The increase in building height above 24 storeys requires an increase in the protection of exit staircases such that exit staircases must be designed to prevent smoke retention or infiltration.

Direct entry into exit staircases may only be permitted if the exit staircase is adequately cross-ventilated or is 'externalised' (Figs. 2 and 3). 'Internalised' exit staircases which cannot be naturally ventilated are required to be 'pressurised'.

Such exit staircases may also be entered direct' (Fig. 4).

Other than the instance as stated above, the entry condition into exit staircases must be 'smoke-free', i.e. either through an external corridor or through a smoke-stop lobby (Fig. 5).

There is normally no requirement to further increase the protection of elements of structure. Compartmentation requirements remain unchanged with no mandatory requirements for installation of automatic sprinklers.

Firefighting and rescue is expected to be engaged from the outside. Hardstandings may be required to accommodate firefighting appliances. Access openings are required to be provided along the external walls of the building, the numbers being dictated by the size of the building.

Building, exceeding 24 metres but not exceeding 60 metres in habitable height.

A 'high-rise' building may able defined as a buildings which is beyond the height which could be supported by effective external firefighting and rescue. Within the Singapore context, the limit for effective external firefighting was established at 24 metres habitable height, although the current available firefighting appliances, i.e. turntable ladders and hydraulic platforms. are capable of reaching heights beyond 24 metres.

For buildings which exceed 24 metres but do not exceed 60 metres, an integrated set of provisions for internal firefighting which includes a fire lift, firefighting exit staircase, dry riser with landing valves located within a firefighting smoke-stop lobby becomes a requirements (Fig. 6). The fire lift is required to be connected to a secondary 'emergency' power supply for operation by the firefighting brigade in the event of power failure.

At the ground level of the building, a fire command centre with voice-communication equipment is mandatory, for management of fire safety and emergency procedures. The requirement for the protection of exit staircases and the need for smoke free exit staircases remain unchanged from the previous category of buildings. The protection of elements of structures are required to be increased. For example, in the case of a building used solely as offices, the fire resistance for elements of structure has to be increased on the lower levels, the fire resistance for elements of structure has to be increased to two hours.

compatmentation requirements similar to the previous category of buildings is enforced for the part of the building up to 24 metres in habitable height. i.e no compartment is permitted to exceed 3 storey levels. On the higher levels, every

storey is required to be compartment (Fig. 7). The entire building is also required to be protected by an automatic sprinkler system. (For residential high-rise buildings, there is no requirement for the installation of an automatic sprinkler system).

The requirements for access openings and hardstanding for firefighting appliances remain unchanged, to cater for external firefighting rescue to the lower levels of the buildings which are within reach of the appliances.

Building Exceeding 60 Metres in Habitable Height

The additional requirements for buildings which exceed 60 metres in habitable height are focused mainly on the internal firefighting provisions and on improving the safety protection of vertical exist. many pumping appliances may be incapable of delivering water to levels above 60 metres in height. Dry rising mains are therefore required to be replaced by fully chargèd 'wet risers'. With a ready supply of water, less time is required in preparation for internal firefighting. In addition to the fire lift, at least one other passenger lift with provision for landing at every storey level is required to be connected to a secondary power supply. This provision effectively enables the firefighting brigade to utilise another means of rapid vertical transportation in an emergency. Exist staircases are required to be entered through smoke-free conditions at every storey level. This requirement is extended to exit staircases which are 'pressurised', thereby increasing the level of protection to such vertical exits.

Appraisal of the Singapore Practice

The measures adopted to achieve an improved level of fire safety in singapore recognise the essential aspects which are required to make all buildings safer. Horizontal compartmentation at every storey level for the higher floors provide the necessary isolation of individual floors it also means that evacuations several floors below the fire floor will be sufficient to secure the safety of occupants descending from the fire floor and floors above the fire floor. Under conditions when it may not be necessary for total evacuation of the buildings, floors below the fire floor may be utilised as area of refuge.

Increasing the protection of exit staircases in necessary to ensure greater safety of vertical exists required for essential means of escape. The provision of rising mains must be an inevitable resource under conditions when internal firefighting and rescue is the only viable proposition in many tall buildings.

Increasing the availability for vertical transportation through the provision of secondary power supply to a firefighting lift with the requirement extending to an

additional passenger lift for buildings exceeding 60 metres in height will surely facilitate internal firefighting and rescue. However, if it is necessary to look critically at the system, the areas of contention may be focused don how well the requirements deal with the integral aspects of safety, from building provisions to emergency management, and on the question regarding the continuing dictates of economic consideration over the application good principles of fire safety in tall buildings.

The safety of a building must ultimately be determined by how well the building performs in an emergency situation. In the case of tall buildings, it may be determined by how efficiently occupants are able to evacuate the building, and with ease.

The quite stringent regulations which govern the design and construction of buildings in Singapore under the code of Practice for Fire Precautions in Buildings, or the Fire Code, is confined to the building programme only. There is as yet no code which requires building owners to maintain a high standard of emergency management.

As it stands, the building provisions may be adequate to maintain an effective evacuation in an emergency, only if activated through a well organised emergency programme which complements the design features of the building. for example, it is necessary to utilise one of the floors below the fire floor as an area of refuge, the floors which may be utilised must have already been identified as part of the features of the emergency plan. It must have the capacity to hold the projected number of evacuees, be accessible at the time of emergency, and the evacuation process must be managed such that evacuees are aware that such a floor is for refuge purpose and are assured that the area will be safe for the duration of its being used as a refuge.

A building code alone is not sufficiently adequate within that 'total concept' of life safety. Building code should be complemented by adequate provision of fire safety management and the administration of an emergency plan.

(For the issue of 'Public Building Certificates', public building have to be inspected twice yearly to ensure that buildings have been adequately maintained. The government also is in the process of passing the. 'Fire Safety Act', to require in owners of every high-rise and large commercial buildings to engage fire safety officers to manage and maintain the fire safety aspects of the building premises).

The building development process will most always out-pace enforcement of safety standard. A tall building of 60 metres may at one time be considered as a reference standard only that many high-rise buildings are now being built which are several times those heights. Under the current code, no additional

requirements may be enforced upon building which substantially exceed 60 metres in height.

The height of tall buildings will progressively increase with advancement in technology and it is evident that safety standards must progressively keep up with development trends and technological advancement. Building owners must be fully aware of the complexities involved and must be prepared to confront the problems in order to secure the safety of its occupants.

Lift shafts provide efficient vertical transportation but are also potential channels for vertical spread of smoke. As a protected shaft, lift doors may be required to have fire resistance rating. However, sliding lift fire door may not be sufficiently effective in preventing smoke infiltration into the vertical shafts. There may be a need to demand that lifts in tall buildings may only be accessed through smoke-free conditions, such as in the case of exit staircases (Fig. 8)

Whilst it is commonly accepted that the dictates of real estate values are of prime consideration in highrise developments, it is however necessary to constantly reassess the situation from the standpoint of life safety.

For example, the desire to maximise habitable space adjacent to external walls often results in the positioning of exit staircases inside the building and in locations deprived of natural ventilation. Smoke infiltration becomes an obvious problem under the adverse conditions of a major fire.

Pressurisation of the exit staircases may help to resolve the problem except that the effectiveness of the system may be entirely dependent on good housekeeping in keeping all exit doors closed, on effective engineering design and on regular maintenance of appliance and machine parts to guarantee system operation in an emergency. Failure of the system could lead to dire consequences which under a worst scenario conditionally result in the vertical exits being transformed into smoke stacks.

There is therefore no substitute for natural and well ventilated conditions for exits if safety of evacuees is not be compromised.

The Concept of Reducing Effective Height

If it is recognised that height is directly related to time and an extended period of evacuation time will obviously increase the risk to building occupants in the event of a fire the concept of height reducing should immediately result in a reduction in the time required for occupants to evacuee to a place/s of relative safety.

Dependency on emergency management for effective evacuation of occupants from tall buildings is a perpetual would merit serious consideration. By the concept of reducing effective height, evacuation procedures may be simplified, as in the case of low rise buildings where evacuation management may not be critical when the vertical exits are relatively short and the period do confinement within such exits may not be extensive.

A good example of the type of development which could benefit from the concept are buildings which consist of tower block located over a lower level 'podium' block (Fig. 9). The separation achieved through the compartment floor and 'roof deck' between the lower and taller portions of the building provide the essential element in prevention of fire and smoke spread The podiumd 'roof deck' may be utilised as an external 'area of refuge' for holding and re-distributing evacuees to other means of escape facilities without congesting the exit staircases within the lower levels directly below the 'tower block'. The 'effective height' of the tower block may be substantially reduced as a consequence.

A simple model which illustrates the concept through reduction of effective height is one which the tall building may be sub-divided into a number of vertical zones and separated by refuge floors (Fig. 10). The primary element in such a concept is the introduction of the refuge floor coupled with the features incorporated within the floor.

The basic function of refuge determines that such a floor will need to be protected in a way that floors may not be. For example, over and above the need for horizontal compartmentation, all vertical protected shafts passing through the floor may need to be fire-stopped or substantially separated thereby reducing the extent of vertical inter connection which could act a channels for fire and smoke spread (Fig. 11).

The additional precaution to prevent smoke from infiltrating into this floor will require that all lifts may only be accessed through smoke-free conditions, i.e through an external corridor or smoke-stop lobby.

Occupancies on the refuge floor may be limited to those which are less hazardous and accompanied by minimal accommodation of combustible materials.

The floor must be accessible at all times during the period when the building is occupied and the floor area must be capable of accommodation the projected number of evacuees expected to utilise such a floor for refuge. This factor may depend on the height of building and the number of storeys of occupants each refuge floor may be required to serve.

A substantial part of the floor must be naturally ventilated or is capable of being

naturally ventilated in the event of a fire. Ideally, the refuge area is part of an external area, to avoid smoke logging. The floor must be capable of sustaining life safety without the need for mechanical aids.

The design and layout of exit staircases may require evacuees to discharge into the refuge floor before being permitted to proceed downwards (Fig. 12). By this method, the control of the evacuation process may be instituted at every refuse floor. At the point of discharge an re-entry into exits, emergency signs and voice communication may be used to direct evacuees. In the unlikely event of a failure in emergency management, evacuees may be intercepted by the forced discharged into the refuge floor.

Where pressurised exit staircases are used, each vertical zone may be designed a sophistical independent section. By this method, the pressurisation process may be more effective and the failure of any zone would not jeopardize the entire vertical exit.

Secondary fire command centres may be located at each refuge floor adjacent to the firefighting exit staircase, to improve communication with the main 'command centre' and with other floors, and to be used as control centres for evacuation procedures.

Towards An Ideal Solution

If it is necessary to know the extent to which safety measures are being compromised under the demands of real estate and economic considerations, if may be appropriate to identify those conditions which best serve to address the situation in order to arrest the trend.

In the event of a major fire, it is smoke which inflicts the greatest risk to lives. It is the paths through which smoke may be permitted to permeate into building interiors which pose a direct danger to lives.

In tall buildings, vertical shafts may be identified as the main culprit for vertical smoke spread. The normal practice of protecting the vertical shafts may only be as effective as the maintenance and housekeeping programme. Any failure to secure the closure of doors and activation of shutters will render such protection null and void.

The situation becomes more critical when such protected shafts are designated means of escape facilities, such as exit staircases, Failure to keep doors opening into 'internalised' exit staircases closed will only facilitate smoke spread through the same protective enclosures which are intended to protect the building occupants.

Mechanical systems such as in the case of pressurised exit staircases are only as effective as the situation would permit and conditioned by the perimeters adopted for the design and operation of the system. It depends entirely on the ability of the system to sustain adequate pressure, on maintaining minimal pressure leakages due to perforations within the enclosure or opening of doors, on the operation of emergency power supply and on the performance of appliances. It is debatable if such a system can be fully depend upon when lives are at stake.

It if its necessary to device a 'fail-safe' solution for the evacuation of occupants in all buildings, it may only be achievable through vertical exits which are well and naturally ventilated (Fig. 13).

Circulation within the interior of many tall buildings is normally achieved through the use of internalised corridors, double-loaded in order to minimise service areas. Such corridors are also depend upon as access routes for means of escape leading to exit staircases. Internal corridors are normally mechanically ventilated with no provision for smoke extract.

In the event of a fire, any smoke which permeats into such interliased corridors will cause smoke-logging within a very short period of time, thereby crippling the essential escape route.

There is currently insufficient attention being given to the layout of interior spaces in tall buildings in order that occupants may be guaranteed safe means of escape provisions which would enable them to reach protected escape and exit facilities.

If it is necessary to achieves smoke-free conditions within building interiors, especially for means of escape, passages leading to exits should ideally be located along the perimeter of the building in the form of corridors which are capable of being naturally ventilated for effective smoke dispersal or as external passageways such that smoke logging will not longer be a concern.

Where the use of internal corridors are inevitable, provisions for smoke dispersal must be made as a basic concept of the building design.

Conclusion

There is particular appeal in maximising land resources within high density urban precincts. For real estate developers and urban planners, the emphasis may be essentially confined to achieving a balance between building economics and social integration. Architects find enormous pleasure in devising towering and often extensively sculptured forms suspended whtin the urban scope, users will

almost always delight in between flights of fancy, perching atop high places, punctuated with momentous fright through fear of falling down uninterrupted space. Fire engineers will want to avoid the nightmarish thoughts of towering infernos.

To achieve an equitable state of building environment with fail-safe features under even the most adverse conditions, it would be necessary for real estate developers, planners, architects, engineers, building managers and users to be aware of and recognise the need for fire safety.

Fire safety in tall buildings is important not only for protection of lives, but also for protection of properties and for enabling smooth running of modern economies. In order to succeed, it would be necessary to constantly re-examine the conditions under which buildings are designed, managed and maintained.

'Concepts' which are devised primarily with the sole purpose of achieving safe indoor environment are necessary to serve as basic models for instructions and comparison. It is hoped that some of the ideas which are being promoted may serve to instigate action towards the desing and construciton of tall buildings to achieve higher levels of fire safety.

ACKNOWLEDGEMENT

The author wishes to thank Mr. Arthur Lim Beng Lock, FIFireE (Singapore Fire Chief of 17 years, now retired) for his invaluable advice and contribution to many views and ideals expressed in this paper.

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Note : This paper is reproduced in the interest of concern professionals and developers for more information on the subject from the other part of the world.

Courtesy : This has been reproduced from 'Fire Engineers Journal' UK - March 1994.
Courtesy : Ar.Kem-Jin Teh, Singapore.

Note : Please refer all sketches of this chapter hereafter.

ENTRY TO FIRE STAIRCASE

BUILDINGS UPTO 4 STOREYS

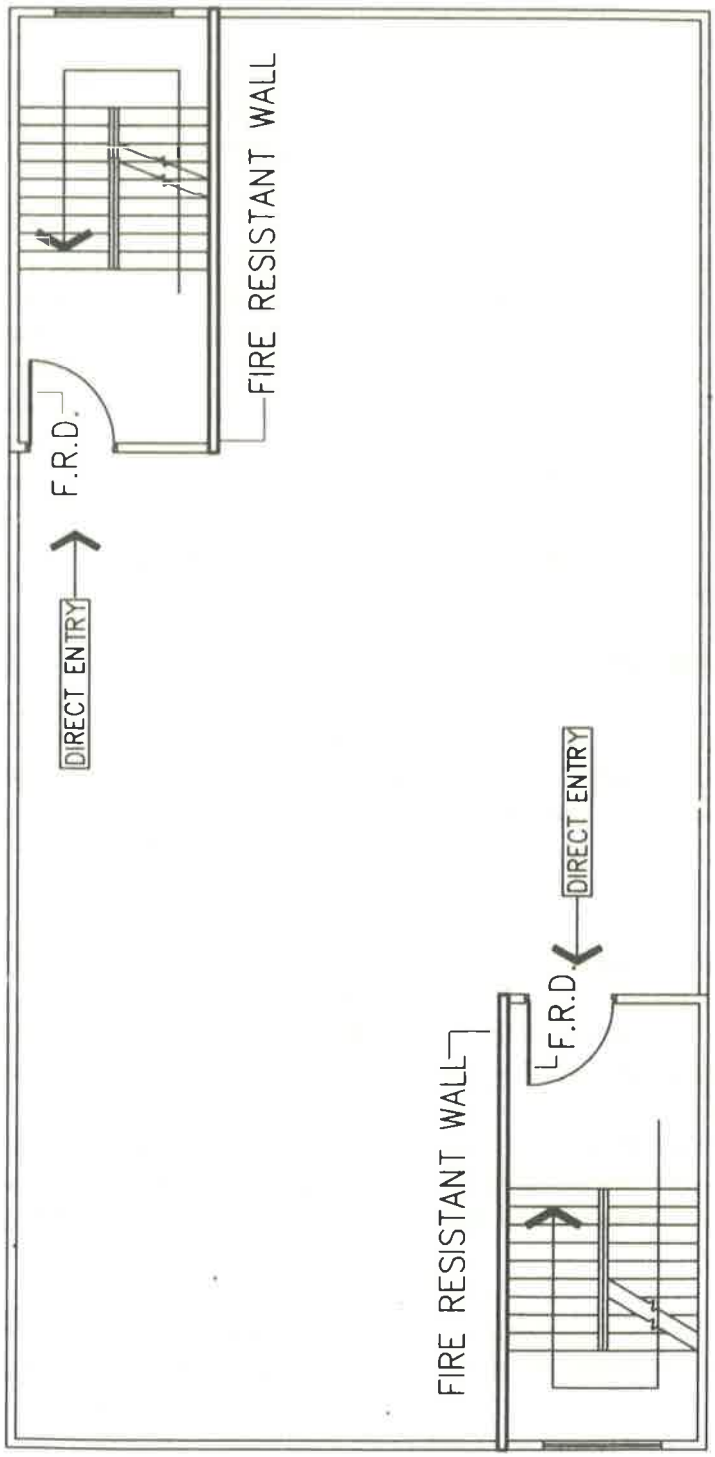


FIG.1

ENTRY TO FIRE STAIRCASE

BUILDINGS EXCEEDING 4 STOREYS BUT NOT EXCEEDING 24 MTS. IN HT.

EXTERNALISED STAIRCASE
WITH ADEQUATE CROSS-
VENTILATION

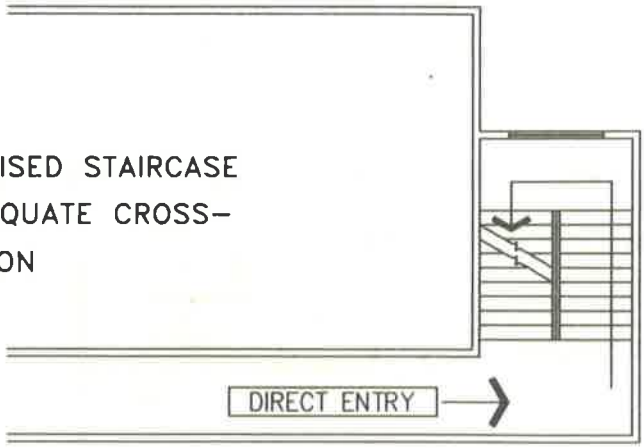


FIG.2

EXTERNALISED STAIRCASE WITH ADEQUATE CROSS-VENTILATION

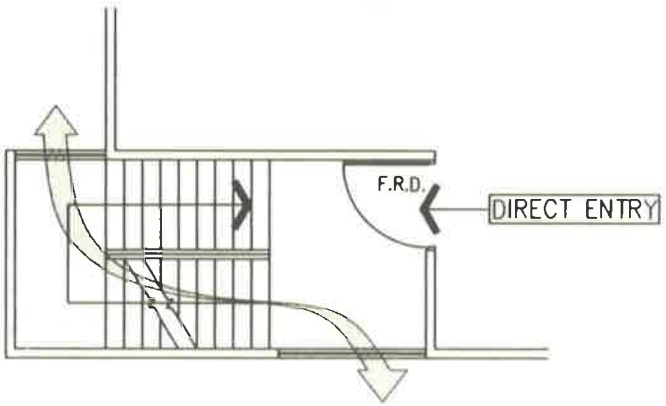


FIG.3

INTERNALISED STAIRCASE WITH PRESSURISED VENTILATION

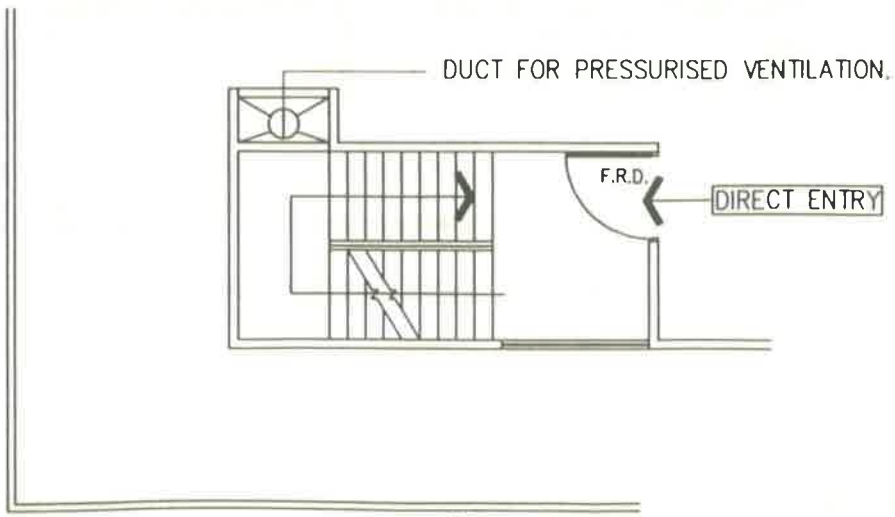


FIG.4

ENTRY TO FIRE STAIRCASE

BUILDINGS EXCEEDING 4 STOREYS BUT NOT EXCEEDING 24 MTS. IN HT.

ENTRY THROUGH "SMOKE FREE " CORRIDOR OR "SMOKE FREE" LOBBY

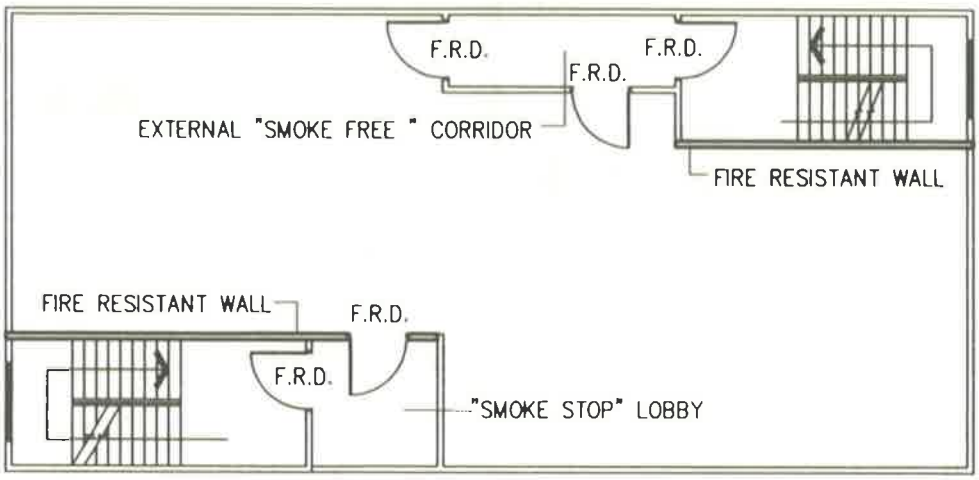


FIG.5

BUILDINGS EXCEEDING 24 MTS. BUT DO NOT EXCEED 60 MTS.IN HT.

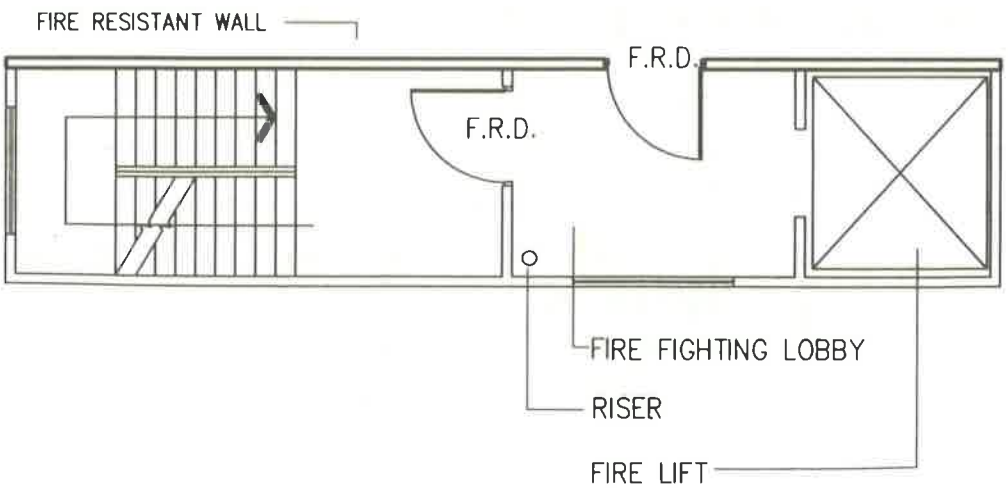


FIG.6

COMPARTMENTATION

COMPARTMENT SHALL CONSIST OF NOT MORE THAN 3 STOREYS

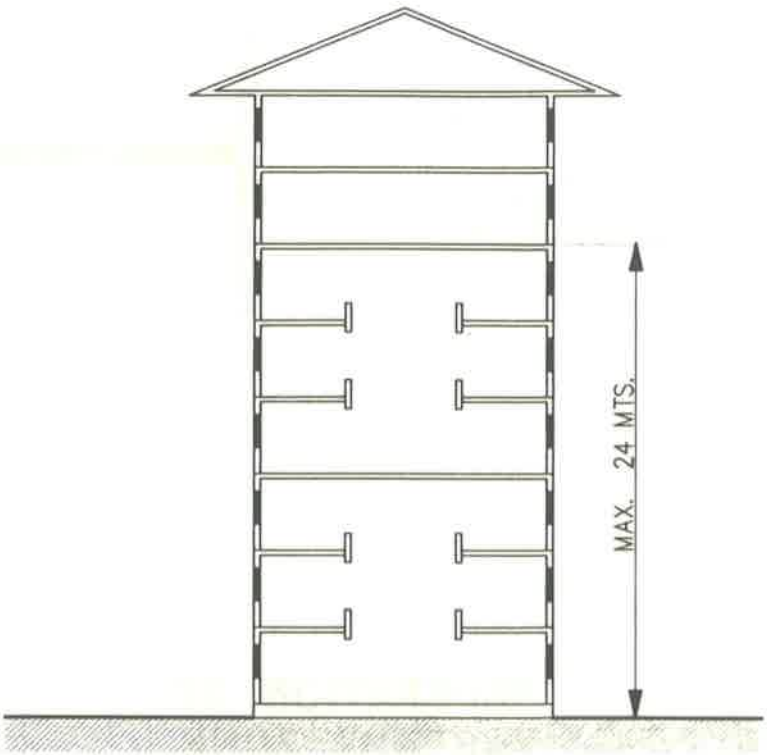


FIG.7

LIFT SHAFTS

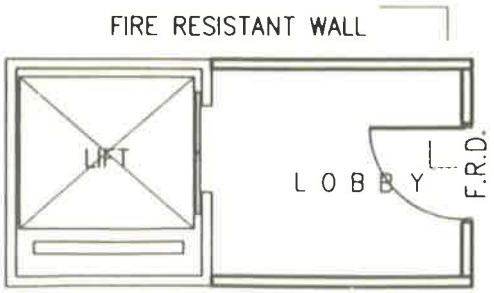
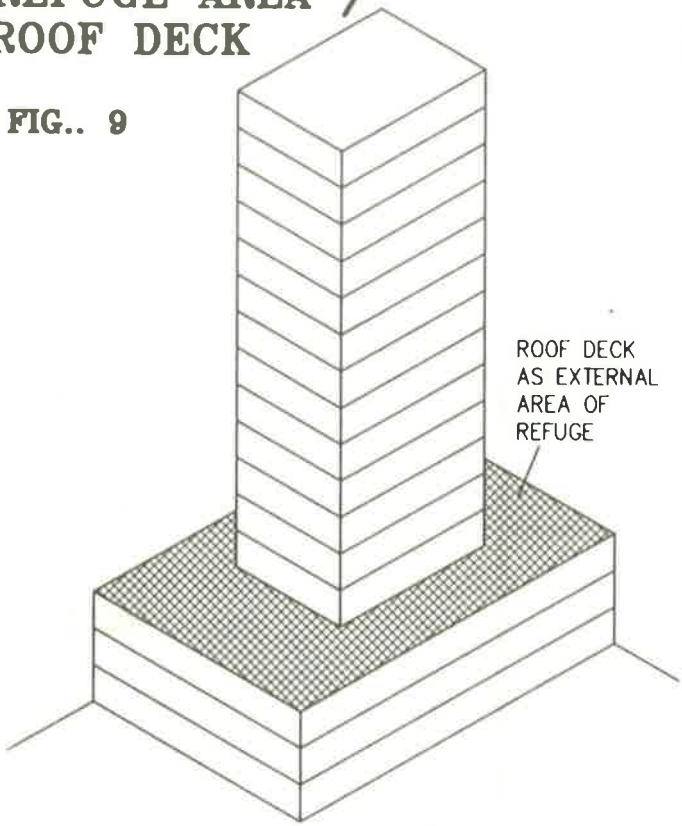


FIG.8

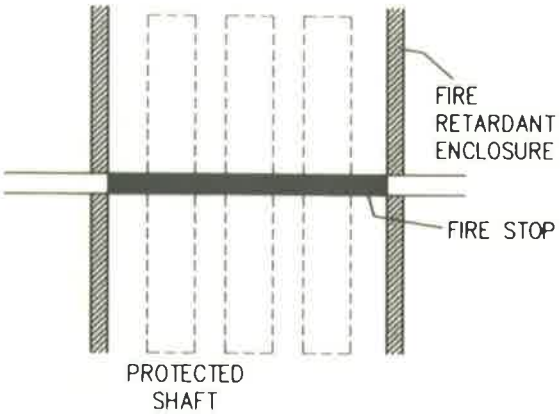
REFUGE AREA / ROOF DECK

FIG.. 9



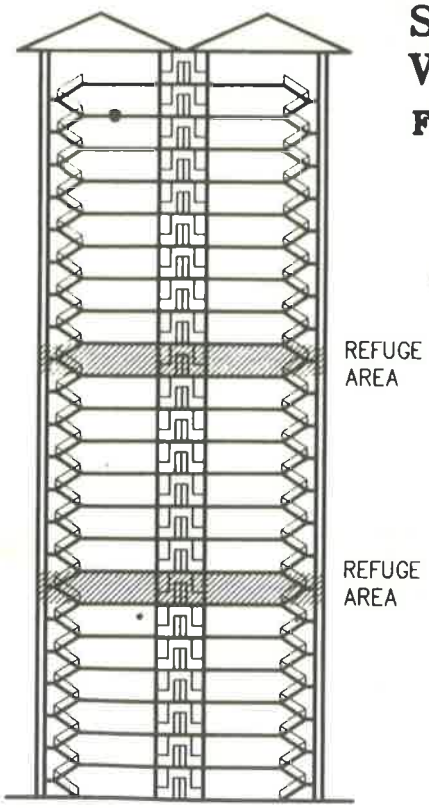
HORIZONTAL COMPARTMENTATION

FIG.11



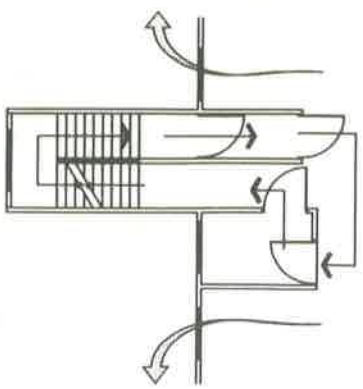
SEPERATION OF VERTICAL ZONE

FIG.10



DISCHARGE TO REFUGE FLOOR

FIG.12



BHAL: DCR

"FAIL SAFE " SOLUTION

VERY WELL AND NATURALLY VENTILATED VERTICAL EXITS FOR THE SAFE EVACUATION OF OCCUPANTS.

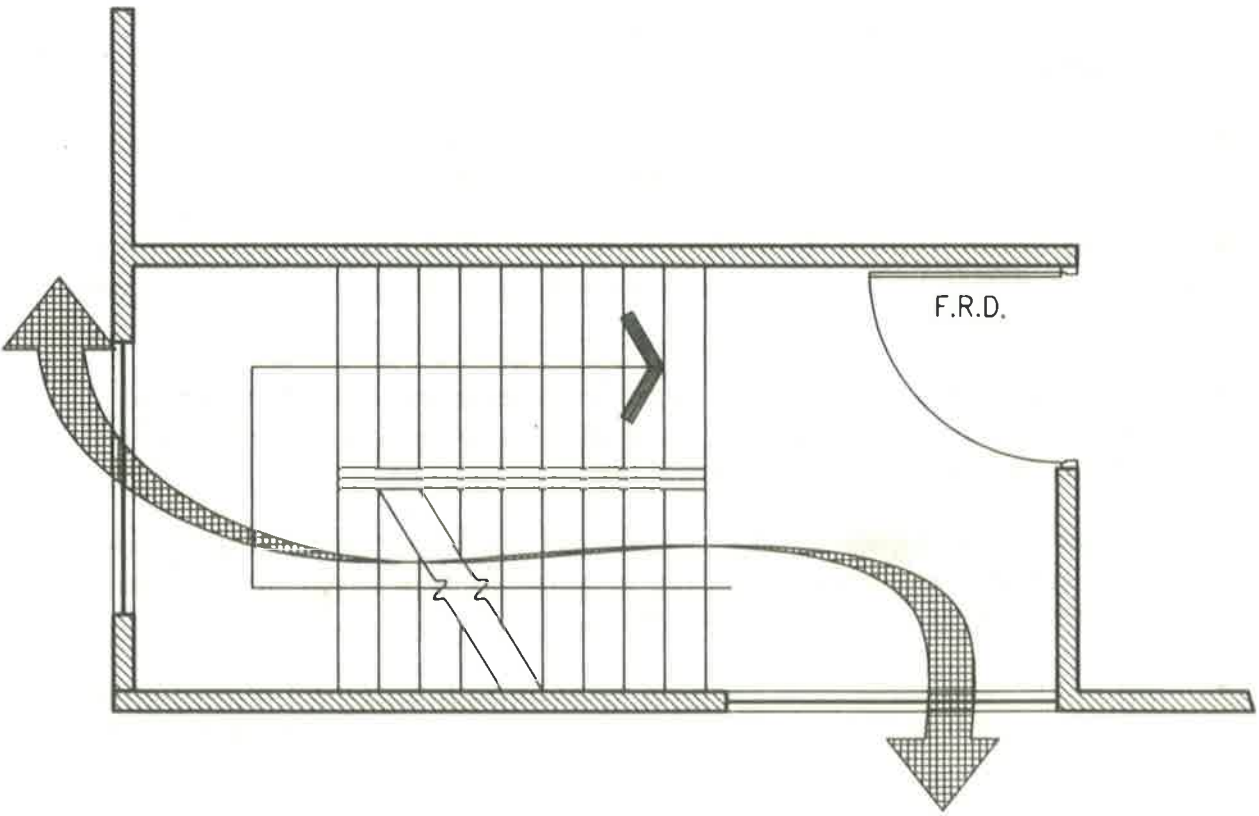


FIG.13

FIRE SAFETY PRECAUTIONS DO'S & DONT'S :

- Do not allow encroachments or storages in the courtyards of the building. Open courtyards are required for placing and operating the fire and rescue appliances in case of emergency.

- Do not allow storages or obstructions in the common corridors and staircases. These exit routes, if maintained clear, will help easy escape in case of fire.

- Do not allow the Fire Doors of the staircases to be kept open, in case of fire. Heat, Smoke & Fire enter the staircase and prevent the escape of people.

- Do not use LIFTS for escapes in case of Fire. They may fail midway trapping people inside. Use only staircase.

- Do not allow Electric Meter Rooms to be used as storages/dumping places or as living quarters for servants. They are potential fire hazards.

- During Diwali Season, do not keep any combustibles in the balconies. Do not dry clothes in the balconies or outside the building line. Flying crackers have caused serious fires.

- Do not allow the Refuge Areas to be enclosed or misused. The Refuge Areas are provided in high-rise buildings at different floor levels. They provide safe shelter in the event of fire.

- Do not use the basements for any purpose other than permitted purposes. Because of ill-ventilation, habitation or working in the basement, services Quarters, shops, offices, etc.) will make it death-traps.

- Do not provide continuous electrical ducts through the height of the building enable the fire to spread from one floor to another. Seal them at each floor slab level.

- Do not allow Air-Condition ducting to pass through one floor to another. Because fire, heat and smoke travel through these ducts and spread to the other parts of the building. Sectionalise them, as far as practical even on a particular floor, so as to limit the spread of fire, heat and smoke, and to minimise damages.

- Do not paint or coat fire detectors or sprinkler heads (glass bulbs). If done, they will become ineffective.

- Do not re-enter the fire affected building to collect valuables or for any other purposes. It may cost your life.

- Do not decorate walls and ceilings of common corridors with combustible material such as wooden panelling etc. They create unwarranted fire risk in the escape route in case of fire.

- Do not allow Fire fighting tanks to be misused or remain empty. Do not block access to the tank. You/Fire Service may need them for use at any moment.

- Do not damage wet riser system. It has been provided for your use to extinguish/check spread of fire before arrival of Fire Brigade. It's good maintenance ensures your safety.

- Do not 'switch off' electricity of the entire building in the event of a fire. This will cause stoppage of all the fire protection and fire fighting systems installed in the building.

- Do not carry out unsafe additions and alterations in the building and mass interior work. Consult Fire Brigade before undertaking such works, for your safety.

DO's

- Acquaint yourself with the layout of the escape routes, staircases, refuge areas and the location of fire alarms.

- Train yourself and the security personnel in the proper operation and use of first-aid hose reel provided at each floor level and fire extinguishers. Also train them in switching on the fire pump at ground/basement level and also the booster pump at terrace level and the method of summoning the Fire Brigade Department in the vent of a fire.

- Always keep closed, the fire doors of staircases, main entrance to the flat / occupied space and the kitchen.

- Keep in good state of repair all the fire protection installations such as fire pump, booster pump, wet riser-cum-downcorner, sprinkler installation, fire extinguishers etc. Timely use of these will help in controlling / extinguishing the fire in the early stages, thereby minimising life and property losses.

- Always maintain good house keeping.

- Ground all the lifts, including FIRE LEFT, in case of a fire.
- Practise evacuation drills periodically.
- Irrespective of the magnitude of fire, summon the Fire Brigade AT ONCE.
- Seek the advice and guidance of Fire Brigade Department in the matters of fire safety.
- In case of fire, guide the Fire Brigade personnel about the location and extent of fire, information about trapped persons, if any, and provide any other information they may request. HELP THEM TO HELP YOU.
- Remember, FIREMAN is your FRIEND.

TO PREVENT FIRE :

- Do not overload electrical circuit, it may cause short circuit and a fire. Use one socket for one electrical appliance.
- Do not leave electrical appliances unattended.
- Switch off the electrical appliances after use and remove the socket. It is a fire safe practice.
- Switch off the 'Main Switch' after use.
- Do not keep electric wiring hanging; batten it properly.
- Provide main circuit bracker (MCB) and Earth Leakage circuit Braker (ELCB) of appropriate capacity.
- Do not use candle in case of failure of electricity. Use battery operated touches.
- Smoke only in smoking zones; use non-combustible ashtrays for depositing lighted smoking material.
- Use ashtrays while smoking.
- Keep matches, crackers, lighters away from the children.
- Keep L.P.G. Stove / Segree / Burner on raised non-combustible platform.

- Turn off both the L.P. Gas cylinder valve and burner knob of the gas segree/ cooking range etc. when not in use after cooking.

- Ventilate the entire room if L.P.G. cylinder is leaking and do not switch on or off any of the electric switches in the room. Replace L.P.G. supply tube periodically or as and when advised by Mechanic.

- If L.P.G. Cylinder is Leaking.
  a) Close the main cylinder valve.
  b) Ventilate the entire room.
  c) Do not operate electric switch.

- Do not allow children to play with fire crackers.

- Do not light fire works very close to the buildings, vehicles and in corridors.

- Close the windows and openings properly to prevent ingress of lighted flying crackers

- Do not leave lighted oil lamps, agarbattis or candles on the floor or near combustible material. Put them off before retiring to bed.

- Do not store scrap / combustible material in and around the building; dispose it regularly.

IN CASE OF FIRE :

- Do not panic; keep calm.

- Actuate the manual fire alarm system provided on the floor to raise alarm.

- Think and act quickly.

- Report to Security.

- Summon Mumbai Fire Brigade on Tel. No. 101, 3085991, 3085992, 3085993, 3085994

- Alert the people in the vicinity of fire.

- Do not take shelter in toilet.

- Fight the fire only if you can. Do not take undue risk.

- Crawl, in case you encounter smoke.

- If you know the details of fire/fire extinguishing system provided, inform Fire Brigade Personnel on their arrival.

WHAT TO DO WHEN TRAPPED BY A FIRE?

- If the fire happens to be on your floor and there is considerable amount of smoke (or the floor is smoke-logged), drop to the floor and try to crawl out. Don't ever try to walk through heavy smoke. Actuate Manual Fire Alarm located on the floor, if possible.

- If the fire is outside your office room and the exit is blocked by intense heat and smoke, close the door and seal the crevices around the door with wet clothes. Keep pouring water on clothes to maintain wetness.

- Get to the balcony or external window and shout for help. Somebody will inform the Fire Brigade, that you are trapped. In case you have a telephone in your office, inform Fire Brigade and Building Security personnel.

- Above all, keep calm; it will help you think clearly and act quickly.

REMEMBER :

- FIRE KILLS PEOPLE AND DESTROYS PROPERTY.

- PROVISION OF FIRE FIGHTING EQUIPMENT ON THE PREMISES DOES NOT PREVENT OUTBREAK OF FIRE.

- YOUR FIRE SAFETY IS IN YOUR HANDS. DO NOT LEAVE IT TO THE CARE OF OTHERS.

- KILL FIRE BEFORE IT KILLS YOU.

FIRE INSURANCE FOR BUILDINGS GENERAL GUIDE LINES

(Courtesy : Delhi Insurance Institute)

Insurance Cover :

The importance of obtaining fire insurance cover for an appropriate amount cannot be over-emphasised. Many a time the sum insured under a Policy is found inadequate to fully compensate the loss. This happens partly because of ignorance of the insuring public and partly because of delibrate under-insurance in order to save a little premium. It is often not realised that under-insurance may prove disastrous in the event of loss because, under the Policy conditions, a share of the loss, proportionate to the amount of under-insurance, has to be borne by the insured.

Contract of Insurance :

A contract of insurance is defined as "a contract whereby one party, called the "Insurers", in consideration of premium paid by another party, caled the "Insured", agrees to indemnify the latter in the event of loss of or damage to the subject matter of insurance due to any of the insured perils as per the terms and conditions of the policy.

Fixing of sum Insured :

In the case of the Fire insurance contract, the sum insured should be adequate; because the policy provides for an Average Clause whereby the assessed claim is reduced in proportion to the under-insurance. The average clause is reproduced below :

Policies A & B - Non-Industrial risks

"If the property hereby insured shall at the breaking out of any fire or at the commencement of any destruction of or damage to the property by any other peril hereby insured against be collectively of greater value than the sum insured thereon, then the insured shall be considered as being his own insurer for the difference and shall bear a rateable proportion of the loss accordingly. Provided, however, that if the sum insured hereby on the property insured shall at the breaking out of such fire or at the commecement of such destruction or damage be not less than 85% (eighty-five) percent of the collective value of the property insured, this condition shall be of no purpose and effect".

Policy C - Industrial risk :

"If the property hereby insured shall at the breaking out of any insured peril be collectively of greater value than the sum insured thereon, then the insured shall be considered as being his own insurer for the difference, and shall bear a rateable proportion of the loss accordingly. Every item, if more than one, of the policy shall be separately subject to the condition".

Fixing of Sum Insured :

Since the purpose of the insurance is to place the insured in the same financial position in which he was at the time of loss, it is necessary that there should be not under-insurance and the sum insured be adequate.

Fixing of adequate sum insured is also important from the point of view of the banks or financial institutions who may have advanced money on the security of the insured property. It is sometimes found that the banks or financial institutions do not concern themselves with the adequacy of the sum insured so long as it is sufficient to cover the money advanced by them or at best the full value of the property on which they have advanced money. Invariably in such cases they find the problem only after happening of a loss when the claim amount is suitably adjusted for under-insurance and the full indemnity is not available due to the inadequacy of the sum insured.

Sum Insured : Key Notes :

1) The sum insured is always fixed by the proposer.

2) It is the limit of Insurer's liability under a policy.

3) It is the amount on which the rate is applied to determine the premium payable for the insurance.

4) The sum insured should represent the actual value of the property to be insured. Insuring for higher value than the actual value gives no advantage to the insured, as payment of claim, if any, is subject to the principle of indemnity.

5) Insuring for value lesser than the actual value makes the insured self-insurer for the diffrence and claim, if any, is subjected to 'average' clause whereby he is penalised for under-insurance.

6) In case of joint ownership of any property, the insured can get the claim only in respect of his share. He could, however, insure full value of the

property on behalf of other co-owners as well in which case the claim, if any, is paid to each co-owner to the extent of their insurable interest.

It is therefore, important to determine the sum to be insured very carefully. It is suggested that this should be based on each of various items i.e.building, plant, machinery, contents, etc. A Check-List to facilitate computation of proper sum insured is appearing herein below.

Check List for Computation of Sum Insured:

A Buildings

A-1 Check if the following values are included or excluded :

i)	Land value (It should not be included since it cannot be damaged by fire)	Yes/No
ii)	Foundation / Plinth (Not to be included for fire peril but may be shown as a separate item in case earthquake fire and shock peril is taken)	Yes/No
iii)	Underground assets (May be included since they may get damaged in case of a serious fire and also liable for damage due to flood, inundation, earthquake fire and shock. If included, it should be so described in the policy).	Yes/No
iv)	Assets embedded in walls, roofs, floors (These should be included and so described in the policy)	Yes/No
v)	Road and pavement	Yes/No
vi)	Boundary walls and fences	Yes/No
vii)	Utility Buildings	Yes/No

(Should be included and so described in the policy)

A-2 Check the basis of valuation

i)	Original Cost	These will result in under-insurance
ii)	Book Value	
iii)	Market Value of similar property	Correct basis for taking standard fire policy.
iv)	Reinstatement Value (Value of similar new property)	Correct basis for taking policy with Reinstalement Value Clause

Note : A monthly, quarterly or semi-annual revision in values is recommended.

COMMON POINTS :

Has escalation clause been taken for :

a)	Anticipated inflation during policy period for buildings	Yes/No
b)	Removal of Debris for Buildings	Yes/No
c)	Omission to insure addition etc. for building	Yes/No.
d)	Other additional covers that may be added to fire policy, such as Insurance of rent etc.	Yes/No.

OPTIONAL EXTRA BENEFITS :

A part from the standard cover under a fire insurance policy, certain additional benefits can also be added to the policy, if desired by the insured for which separate sums insured have to be fixed. These additions are :-

Escalation Clause :

Automatic regular increase in the sum insured throughout the period of the policy can be be arranged on payment, in advance of additional premium equal to 50% on the selected percentage increase, subject to the following conditions :-

1) Selected percentage increase shall not exceed 25% of the sum insured.

2) The clause applies to policies covering building, machinery and accessories only (not stocks.)

3) The sum insured at any point of time would be calculated after application of escalation clause.

4) Prorata condition of average applies.

5) Automatic increase applies from the date of inception upto the date of operation of any of the insured perils.

Additional expenses of rent for an alternative accommodation :

Additional expenses of rent for an alternative accommodation in respect of non-manufacturing risks can be insured under a Fire (Material damage) Policy.

Indemnity period is limited to the period during which the original premises remain untenable as a result of occurrence of the perils insured against, subject to a maximum period of 3 years.

This cover can be held by a tenant as also the owner-occupant, but in respect of the latter, the alternative accommodation is limited to a premises of the same area, age and type as the insured premises.

Loss of rent caused by insured perils :

Rent loss caused by an insured perils can be considered if the said building or any part thereof is unfit for occupation in consequence of its destruction or damage. The amount payable is not to exceed such portion of the sum insured on rent as the period necessary for reinstatement bears to the terms of the rent insured.

Removal of debris following damage by insured perils:

Cost and expenses necessarily incurred by an insured in the removal of debris from the premises of the insured, dismantling, demolishing, shoring up or

propping of the portion or portions of property insured, can be covered, as a separate item for an amount not exceeding 10% of the total sum insured.

Omission to insure additions, alterations or extensions.

The insurance by the Policy can be extended to cover buildings and/or machinery, plant and other contents which the insured may erect or acquire or for which they may become responsible:

a) at the within described premises.

b) for use as factories.

The Liability under this Extension is restricted to 5% of the sum insured.

Additions to the Building :

All new additions to Buildings and / or Machinery and Plant not specifically insured / included during the currency of the policy should be declared at the end of the year and suitable additional premium paid on pro-rata basis from the date of completion of the construction / erection of additions. If the insured fails to declare the value of such additions within 30 days after the expiry of the policy there shall be no refund of the advance premium collected.

This clause should be incorporated at the time of issuing the policy.

SPECIAL POLICY CONDITIONS RELATING TO BUILDING IN COURSE OF CONSTRUCTIONS AND MACHINERY, PLANTS AND EQUIPMENTS IN COURSE OF INSTALLATIONS IN NEWLY CONSTRUCTED BUILDINGS.

New Buildings:

Insurance of Buildings in course of construction and Machinery, Plant and Equipment in course of installation in newly constructed buildings and materials on the site can be covered on either of the following basis.

i) Policy is issued for the sum insured required at the outset. Increase in the sum insured is allowed from time to time as requested by the insured with payment of additional premium calculated on a pro-rata basis.

On completion of the building(s) cancellation of the policy is permitted with return of premium on a pro-rata basis.

ii) Insurance may be taken for the total estimated completed value of the building(s) and to cover the whole period of operations on the site.

FIRE INSURANCE FOR BUILDINGS

For insurance of buildings one has to take into account various factors and ensure that the value of the land is excluded since the land cannot be damaged by fire or allied perils. The plinth and foundations normally do not get damaged but in the event of a serious fire, they can be so affected as to require re-doing. The present day value of plinth and foundations is substantial and therefore if the intention is to insure its value, it is suggested that this must be separately declared. In case the intention is not to insure plinth and foundations against fire and allied perils it may still be considered for insurance against 'earthquake shock' and 'earth-quake fire and shock' risks for which there is a suitable provision for insuring these as a separate item without corresponding insurance against fire perils. In other words, the sum insured against earthquake risk on that portion of the building above the ground level will be same as the sum insured under fire policy but the plinth and foundations will be insured under a separate item if it is desired to be included against earthquake peril. The value of the building should be computed taking into account the cost of floors, walls, roofs / false roofs / ceilings and value of such items which may be embedded underground or in the walls / roofs which become integral part of the building. The intention of including such items must be clarified by suitable description in the policy itself in order to avoid any future confusion / misunderstanding. Examples of items which are embedded underground or in walls / roofs are :

a) Pipes

b) Electric and telephone wirings or other items used for special purpose.

Valuation

Buildings are usually insured on one of the following bases by the insured :

1) Original cost

2) Book value

3) Market value

4) Reinstatement value

and the sum insured for each basis will obviously differ.

Original Cost

Every new building has its original cost at which it has been acquired and is

atleast relevant during the first year of its insurance. For old buildings the original cost has no relevance to its value for insurance purpose since it is subject to depreciation due to its age and also appreciation in value due to inflation.,

Book Value

Book value of a property has no relation to insurable value except in the case of new building in its first year of insurance. In the subsequent years, the book value continues to be brought down by depreciation and as such it does not represent the market value or the value of similar new property. The classic example is of the Bank of England's buildings which is insured for several million pounds but its book value is only £1

Market value

This is determined by the amount at which property of the same age and condition can be bought or sold. This value takes into account both depreciation due to age and appreciation and due to inflation. For determining the sum insured for buildings, apart from excluding the value of land and plinth, the present cost of construction of similar building should be taken and then the depreciation for age and usage, deducted.

Reinstatement value

This means the value of similar new property. In fire insurance the principal of indemnity can be modified in the case of building machinery and other fixed assets whereby, subject to the sum insured representing the value of similar new property, it can be insured under 'Reinstatement Value' clause. In case of reinstatement value policy, the basis of loss settlement is the value of new property without taking any depreciation into account. This type of insurance enables the owner to replace his property without any financial strain on his own resources and is quite commonly taken by industrialists and building owners.

Each building has a definite built-up area and ascertainable constructional specification. Any civil engineer or architect can examine the current cost of construction, keeping all relevant factors in view. For arriving at the cost of buildings, various publication such as the CPWD rates are available as guidelines. In case of old buildings if an escalation method is to be made use of, the cost rise indices published by the National Buildings Organisation should be referred to for arriving at present value for insurance purposes. Depreciation in the case of buildings is to be adjusted from the estimated current replacement cost. Calculation of depreciation may vary considerably and therefore each individual buildings will require fixation of depreciation on merit taking various features,

interalia construction, occupancy (some occupancies generating heat / vibration will require higher rates of depreciation), degree and standard of maintenance. It is, therefore, very difficult to have a fixed formula and yet merely as a rough guidelines the following range could give some indication :

Type of Building	Rate of depreciation :	Remarks
1st class RCC structures	1% to 2%	Rates per year, from the year of construction to the date of Insurance
Factory sheds with RCC	1½% to 2%	
Factory sheds with AC sheets / CI sheets roofs on steel or wooden frame works	2% to 4%	
1st Class RCC construction	1%	
Other construction	2% or 2½%	

Summary

From the above it will be seen that whilst in the first year original cost, book value, market value and reinstatement value of any property remains same, in the subsequent years, they start varying from one another as the following illustrations will show and the correct basis of fixing the sum of to be insured should be as described in 3 and 4 below :

30 year old building -

1)	Original cost in 1958	10,00,000
2)	Book value in 1988	39,000
3)	Market value in 1988 (after adjustment for inflation)	1,38,73,000
4)	Reinstatement Value in 1988.	1,73,40,000

	Original Cost	Book Value	Reinstatement Value	Market Value
	1	2	3	4
1958	10,00,000	10,00,000	10,00,000	10,00,000
1968	10,00,000	3,00,000	15,00,000	12,00,000
1978	10,00,000	1,02,000	1,51,00,000	40,80,00
1988	10,00,000	39,000	1,73,40,000	1,38,72,000

(1) The Book value has been calculated at a rate of 10% depreciation per year on diminishing value basis.

(2) The Reinstatement value has been calculated after applying the average index escalation.

(3) The Market value, has been calculated by applying 2% depreciation on straight value basis over Reinstatement value.

(Extract from the Report of Advance Study Group of Delhi Insurance Institute)

Courtesy: Delhi Insurance Institute.

LOSS PREVENTION ASSOCIATION OF INDIA LTD.

(Western House, 4th Floor, Sir P.M. Mehta Road, Fort, Mumbai - 400 001)

A Profile

Loss Prevention Association of India Ltd. (LPA) is a non-profit organisation engaged in promoting safety and loss control through education, training and consultancy. LPA's work involves both educational and engineering aspects of safety. To meet these requirements, the Association employs a team of professionals with expertise in the various technological aspects of loss prevention as well as in the field of mass communication.

LPA has developed training programmes on fire safety, materials handling, road safety and a host of other related subjects. Many of these programmes are aimed at supervisory and managerial personnel to inculcate safety attitude and to impart knowledge on safe manufacturing practices. It has been providing safety consultancy and advisory services to various organisations. These services include identifying and evaluating exposures to property damage and other accident hazards affecting an organisation, suggesting appropriate risk reduction measures, and methods to manage the residual risks. LPA regularly disseminates information on safety through its periodicals Loss Prevention News and Road Safety Digest. The Association also provides advice on safety through bulletins on safety and various other publications like safety posters, leaflets and data sheets. LPA's range of video cassettes and posters on safety have benefited both medium as well as large size companies.

The Association's library-cum-information centres at Calcutta, Chennai, Hyderabad, Kochi, New Delhi and Mumbai are equipped with latest books, codes, statutes, standards, technical reports, manuals, national and international journals and other publications in the field of safety, especially in the disciplines of fire, road safety and cargo loss prevention. Although the library stock is not loaned, members can refer to the publications available in the library free of charge. Important extracts to a limited extent, can be made a available to members on specific request and on payment. The Centres also provide information search services at cost.

The services offered by LPA can be availed by Associate Members. Associate Membership provides a channel for communication on safety and loss prevention issued at micro and macro levels.

Associate Membership is open to all business, quasi-commercial & charitable organisations and Government departments. The annual Associate Membership fee is Rs. 1800/- (Rupees one thousand eight hundred only) for organisations in

India and U.S. $100 (US Dollars one hundred only) for organisations / individuals abroad.

An Associate Member (Organisation) is entitled to various benefits and facilities :

Complimentary Basis

- Loss Prevention News (Quarterly)
- Road Safety Digest (Quarterly)
- LPA's Safety Bulletin (Monthly)
- A set of selected LPA's publications / posters (subject to availability of stock)
- A copy of new publications and posters brought out by LPA from time to time
- Access to Library-cum-Information Centre
- Advisory service based on readily available safety related information.

Payment Basis

- In-company training programmes
- Safety consultancy projects
- Participation in the public training programmes / seminars organised by the Association (at concessional rate)
- Information search service (concessional charge)
- Posters, publications and video cassettes.

What perhaps distinguishes LPA from many other safety organisations all over the world is the role it has been laying in the area of public education. LPA undertakes mass communication public service campaigns on safety e.g., home safety, road safety, fire safety and industrial safety, using press media, radio and television. LPA organises programmes for school children, housewives and employees of office establishments. LPA has also developed special training modules on road safety for 2-wheeler riders, professional and non-professional drivers of 4-wheelers, and drivers of carriages of hazardous substances. Audio-visuals in the form of films, slides, booklets and posters were developed to conduct these programmes.

LPA's pioneering role in developing safety concepts and a wide range of loss prevention services helped the nation to save valuable human and material resources. LPA relentlessly strives to create awareness of the need to produce safety products, build safer homes and operate safer plants.

TARIFF ADVISORY COMMITTEE

(H.O. Ador House, 1st & 2nd Floor, 6 K. Dubhash Marg, Mumbai - 400 023)

A Profile

The Tariff Advisory Committee (TAC), a Statutory Autonomous body under the Insurance Act, 1938, formulates and administers Tariff for major classes of general insurance business such as Fire and Allied Perils, Petrochemicals, Marine Hull, Engineering and Motor. Tariff encompasses rate terms and conditions of General Insurance Business and provides for taking into account individual features of larger industrial units while evaluating and rating them. Aspects taken into account include past loss record, physical features such as safe distances between blocks, provision of Fire Fighting Appliances and Good-Housekeeping. Various schemes of special rating and discounts have been formulated by TAC to give the benefit of lower premium rates to units which adopt sound risk management practices. Thus the concept of flexible merit rating is built into the system.

For the purpose of assessing good features of larger units which form the basis of special rates and discounts, the TAC has developed safety standards most suited to Indian conditions. These have been evolved by blending the best available standards in the world with the experience gained in carrying out annually over three thousand inspection of industrial plants, petrochemical complexes and projects in the course of construction / erection by the TAC's own team of Risk Inspection Engineers.

Apart from improving safety, the various schemes of special rating and discounts offered by TAC provide financial incentives to industries for risk improvement. TAC's standards also act as a reference point for industry to check the adequacy of safety features built into the plant.

Tariff in General Insurance Industry is not merely a system of providing rates or premium but covers a wide range of issues relating to terms, conditions, loadings, discounts, warranties etc. for several types of risks.

The TAC is a high level body of Experts headed by the Chairman IRA as an Ex-official Chairman with representatives from the Insurance Companies, Ministry of Finance and Bureau of Industrial Cost and Prices (BICP), Government of India, Tamilnadu & Bihar Govts. CII, Chambers of Commerce etc. It has its headquarters at Mumbai and has Regional Offices at Ahmedabad, Mumbai, Calcutta, Delhi and Chennai, divisional offices at Bangalore and Lucknow, having Risk Inspection Engineers and Insurance Specialists.

Technical Groups consisting of representatives of Insurers as well as of the TAC have been constituted for various classes of insurance such as Fire, Consequential Loss, Petrochemicals, Engineering, Marine and Motor. These Expert Groups consider and recommend modifications in the Tariffs from time to time, to fine tune them to changing market needs and update the rates in relation to the loss experience.

It is TAC's endeavour to ensure that it fixes rates and premium, adequately and equitably keeping the interests of both the Insurers and the Policy holders through a scientific method of rating.

It may be stated that the stability and discipline in the Indian Insurance market for nearly three decades now is in no small measure, owing to the positive contribution of TAC in scientific pricing of insurance products in India.

Schemes of Special Rating and Discounts

The tariff system has an in-built mechanism for taking, into account individual features of larger risks while evaluating and rating them.

Individual features which are taken into consideration include past claims experience, types of Larger risks while evaluating and rating them.

Individual features which are taken into consideration include past claims experience, type of fire protection systems provided, segragation of hazardous occupancies and adequate distances between blocks, reflecting safety aspects.

TAC has developed safety standards for industrial plants best suited for Indian conditions by blending the experience gained in carrying out over 3000 inspections annually with the best available standards in the world. These serve as a reference point for assessing favourable features of the risk.

TAC operates a number of Special Rating and Discount schemes for providing the benefit of lower premium rates to larger risks which conform to TAC's safety standards. For example well managed risks could earn discounts of upto 50% in fire premium rates under the various schemes of Special Rating and Discounts. Apart from providing financial incentives, the schemes promote safety consciousness and encourage adoption of risk improvement methods.

Risk Inspection engineers from TAC are often associated, through the insurer, with large industrial projects right from the blueprint stage. They thus help to build safety into the plant. TAC engineers also carry out surveys of major fire losses out (Rs. 50 lakhs and above) to determine causes of accidents and suggest risk improvement measures.

Fire Special Rating

The Fire Special rating scheme designed by TAC, is based on the assessment of risk potential in an industrial unit and its past loss record as reflected in the claims experience. Physical features of the risk such as proximity to the fire brigade, distance of buildings from compound wall, as well as distance between blocks, type of construction, fire protection systems provided, safety management practices, concentration of value, good housekeeping etc., are some of the factors taken into consideration.

Salient Features :

- Sum Insured under Fire Policy 'C' should be Rs. 25 crores or more.
- Claims experience for the past 5 years (preceding expiring policy period) should not exceed 70%
- Discount of upto 25% for physical features on buildings, open storage areas and tank farms with sum insured of Rs. 50 lakhs or more.
- Discount of upto 20% for good claims experience for the past 10 years for the plant as whole. (maximum of 15% for 5 years).
- Maximum discount for physical features and good claims experience together limited to 35%.
- New units or units with less than five years claims experience will be eligible for special rating but only for discount for physical features, provided the past claims experience is less than 70%.

What does Sum Insured mean?

Sum Insured on buildings and contents of all blocks as well as open storages located in one compound / complex.

What does 'Contents' stand for ?

It includes all properties like machinery, stocks, stock-in-process stock-in-open, electrical installation, furniture, fixtures, fittings and other contents of any nature.

What about sister concerns located in the same compound?

Sister concerns in one compound are eligible for Special Rating provided their individual Sum Insured is Rs. 25 crores and above. However, if more than one

sister concern is located in the same building no Special Rating will be applicable.

Who is the authority concerned for granting Special Rates ?

The authority rests with the regional offices of the TAC.

How long are these Special Ratings valid ?

Where the Sum Insured in one compound or complex is between Rs. 15 crores and Rs. 25 crores, the rates are valid for 5 Policy periods. Where the Sum Insured is between Rs. 25 crores and above, but not exceeding Rs. 50 crores, the validity period is 4 Policy periods, and in cases where Sum Insured is exceeding Rs. 50 crores, the rating is valid for 3 Policy periods. In the case of the following types of risks, the validity period will be reduced by 1 Policy period. Explosive Factories, Oil Extraction Plants, Oil Mills, Plywood Factories, Saw Mills, Turpentine / Resin Distilleries.

Are the Industries subject to periodic inspection ?

Yes. Your Industry may be inspected by the engineers of the TAC once in 3, 4 or 5 years as the case may be. However, in the case of the above mentioned types of risks, an inspection would be conducted one policy period ahead of the period indicated earlier.

What is the purpose of the inspection ?

For a detailed review of the special rates.

Is this validity period unconditional ?

No. These periods are conditional on the fact that there is no material alteration in risk and / or the claims experience in the five-year period that proceeds the current policy does not exceed 70%.

How do I apply for the Special Rating ?

Contact your Insurance Company and apply in the format which will be given to you and please ensure that all necessary details in the questionnaire and the annexures are duly filled up to ensure quick processing of your application.

Is there a time limit for the application ?

Yes. Your application routed through your insurance company must be received

by the regional office of the TAC 3 months prior to the date of renewal of the policy. In case of first time application it must reach within 3 months of inception of the policy.

Discount Scheme for Fire Extinguishing Appliances (FEA)

Salient Features :

Financial incentives by way of discounts in fire insurance premium are offered for providing fire extinguishing appliances as per TAC Regulations. Discounts varying from 2.5% to 50% are available as details below depending on the type of fire protection system installed.

- Hand appliances viz. fire extinguishers and bucket installed as per TAC's Fire Protection Manual (Discounts applicable for process blocks only), 25%
- Small bore hose reels installed as per TAC's Fire Protection Manual, except in buildings where only electrical apparatus is installed or buildings, where inflammable liquids are stored, 2.5%
- Fire Engines / Trailer pumps provided as per TAC's Fire Protection Manual, 5%
- Hydrant system installed as per TAC's Fire Protection Manual, 15%
- Sprinkler system installed as per TAC's Sprikler Rules together with hand appliances, 15% to 35%
- Sprinkler system in addition to hydrant system and hand appliances as per TAC Rules, 30% to 50%
- Medium / High velocity water spray system as per TAC's Water Spray Rules in combination with hydrant system and hand appliances, 15% and 45%.
- Special systems like CO2 flooding / Foam system as per TAC requirements in combination with hydrant system and hand appliances, 15% to 45%
- Automatic Fire alarm systems as per TAC's Fire Protection Manual, 5%
- Mutual Aid Scheme as per TAC requirements, 5%

How to apply :

The application for discounts should be made through the insurer to the Regional Office of TAC, where the risk is situated, giving complete details of the system to be installed.

Where only hand appliances are installed as per TAC Rules, the Insurance Company itself can grant the discount.

It is advisable to get the proposed installed plans for the system approved by TAC (except hand appliances) before the actual installation is done because in most cases like hydrant, sprinkler, Medium Velocity / High Velocity Water Spray systems, inspections / testing is necessary even during the course of the installation.

In case of simple hand appliances the validity period of discount is 4 years. In case of other FEA systems, inspections and review of discounts is generally done every year.

Discount Scheme for Electrical Installations

Salient Features :

- The Rules for Electrical Installation in Buildings, as formulated by TAC provide detailed requirements relating to the wiring and the types of electrical equipment to be installed.
- Blocks which conform to TAC's Rules for electrical installations in buildings are eligible for this discount.
- Discount upto 10% on fire insurance premium is applicable for eligible blocks.
- For industrial risks, where the Sum Insured is less than Rs. 50 crores, the insurance companies are empowered to grant this discount. For risks with Sum Insured of Rs. 15 crores and more, the discount is sanctioned by the Regional Offices of the TAC where the risk is situated.

How to apply :

Approach the concerned Branch / Divisional office who will make the application for discount to the Regional Office of the TAC or Head Office of the Insurance Company, depending on the Sum Insured.

Discounts are sanctioned, after inspection by TAC Insurance Company Engineers, effective from the date of receipt of application. This is, provided that the installation complies with Regulations and it is generally valid for 3 years if maintained as per TAC Rules.

Industrial All Risks Insurance

The Industrial All Risks Policy, as designed by TAC, covers industrial properties at all locations - both manufacturing and storage facilities. (Minimum Sum Insured Rs. 100 crores) anywhere in India, under one document against All Accidental Physical Damages and Business Interruption Losses following Accidental Physical Damages to Insured property.

Business Interruption Losses following Breakdowns of Machinery, Electronic Equipment and Boilers & Steam apparatus can be taken as an optional cover.

The Policy is subject to certain specified exclusions such as.

1. Faulty Design, Defective Materials, Wear & Tear
2. Collapse or Cracking of building
3. Larceny
4. Coastal or River erosion
5. Normal settlement of structures
6. Vehicles / Ships / Aircrafts
7. Erection Risks / Testing & Commissioning etc.
8. Livestock, Crops & Trees
9. Property covered under Marine Policy or specifically insured.

TAC offers wide range of Rates & Discounts like :

1. Fire Policy 'C' Rates allowing Special discounts upto 35%, Electrical Discounts upto 10% & Fire Extinguishing Appliances discount upto 50% (on a non cumulative basis)

2. Catastrophic perils of Earthquake and Storm, Flood etc. Group of perils - Tariff Rates less 10%

3. All other Special Perils in Fire Dept. FREE

4. Burglary. FREE

5. Machinery Breakdown (M.B.), Electronic Equipment Insurance (E.E.I.) & Boiler Explosion (B.E.) at a very low rate of Rs. 2.5 per mille.

6. Business Interruption Losses (Fire & Special Perils)

   - Tariff Rate less 10%

7. Business Interruption Losses (M.B. / E.E.I. / B.E.)

   Tariff Rate less 20%

   Over & above a Package Discount of 20% or 30%.

Deductibles

1. **Material Damage**

   Compulsory deductible of 5% of the claim amount subject to:

   a) Minimum o Rs. 5.00 lakhs &

   b) Maximum of Rs. 50.00 lakhs

2. **Business Interruption :**

   3 days profit subject to

   a) Minimum of Rs. 5.00 lakhs &

   b) Maximum of Rs. 50.00 lakhs

Voluntary Deductibles

Corporates can opt for Higher Deductibles and get discounts upto 25% in Premium for both Material Damage and Business Interruption covers.

Benefits / Advantages

- Administratively convenient - The Policy eliminates the need for separate Policies for Fire, Machinery Breakdown, Burglary, Business - Interruption etc. since a Package cover is offered.
- 15% under-insurance will be ignored in case of Material Damage Losses.
- Machinery / Equipment sent for repairs outside the premises is covered for a period of 60 days.
- Transit risk inside the Compound of Industrial Risk is covered.
- It is a cost effective cover.

Rating & Discount Scheme for Petrochemical Risks

Salient features :

- A discount of upto 35% on the fire insurance premium can be obtained by incorporating certain special features like specified minimum distances between plants, between plants and storage areas and tanks/tankers, for protection and fire detection systems and compliance with special safety requirements like provision of blow down system, fire proofing of steel structures, safe location of flares etc.
- From experience it is seen that these features are easier to implement at the project stage which optimizes cost of installation vis-a-vis discount.
- The TAC also operates a voluntary deductibles scheme for Petrochemical risk. This is based on the probable maximum loss (PML) assessed for the risk, the fire protection discount obtained, and the amount of deductibles opted.

How to apply :

- Approach your insurer, who will make the application to TAC. Data sheets relating to the risk as a whole, as well as for individual plants will have to be filled in for submission to the Regional Office. of the TAC.
- Rates are given after inspection by TAC engineers and are generally reviewed every 3 years.

Flood Special Rating

Salient features :

- Sum Insured under Fire Policy 'C' should be Rs. 1 crore or more.
- Discount / loading for favourable / adverse claims experience for the last five years preceding expiring policy period.

How to Apply :

This scheme, formulated by the TAC, is now administered by the Head office of the insurance companies and does not require reference to TAC while granting the discount.

Application should therefore be made to the Branch / Divisional Office of your insurer who in turn will make the application to their Regional Office within 3 months of the renewal of the policy. The discounts / loadings are reviewed every year.

Tariff and Discount Scheme for Motor Insurance

The Motor Policy provides cover for loss or damage of a vehicle and its accessories, and for liability as incurred for loss of life or bodily injury to third parties. Cover for loss or damage to third party property is also available.

The Tariff provides for Bonus / Malus system under which the benefit of favourable claims experience of the vehicle is passed on to the insured by way of lower premium rates.

The Tariff also has a scheme of voluntary deductibles whereby discount in premium is given to the insured for bearing the first portion equivalent to a percentage or fixed amount of the claim.

Discount is also available for insured of Private Cars and Motor Cycles for Membership of recognised Automobile Associations.

Rating & Discount Scheme for Projects under Construction / Erection

Erection All Risks Insurance Policy (EAR), Contractors All Risks Insurance Policy (CAR) are offered in Indian markets for projects during construction stage. These policies provide a very wide cover and protect the insured against any sudden and unforeseen damage to the property during the period of insurance. The

Marine-cum-Erection All Risks (MCE) Policy in addition insured Marine and Transit risks.

Tariff Advisory Committee directly rated MCE / EAR Policies issued for large projects with sum insured of Rs. 100 crores and above. Similarly civil engineering projects like Dams, Bridges, Tunnels, Commercial Buildings etc., where the sum insured is Rs. 100 crores and above are directly rated by the Tariff Advisory Committee. TAC also designs tailor-made policies for large industrial and civil engineering projects to provide comprehensive insurance cover to suit the individual requirements. The rates and terms offered by the TAC are at par with the best available in other markets.

TAC offers a wide range of concessions in rates and terms for large projects. They are :-

Volume Discount .. Ranging from 5% to 15% on EAR/CAR rates based on the sum insured of the project.

Discount for opting higher excess than the stipulated Tariff excess .. 5% to 30% on EAR/CAR rate.

Discount for providing Fire Extinguishing Appliances as per TAC Regulations .. 2.5% applicable on SCE/EAR rate (in addition the excess for Fire & Explosion claims is reduced to 5% in MCE/EAR Insurance).

(Maximum discount allowable on EAR / CAR policies is limited to 60%

Discount for opting 5% of aggregate Marine loss as excess under Marine cum Erection (MCE) Policy 5% on Marine rate.

Facility for refund of premium for early completion of the projects .. Available on certain conditions.

How to avail of the benefits .. Approach your insurer who will make the necessary application to the TAC

Rating & Discount Scheme for Machinery / Equipment Insurances

Salient Features :

- TAC directly rates operational insurance policies of the following types designed to provide internal/external breakdown insurance covers for machinery/equipment.

Machinery Breakdown Insurance to provide cover for internal breakdown of plant and equipment machinery ... When the sum insured is Rs. 10 crores and more at one location.

Constructors Plant and Equipment Insurance Policy to provide cover for external breakdown due to impact, fire etc. for mobile equipments like wagons, locos, cranes, bulldozers, earth movers etc.. When the sum insured is Rs. 5 crores and more.

Electronic Equipment Insurance Policy for insurance of computers, electronic medical equipment, micro processors, communication equipment, etc.. When the sum insured is Rs. 1 crore and more at one location.

- Attractive discounts upto 30% of the premium are sanctioned where the claims experience for a five year period preceding expiring policy period is low with loading on the premium in cases of consistently adverse claims experience.

- Discounts upto 42.5% are available for opting for higher excess, over and above the stipulated tariff excess.

- Maximum discount available is 50%.

- Reduction of 50% on Tariff rates allowed for stand-by equipments under M.B. Insurance.

- Provision for refund of premium upto 50% on equipment which are silent (i.e. non-operational) subject to certain conditions under M.B. Insurance.

- 5% reduction in rate offered for seasonal industries under M.B. Insurance.

Rating & Discount Scheme for Marine Hulls

Terms and Conditions for insurance of all types of Ocean-going Vessels, Fishing Vessels, Inland Vessels, Trawlers, Sailing Vessels, covering shipowners interests in Hull & Machinery, Freight and Disbursements / Increased Value, are covered by the provisions contained in the Marine Hull Manual and circulars issued by the Committee from time to time.

For all types of Ocean-going Vessels like Bulk Carriers, Dry Cargo Vessels,

Specialised Carriers, Tankers, VLCCs etc., the initial rating is done by the TAC, taking into account the Age, Tonnage, Sum Insured, Coverage, Trading Limits, etc. of the vessel and the Management of the fleet.

For renewal of rating, claims experience of the preceding 5 years is taken into consideration. Fleets with favourable claims ratio merit reduction in rates, while those with adverse claims ratio, attract increase in rates. Others are allowed to continue terms and rates as per the policy due for renewal. Initial and renewal ratings of all types of Inland Vessels such as Barges, Launches, Passenger Vessels, Tugs etc. is done by the insurers as per the Tariff laid down for the purpose. Where the tonnage exceeds 2000, initial rating is done by the TAC. Provision exists in the Tariff enabling Insurers to apply to TAC for amelioration in certain cases.

All types of mechanised & non-mechanised Fishing Vessels, Trawlers and Sailing Vessels, Trawlers and Sailing Vessels valued upto Rs. 1.5 crores are rated by the Insurers as per the respective Tariffs. Where the sum insured exceeds Rs. 1.5 crores, rating is done by the TAC.

Provision also exists for covering liabilities borne by Charterers and Ship Repairers.

Wherever a risk falls beyond the purview of the Tariff or where no Tariff exists, a body of Marine Hull experts at the TAC examines the proposal and fixes appropriate rates, terms, conditions etc.

Tariff Advisory Committee

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GENERAL INSURANCE CORPORATION OF INDIA (GIC)

("SURAKSHA", 170, J. Tata Road, Churchgate, Mumbai - 400 020)

A PROFILE

- The General Insurance Corporation of India (GIC) was set up in 1973 as a holding company with four subsidiary companies :- National Insurance Co. Ltd., The New India Assurance Co. Ltd., The Oriental Insurance Co. Ltd. and United India Insurance Co. Ltd.

- Entire General Insurance operations in India are carried out by the four Companies, operating all over India, and, competing with each other.

- The GIC and its Companies have been guided by objectives laid down in the General Insurance Nationalisation Act, 1972, to develop general insurance business in the best interest of the community and to function on business principles.

Organisational Network :

- To spread the message of general insurance to all sections of the community, the Industry embarked on vigorous expansion of its organisational network.

- 4,134 operating offices - Branches (BO) and Divisions (DO) have been set up to reach every district of the country. Regional Offices (RO) established at state levels control and monitor their operations. Having attained this reach, the Industry is now consolidating its office network.

Business Operations :

- General Insurance Business in India has been growing at an averge annual rate of 17%. The last two years have been particularly good years for business development as growth rate has exceeded 20%. Gross Direct Premium (GDP) has touched Rs. 63.77 billion last year.

- Insurance business is sourced directly from large corporate accounts. For smaller corporate clients and individual clients there is a two tier marketing structure - Development Officer and Agent.

- To man the vast operational network and service the growing business, manpower of the Industry has grown from 25,057 in 1973 to 84,692 in 1996. The emphasis now is, not on further additions to the manpower, but, on building employee skills through comprehensive training programmes. The National Insurance

Academy set up as the apex training institution, is now international recognises.

- Motor business is the largest single department, even though our premium rating structure is acknowledged to be among the lowest in the world.
- Loss control measures have helped to keep the Motor Own Damage claims ratio under control though the rising Third Party claims ratio has produced substantial underwriting losses in the department.
- Fire insurance is tariff business and the rates are reviewed from time to time.
- Marine and Miscellaneous insurance rates are internationally competitive.
- Loss Prevention Association has been sponsored by GIC and Companies to promote concepts of safety and loss control amongst corporates and individuals.

Financial Performance :

- The general insurance industry has been consistently achieving overall profits for the past 2 decades. However, the motor losses have been placing a strain on the overall profitability in recent years.
- The industry has emerged as one of the major financial institutions of the country and has deployed its funds in socio-economic and development activities on an increasing scale.

Rs. in Billion	1973	1980	1985	1990	1996
Central Govt. securities	0.4	1.9	5.2	9.5	22.1
State Govt. securities & public Sec.	0.4	0.8	2.2	5.4	4.3
Housing sector	-	0.7	5.7	15.4	33.8
Market Investments	1.2	3.0	6.9	15.4	52.4
Other Investments	1.5	2.4	1.7	5.9	12.0
TOTAL	3.5	8.8	21.7	51.6	124.6

- The GIC has utilised synergies to set up ancillary financial services in the form of Mutual Fund and Housing Finance.

Reinsurance :

- The GIC, as holding company, has drawn up a reinsurance programme to ensure optimum retention within the country, consistent with safety and underwriting prudence. As a result of pooling of financial resources, the retention capacity of the industry has grown substantially. The Industry's retention for all classes of business is approximately 84%. GIC and its four companies have substantial financial strength and the group has been rated as "A" class security. For promotion of the Industry's foreign non-reciprocal inward reinsurance business, GIC and companies set up in 1992, a Single Window International Facultative and Treaty (SWIFT) Division. In a short period SWIFT has made tremendous progress and now leads reinsurance programmes of companies in Mauritius, Malaysia and Maldives. It has a desk underwriter for each area for comprehensive services in all classes of business to the client.

Foreign Operations :

- The Indian insurance industry carries out business opeations in 31 countries - 14 countries through Associates / Subsidiaries and in 17 countries through Branches and Agencies.

- Companies overseas branches / agencies are in Australia, Bahrain, Canada, Fiji, France, Hongkong, Japan, Kuwait, Mauritius, Nepal, Netherlands Antilles, Oman, Philippines, Saudi Arabia, Thailand, United Arab Emirates and the United Kingdom. The foreign operations volume have been growing steadily.

- Foreign operations through Subsidiaries / Associate Companies in :

1.	Antigua	8.	Liberia
2.	Barbados	9.	Malaysia
3.	Dominica	10.	Nigeria
4.	Ghana	11.	Sierra Leone
5.	Guyana	12.	Singapore
6.	Jordan	13.	St. Lucia
7.	Kenya	14.	Trinidad Tobago

- GIC as the holding company has been reviewing individual Company foreign branches / agencies operations to maximise impact and achieve economies of scale.

- In Singapore, individual company branch operations were merged in a fully owned subsidiary "India International". India International is now one of the largest insurers in that market with a reputation for prudent underwriting.

- In Kenya, branch operations were merged in a local company floated with local participation. This company "Kenindia" is now, by far, the leading general insurer in that country holding 22% of the market.

Looking Ahead :

- The GIC's underwriting skills and financial strength is now internationally accepted. The industry has equipped itself with the latest information technology to improve its efficiency and speed up response time. The liberalisation of economies now taking place in many parts of the world, including India, offers opportunities for the GIC to look outward to the international insurance world.

General Insurance Corporation of India

"Suraksha" 170, J. Tata Road, Mumbai 400 020
Phone : 022-2833046 Fax : 022-2874129

National Insurance Co Ltd.
3, Middleleton Street, Calcutta 700 071

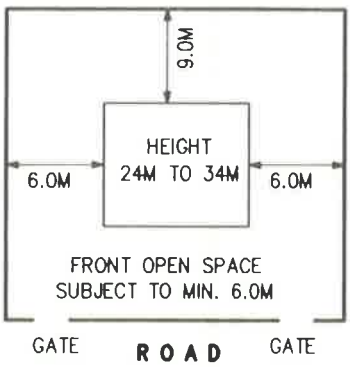
National Assurance Co. Ltd.
87, Mahatana Gandhi Road, Fort, Mumbai 400 023

Oriental Insurance Co. Ltd.
Oriental House, A-25/27 Asaf Ali Road New Delhi 110 002

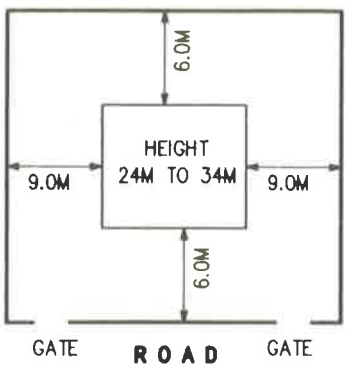
United India Insurance Co. Ltd.
24, Whites Road, Madras 600 014.

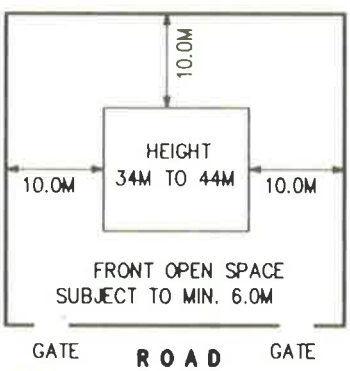
FIRE FIGHTING REQUIREMENTS

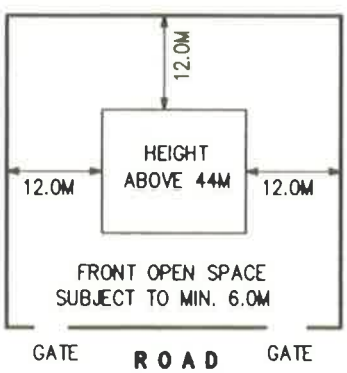
FOR OPEN SPACES



OR







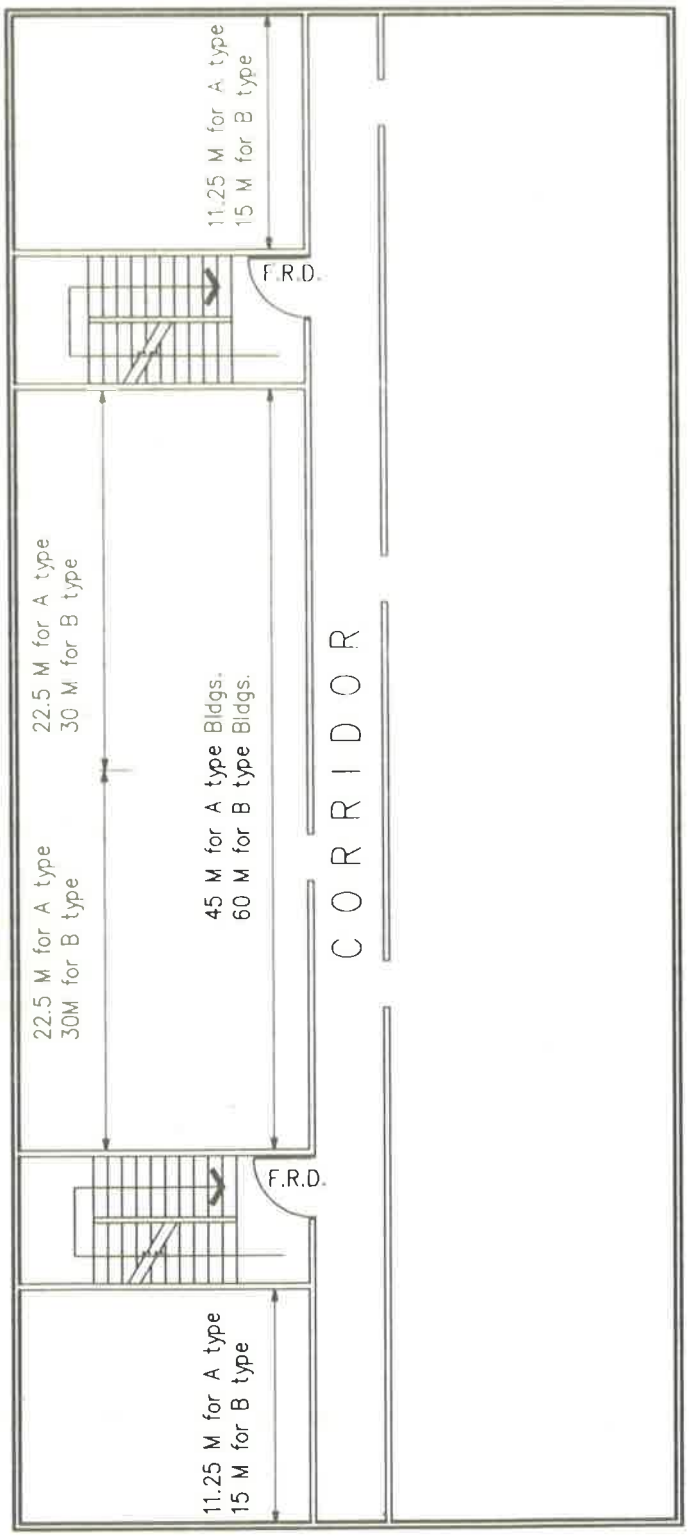
NOTE

a) Minimum gate opening rquired is 4.5 m wide and Archway 4.6 m high

b) Location of gate shall be decided on consultation with C.F.O. as per site conditions.

TRAVEL DISTANCES FROM EXITS/STAIRCASES

D. C. Reg. No. 43 (2) (j) (i & ii)



Note:

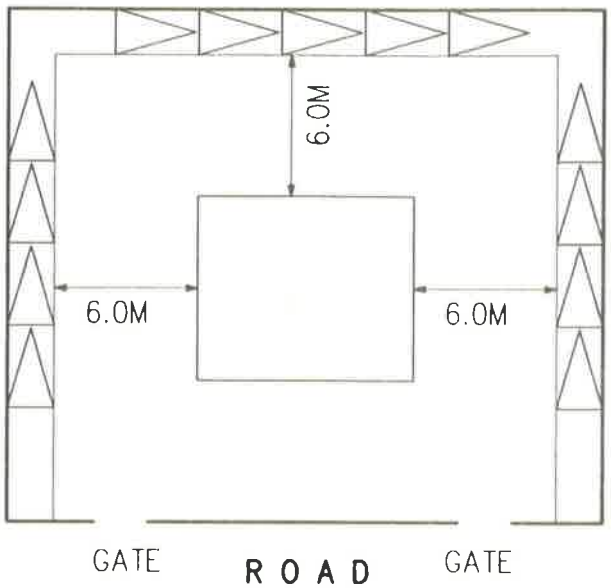
A – Type Bldgs : Residential, Educational, Institutional & Hazardious occupancies

B – Type Bldgs : Assembly, Business, Mercantile, Industrial and Storage Bldgs.

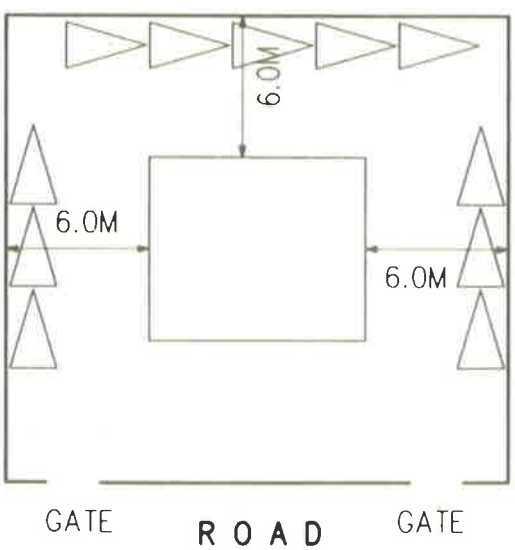
FIRE FIGHTING REQUIREMENTS

CAR PARKING

FOR HIGH RISE BUILDING

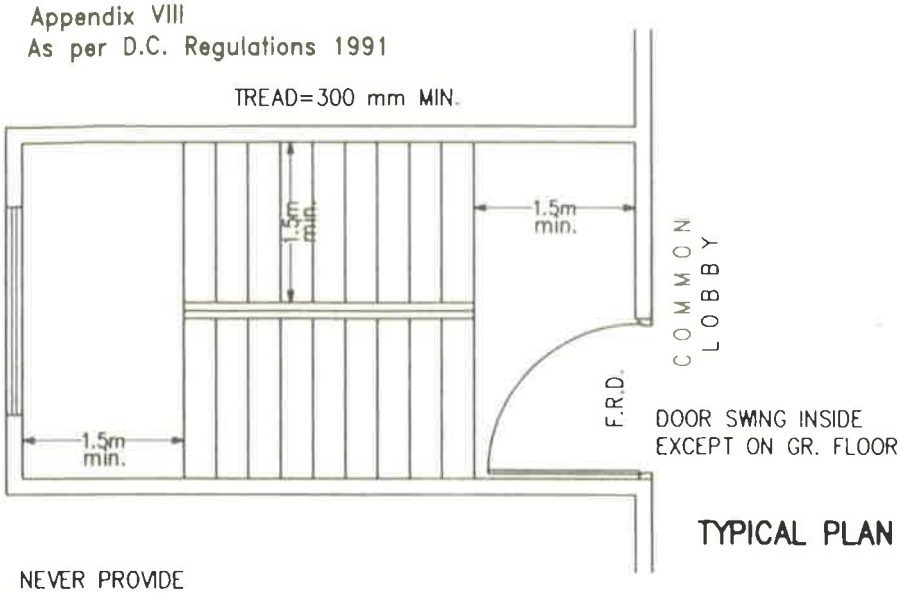


SPECIAL LOW RISE BUILDING

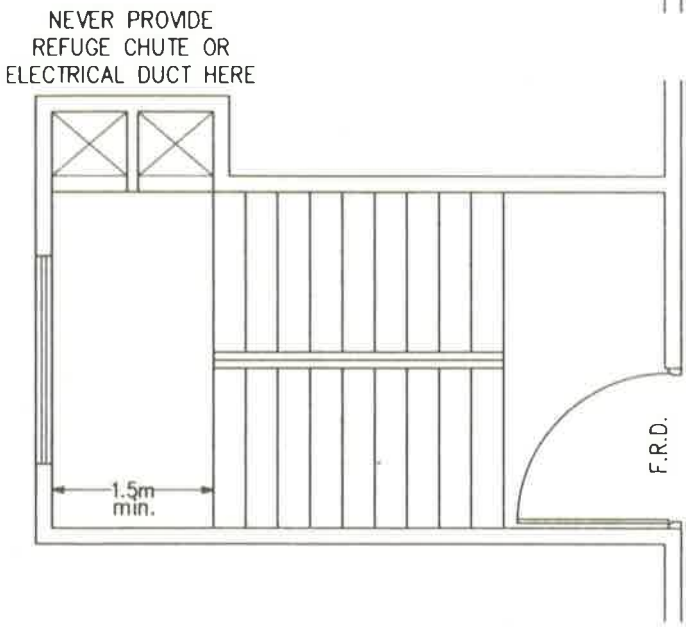


FIRE FIGHTING REQUIREMENTS

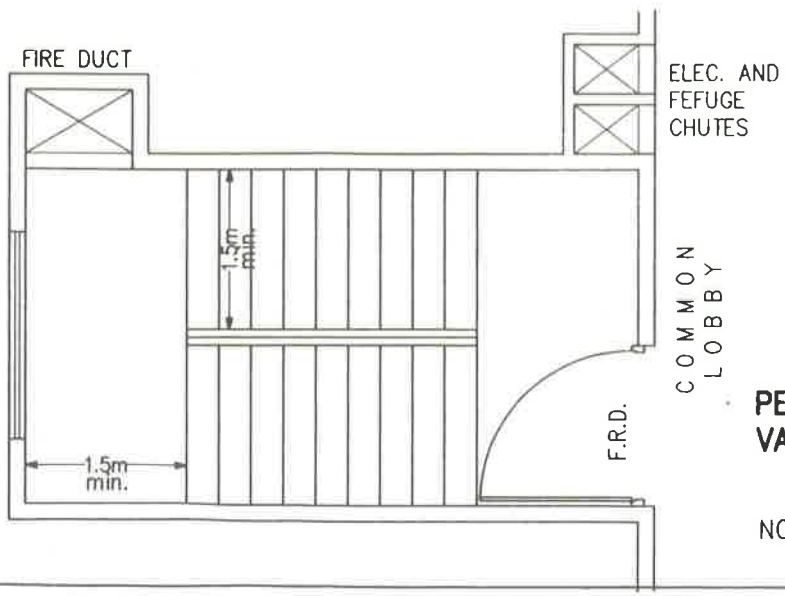
Appendix VIII
As per D.C. Regulations 1991



TYPICAL PLAN OF FIRE STAIRCASE



POSITIONS OF VARIOUS DUCTS NOT PERMITTED

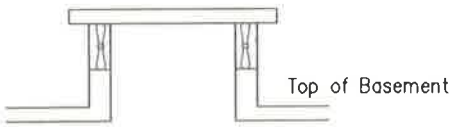


PERMITTED POSITIONS OF VARIOUS DUCTS

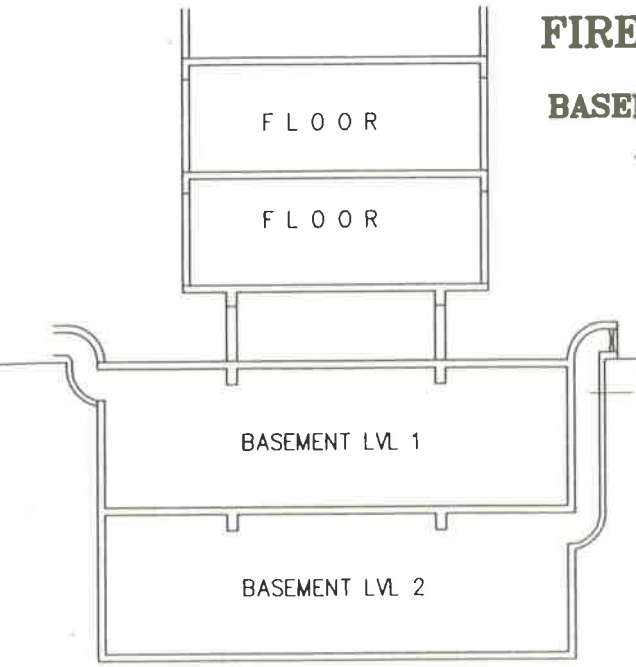
NOTE : ALL STAIRCASE DOORS TO HAVE MIN. 2 HRS. FIRE RESISTANCE

FIRE FIGHTING REQUIREMENTS

BASEMENTS



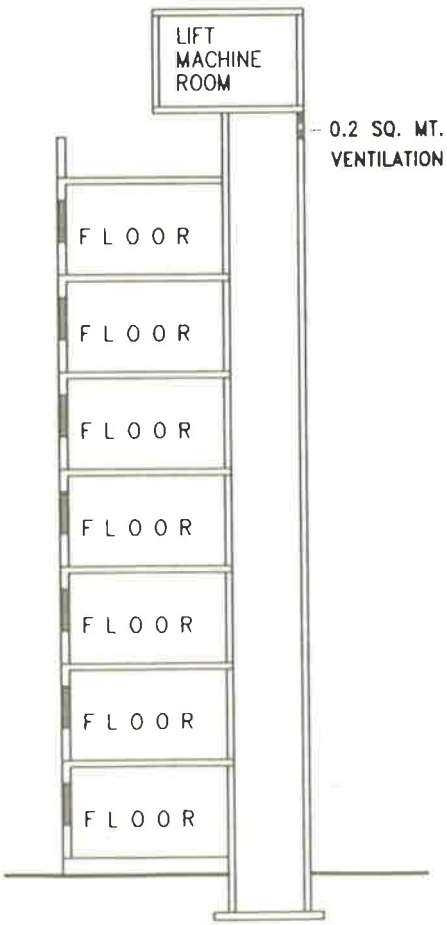
Basement Ventilation



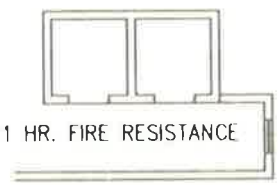
Aggregate crosssection of
2.5 % Floor Area
to be distributed evenly
throughout the floor area

MULTI LEVEL BASEMENT

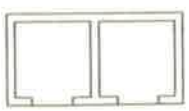
FIRE LIFTS



GROUP OF LIFTS



Maximum 4 lifts

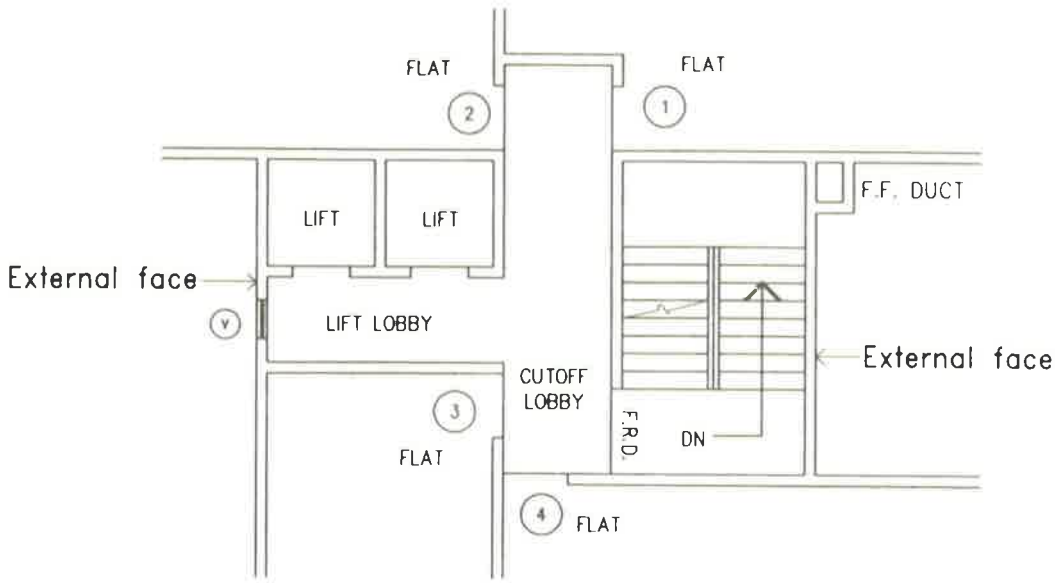


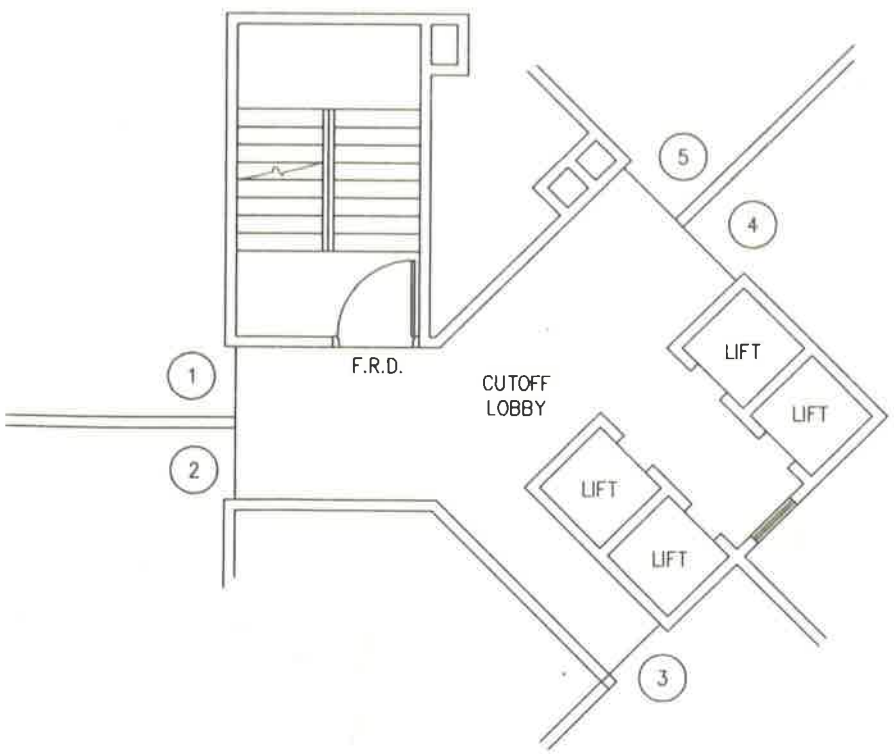
RCC
2 HRS. FIRE RESISTANCE

BHAL: DCR

CUTOFF LOBBIES IN HIGHRISE BUILDINGS

As Recommended by C.F.O.





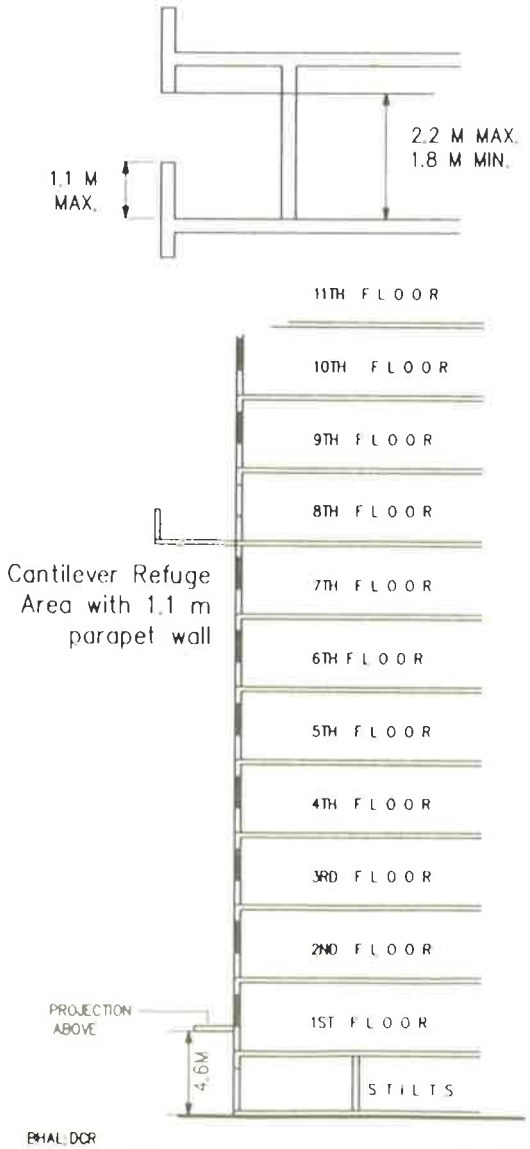
FIRE FIGHTING REQUIREMENTS

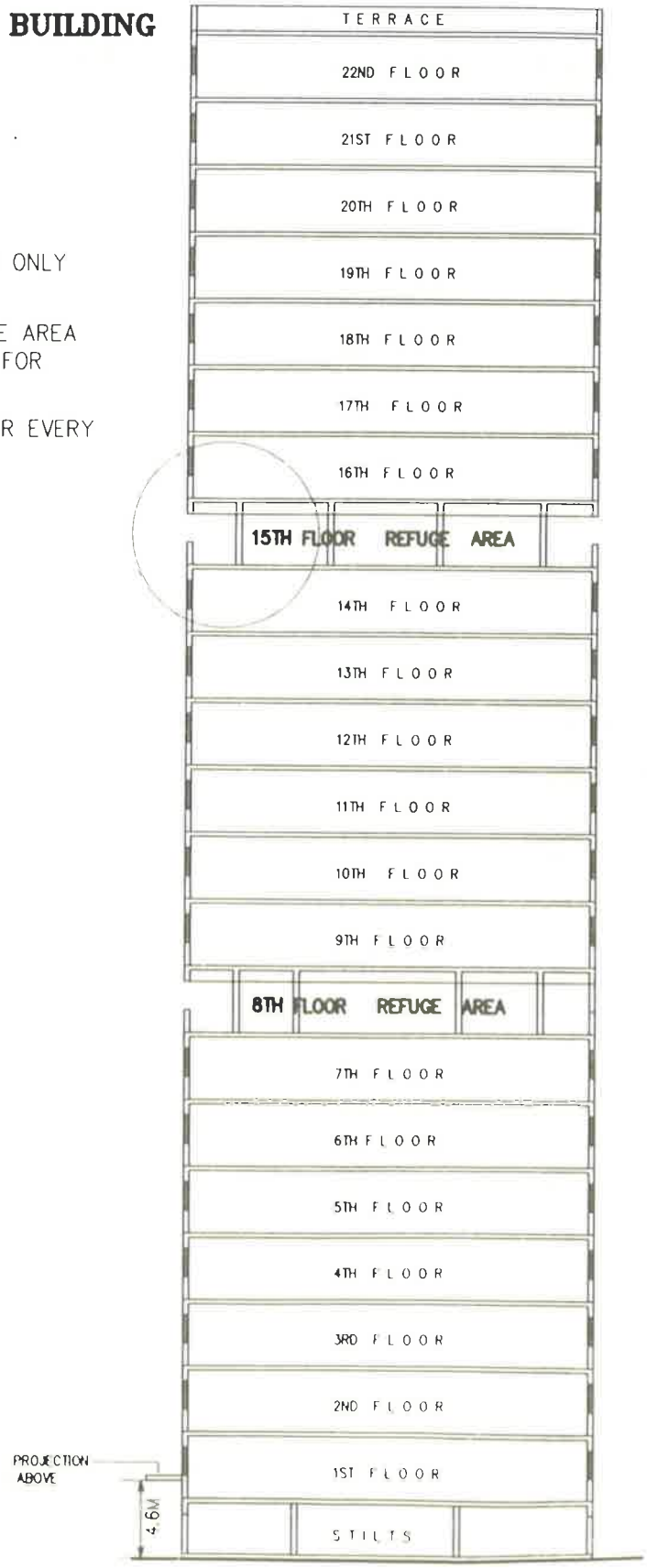
REFUGE AREA IN HIGH RISE BUILDING

Refuge Area minimum 4% of area of all floors above that Refuge Floor till the next Refuge Floor .

NOTE:

1. CANTILEVER REFUGE AREA IS PERMITTED ONLY AT 8TH FLOOR WITH 1.1 M PARAPET
2. SWIMMING POOL IS PERMITTED IN REFUGE AREA PROVIDED IT IS PERMITTED TO BE USED FOR FIRE FIGHTING PURPOSE.
3. REFUGE AREA SHELL BE PROVIDED AFTER EVERY SIX STORIES BEYOND 24 M HEIGHT.



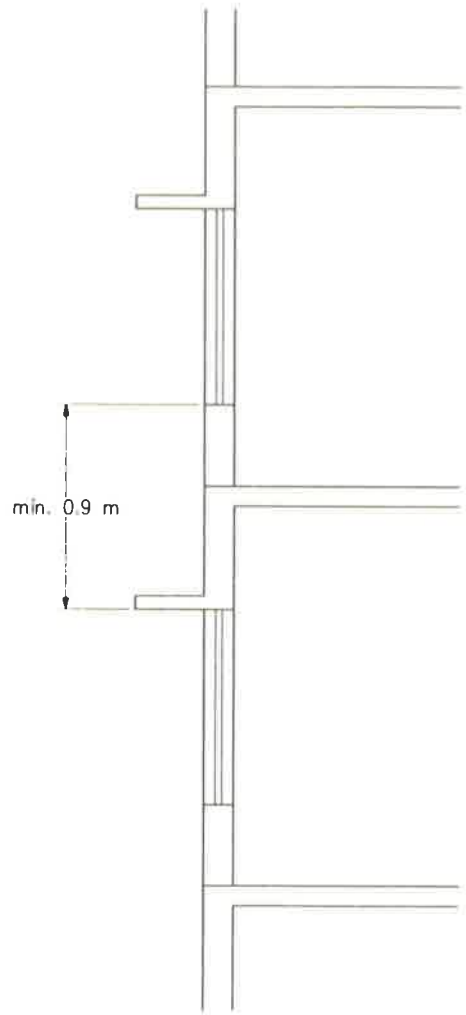


BHAL DCR

FIRE FIGHTING REQUIREMENTS

Appendix VIII D.C.R. 1991

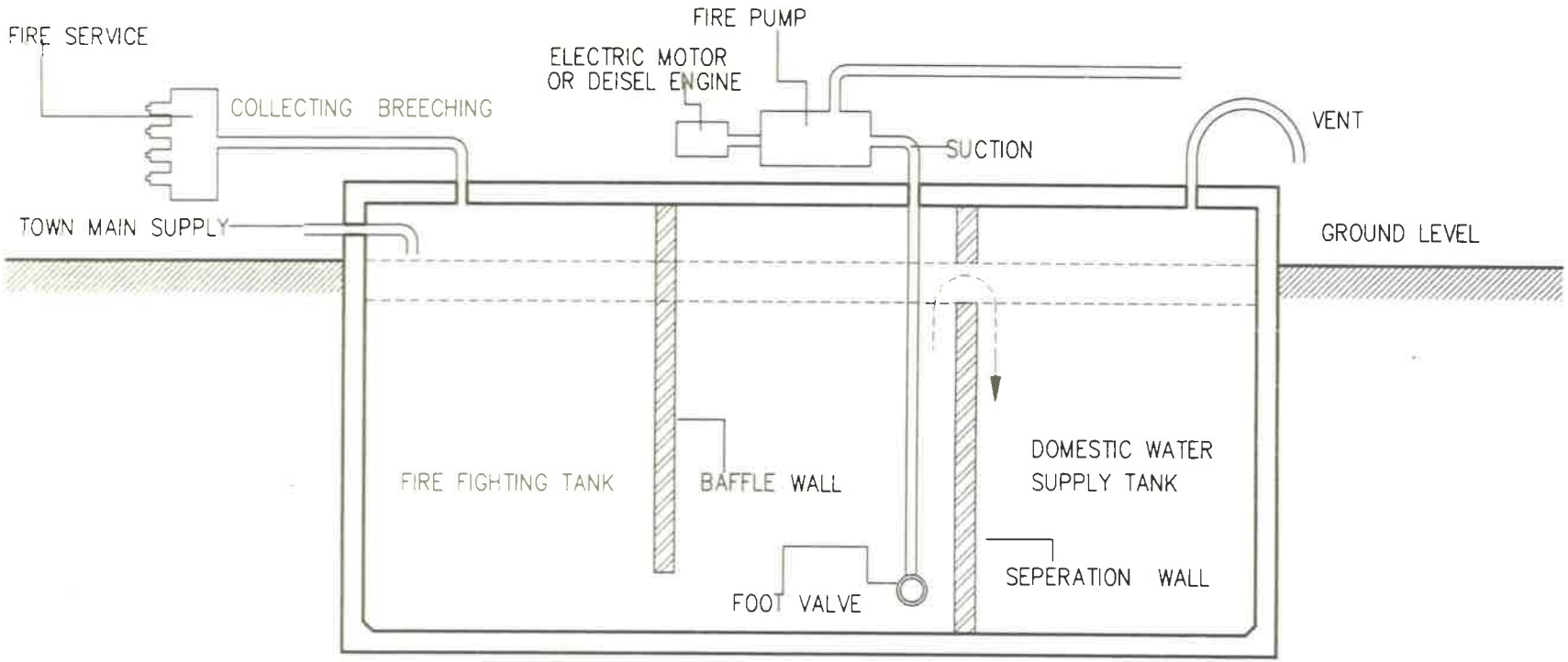
MIN. DISTANCE BETWEEN OPENINGS TO BE 0.9 M TO PREVENT SPREAD OF FIRE FROM LOWER FLOORS TO UPPER FLOORS



TYPICAL WINDOW SECTION THRO' HIGHRISE BUILDING

FIRE FIGHTING REQUIREMENTS

As per D.C. Regulations 1991

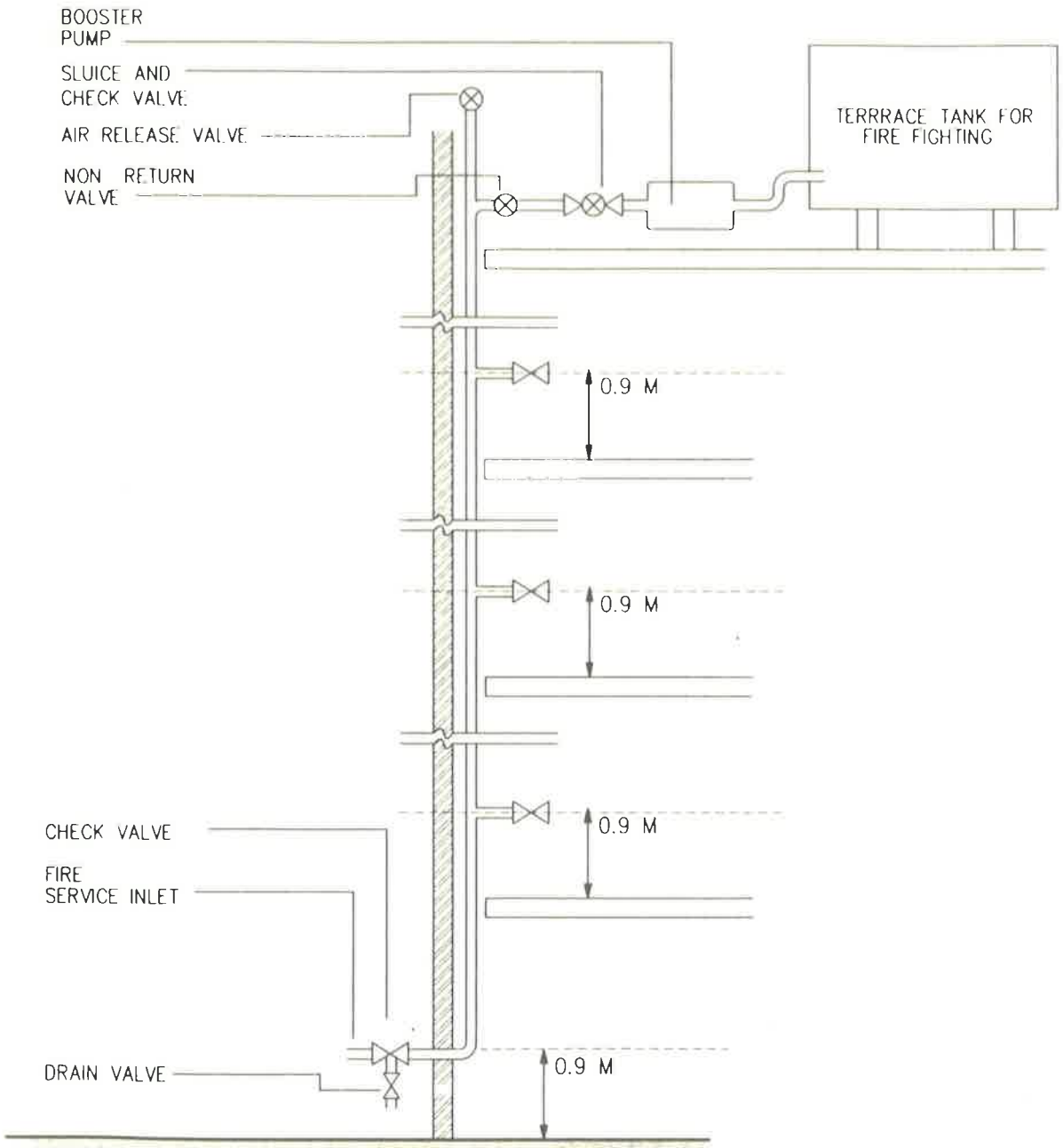


ARRANGEMENT FOR PROVIDING COMBINED WATER TANK FOR FIRE FIGHTING AND DOMESTIC USE

FIRE FIGHTING REQUIREMENTS

ARRANGEMENT OF WET RISER CUM DOWN COMER FOR APARTMENT BUILDINGS ABOVE 15 M. BUT NOT EXCEEDING 24 M.

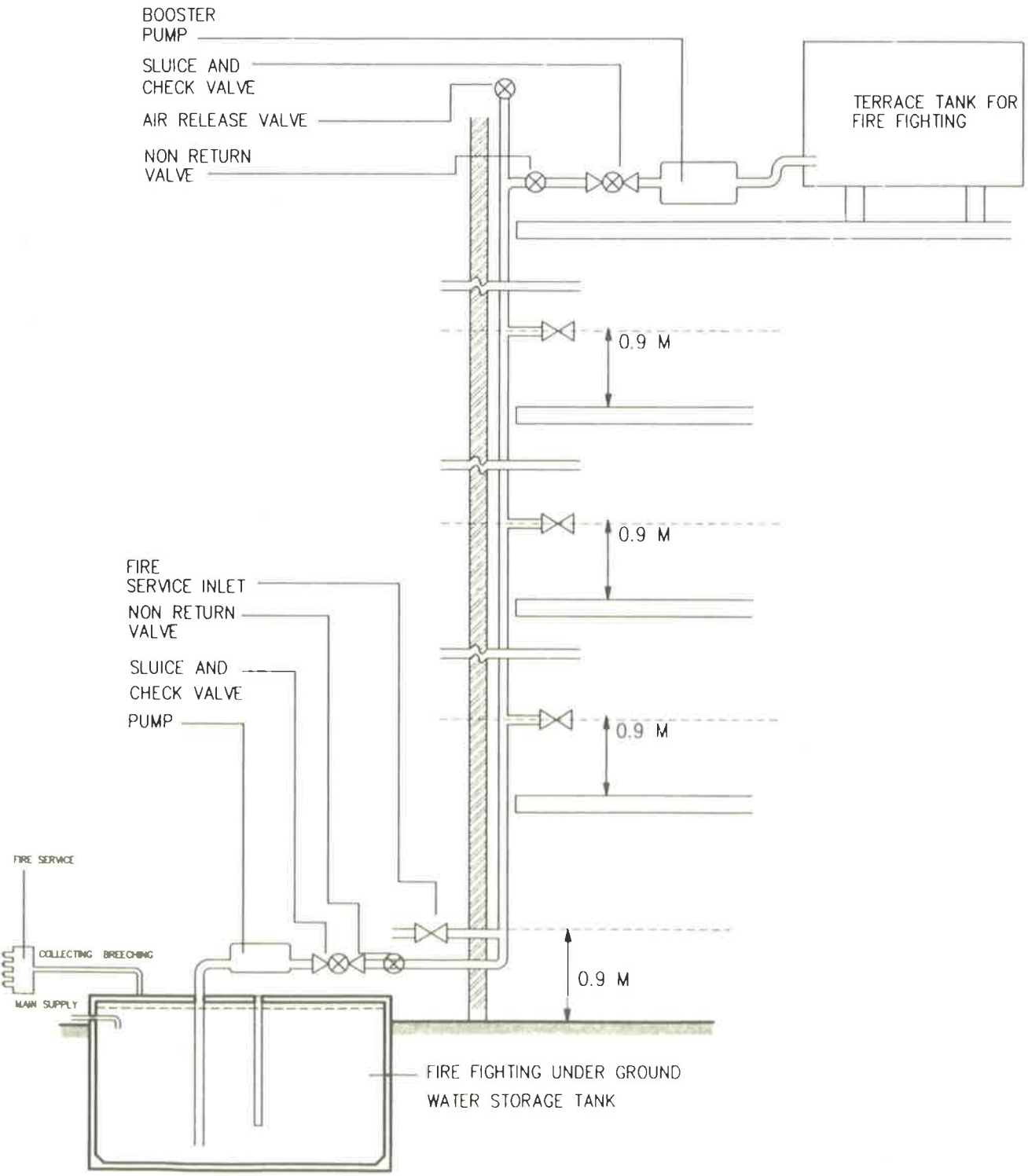
As per D.C. Regulations 1991



FIRE FIGHTING REQUIREMENTS

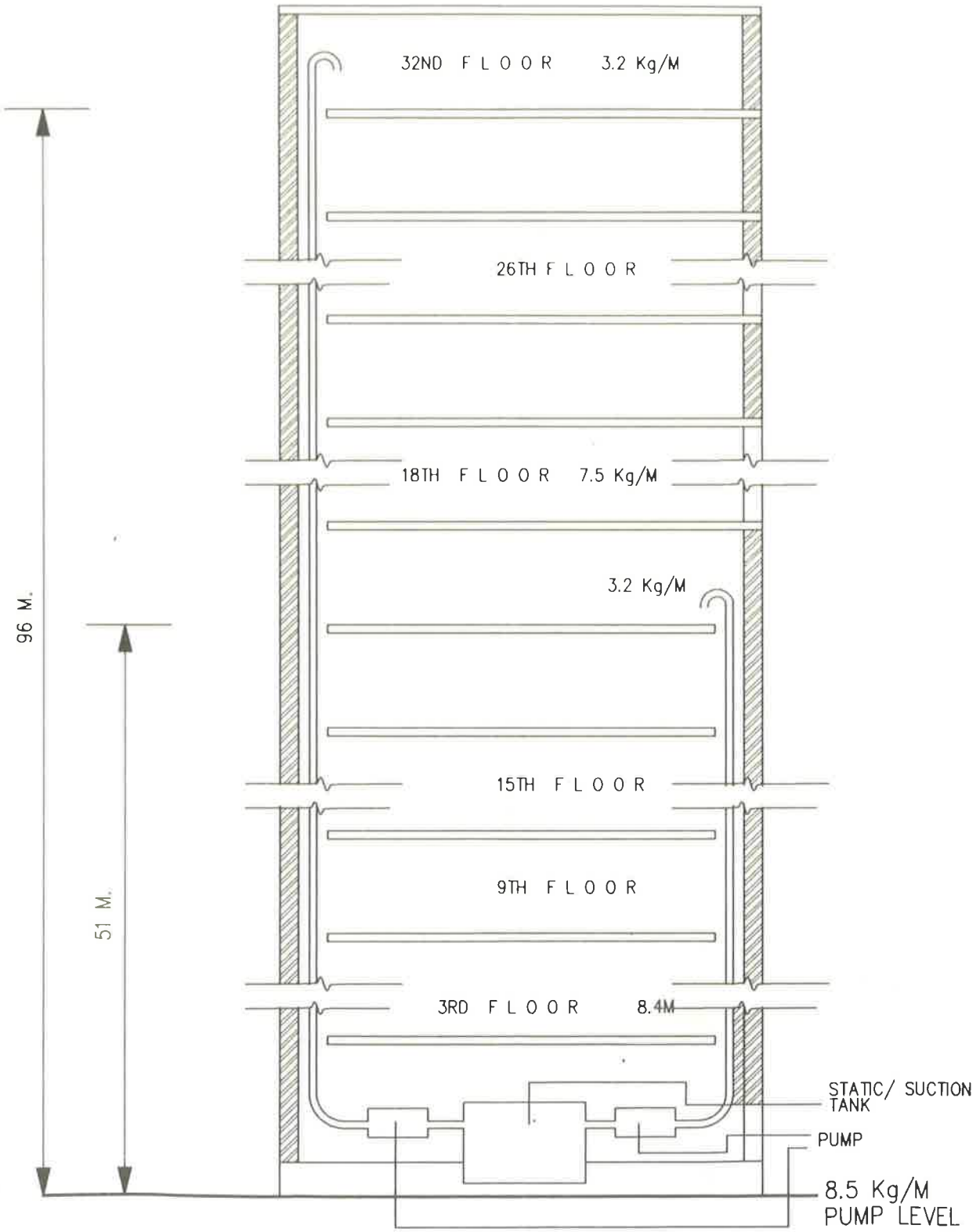
ARRANGEMENT OF WET RISER CUM DOWN COMER FOR APARTMENT BUILDINGS EXCEEDING 24 M.

As per D.C. Regulations 1991



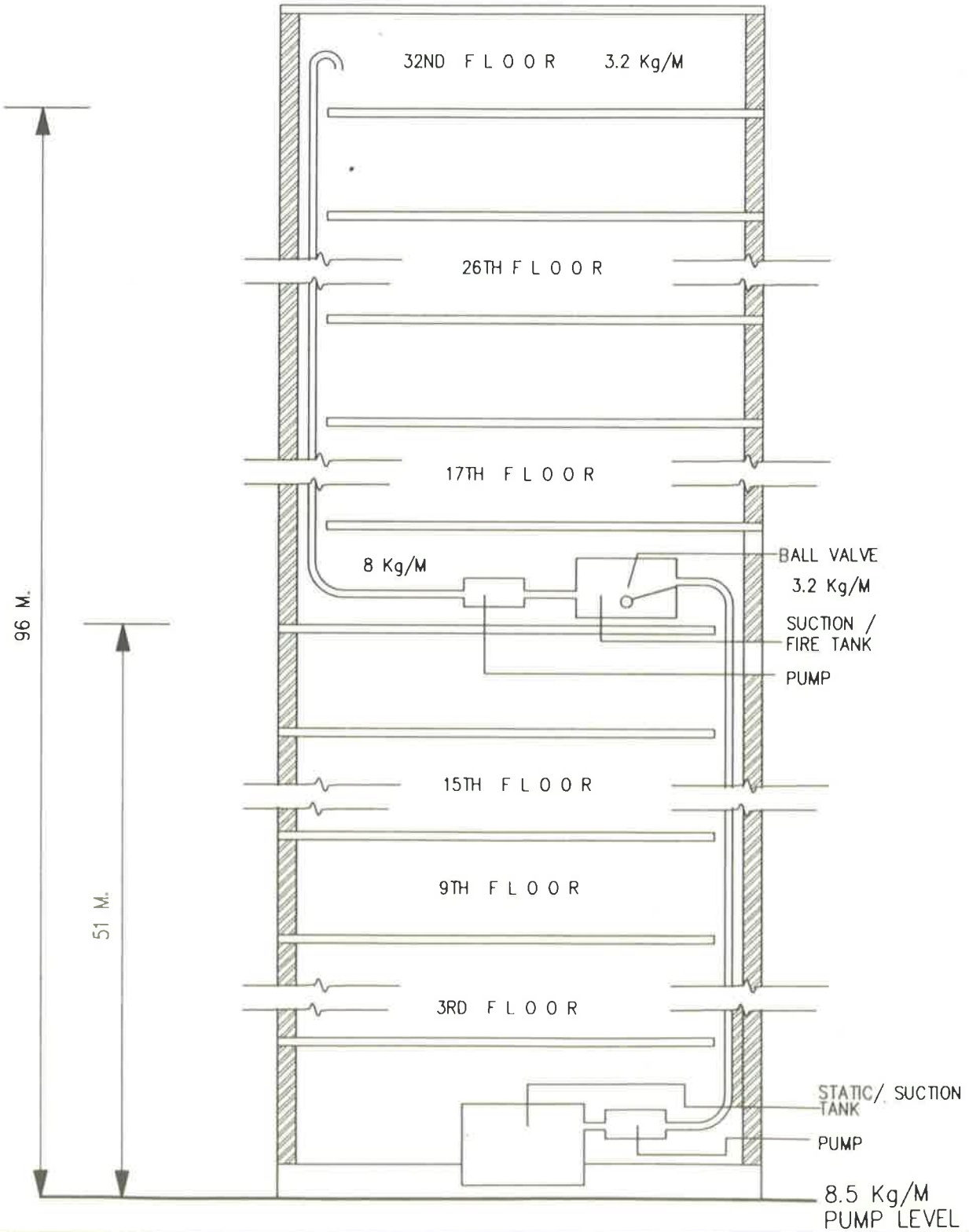
FIRE FIGHTING REQUIREMENTS

ALTERNATE ARRANGEMENT (1) OF WET RISER SYSTEM FOR NON APARTMENT BUILDINGS OVER 35 M.



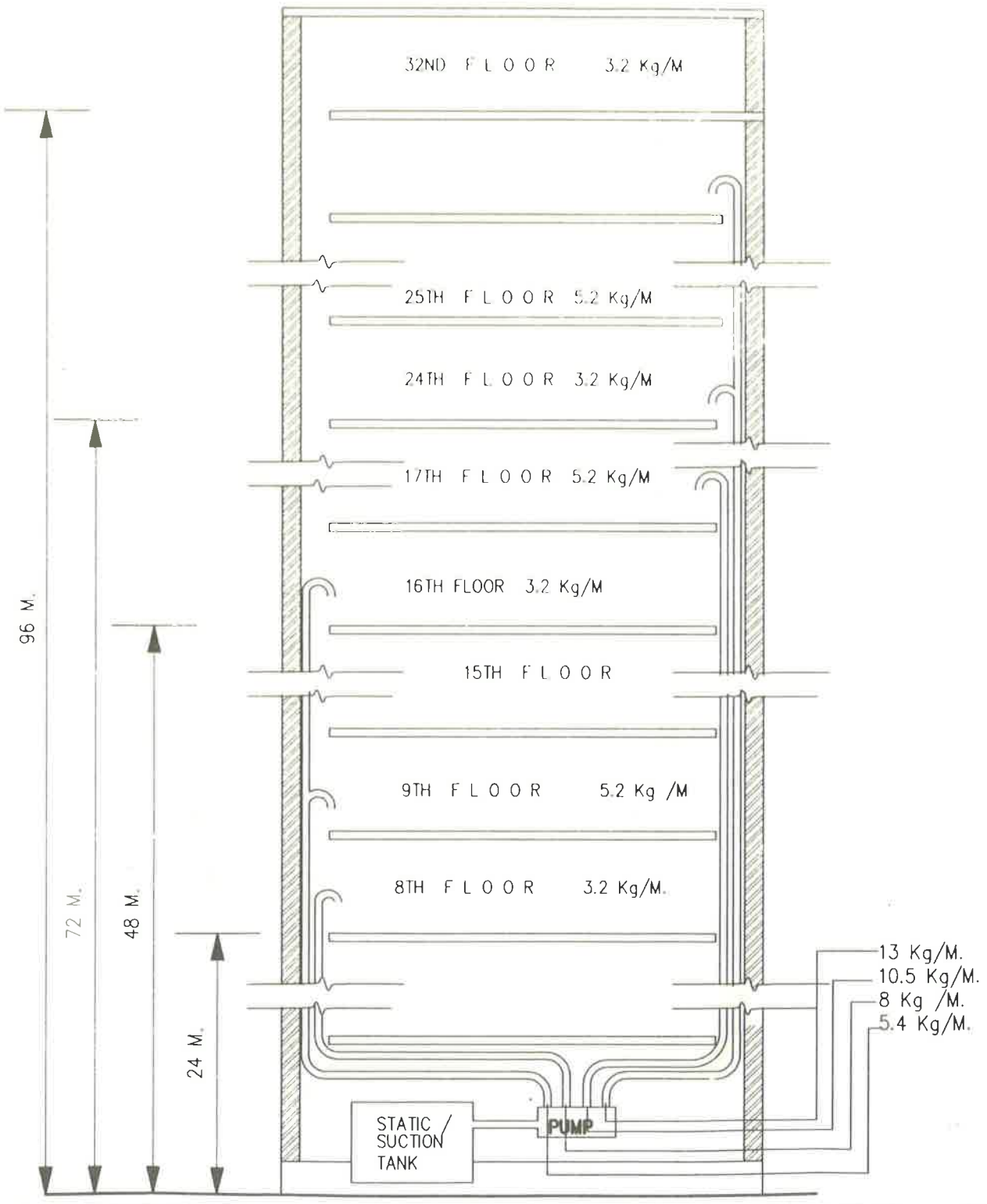
FIRE FIGHTING REQUIREMENTS

ALTERNATE ARRANGEMENT (2) OF WET RISER SYSTEM FOR NON APARTMENT BUILDINGS OVER 35 M.



FIRE FIGHTING REQUIREMENTS

ALTERNATE ARRANGEMENT (3) OF WET RISER SYSTEM FOR NON APARTMENT BUILDINGS OVER 35 M.



PRINCIPAL OFFICERS OF MUMBAI FIRE BRIGADE

Sr. No.	Name	Tel. No. Office	Tel. No. Residence
1.	Shri V.V. Rao Chief Fire Officer	3076111-2-3 3074923 (P) Mobile 9821093708	2882290
	DY. CHIEF FIRE OFFICERS		
2.	Shri D.S. Muley	8210940-1	8368855
3.	Shri. B.B. Surve	8210940-1	8320594
4.	T.G. Nanakani	3076111-2-3	3088562
5.	V.G Sawant	3076111-2-3	3097188
	DIVISIONAL OFFICERS		
6.	Shri. A.D. Jhandwal	3076111-2-3	3738818
7.	Shri. G.S. Sawant	3076111-2-3	3076111
8.	Shri. V.J. Kulkarni	3076111-2-3	3097258
9.	Shri. S.P. Dalvi	5224824 8210940-1	5224824
10.	Shri. S.B. Bhambure	8210940-1	8210940-1
11.	Shri R.A. Chaudhary	3076111-2-3 3080181-2-3	3076111-2-3 3086181-2-3

FIRE STATIONS
MUMBAI FIRE BRIGADE

Sr. No.	Fire Station	Station Officer	Telephone No.
1.	Colaba	Shri Mali	2043603
2.	Fort	Shri. Joshi	2611942
3.	Memanwada	Shri. Tawde	3738818
4.	Govalia Tank	Shri Bhosle	3806001
5.	Byculla	Shri Gaitonde	3076111
6.	Worli	Shri Tatkare	4300178
7.	Dadar	Shri M.R. Kadam	4134200
8.	Shivaji Park	Shri. P.P. Sawant	4457203
9.	Indira Dock		2611589
10.	Mandvi	Shri Hivrale	3716694
11.	Sewree	Shri S.H. Shinde	3775756
12.	Andheri	Shri. Varma	6205301
13.	Vikroli	Shri. Nesarikar	5170730
14.	Chembur	Shri. Gonjari	5224824
15.	Dharavi	Shri. Amin	4077868
16.	Deonar	Shri. A.N. Shinde	5563391
17.	Mulund	Shri Khol-Kumbe	5687637
18.	Rawli Camp	Shri Nikam	4077841
19.	Kandivali	Shri Muzawar	8050101
20.	Marol	Shri. Desai	8210940-1
21.	Malad	Shri Patel	8071010
22.	Bandra	Shri Malik	6435206
23.	Nariman Point	Shri Rahangdale	2882787

Byculla Control Room :	3085991-2-3-4 101

LIST OF CONSULTANTS FOR FIRE PROTECTION SYSTEMS

Sr. No.	Name & Address	Tel. No.
1.	**Shri. V. B. Nikam** Chief Fire Officer (Retd.) 4/34, Municipal Officers' Society, Hajiali - Mumbai - 400 034	4937866 / 4939988
2.	**Shri. S. M. Desai** B 4/5, Municipal Officers Flats, A. G. Road, Worli, Mumbai - 400 018	4973657 / 492 7697
3.	**Dalal Consultants** 44, Dr. R. G. Thadani Marg, Worli, Mumbai - 400 018	4937570 / 4937669 4934821 / 4930123
4.	**Jhon Mech El Technologies Pvt. Ltd.** 91 B, Rajni Gandha, D. N. Nagar, Andheri (W), Mumbai - 400 058	6239410 / 6212715
5.	**S. K. Murthy Consultants** 3rd Floor, Imperial Mahal, Dadar T. T., Mumbai - 400 014	
6.	**Hydro Mech Engineers** D 11/12, Mahindra Park, L.B.S. Marg, Ghatkopar (W), Mumbai - 400 086	5126329
7.	**Sangam Project Consultans Pvt. Ltd.** A/7, New Prem Vasundhara, Mahakali Caves Rd., Andheri (E), Mumbai - 400 093	8394599 / 8375432
8.	**Project Engineering Services** 104 B, Green Park, Yaari Road, Andheri (W), Mumbai - 400 061	6267665 / 6294147
9.	**Creative Engineers** Devendra Building Basement, Sahyog Mandir Road, Ghantali, Thane (W), Pin - 400 602	5416293
10.	**George Sons Services** Krishna Giri, Kulupwadi Road, Borivli (E), Mumbai - 400 066	8861783
11.	**Krishna Fire Protection Consultants** F/101, Vasant Park, Ambadi Road, Om Nagar, Vasai Road (W), Dist - Thane	8686017

LIST OF CONTRACTORS:
FOR FIRE FIGHTING SYSTEM INSTALLATIONS

Sr. No.	Name & Address	Tel. No.
1.	**New Fire Engineers Pvt. Ltd.** T. V. Industrial Estate, S. K. Ahire Marg, Worli, Mumbai - 400 025	4938293
2.	**Minimax** (fire protection div. of Steelage Industries) Atlass Mill Compound, Reay Road, Mumbai - 400 010.	3751427
3.	**Vijay Fire Protection** 35, Chandivali Village, Off Saki Vihar Road, Mumbai - 400 072.	8518773 (11 lines)
4.	**Monsher Enterprises** Nirman Kendra, Dr. E. Moses Rd., Mumbai - 400 011.	4920709
5.	**Vaishali Fire Systems** Vaishali Manor, Govt. Ind. Estate, Charkop, Kandivli, Mumbai - 400 067.	8622017
6.	**Ankit Fire Protection Engineers** Nityanand Nagar No. 4, S. N. Road, Andheri (East), Mumbai - 400 069.	8217085 8208109
7.	**T. P. Enterprise** Best Depot Bldg., Andheri (West), Mumbai - 400 058	6707085
8.	**KSB Engineers** N. M. Marg, Kalptaru Chambers, Fort, Mumbai - 400 023	2671271
9.	**Asia Engineering Co.** Killfire House, Dalia Ind. Estate, Andheri (W), Mumbai - 400 058	6267842

10.	**C. M. E. Industries** Maker Tower, Cuffe Parade, Mumbai - 400 005	2186164
11.	**Nortex Fire Pvt. Ltd.** Darshaw Bldg., 24 Jambul Wadi, Kalbadevi, Mumbai - 400 002.	2063530
12.	**Safe Fire Services** Bhavani Chambers, Veer Savarkar Marg, Thane (W), Pin - 400 601	5365132
13.	**Beenee Enterprise** 2, Balkrishna Niwas, J. S. Marg, Dahisar, Mumbai - 400 068	8944622
14.	**Sankalp Enterprise** Shop No. 10, Parmeshawar Dham, 7th Road, Rajawadi, Mumbai - 400 077	5124950
15.	**Trinity Enterprise** Hira Baug, Cama Wadi, Deonar, Mumbai - 400 088.	5569896
16.	**Firetronics Systems** Shop No. 1, Anand Bhavan, Bajaj Road, Vileparle (W), Mumbai - 400 057.	6712751
17.	**Rahul Fire Proection Services** Ghatkopar Ind. Estate, Mumbai - 400 086	5172510
18.	**Sanket Enterpise** 6, Viral Shopping Centre, Mantri Wadi, Malad (W), Mumbai - 400 064.	8882361
19.	**Firesafe Industries** B-3, Anand Apts., J.P. Road, Andheri (W), Mumbai 400 058	6344976 / 77 Fax : 6286181
20.	**Hiteck Engineering Services** Siddhideep Mahant Road, Vile - Parle (E), Mumbai 400 057.	6191061

21.	**Marshal Fire Contractor Pvt. Ltd.** 214, Nirman Kandra, Dr. E. Moses Road, Worli, Mumbai - 400 011.	3086416 / 3090498 3090877
22.	**Harsh Fire Protection System** 1/1, K.K. Chhaya Apt., Above Allahbad Bank, Station Road, Ghatkopar (E), Mumbai - 400 077	5138574
23.	**Firemarshal Associates** D-10, Berkely Palace, Sir J.J. Road, Byculla, Mumbai - 400 008.	3746937
24.	**Rajyog Fire Service Pvt. Ltd.** 30 - Jailaxmi Apts., 2nd Floor, 338, Narsi Natha Street, Mumbai 400 009	3410427 Fax : 3414987
25.	**Monsher Fire Protection Engineers** 214, Nirman Kandra, Off Dr. E. Moses Road, Mumbai 400 011	4920709
26.	**Newage Industries** 7 Champaklal Udyog Bhavan, Sion (E), Mumbai - 400 064.	4077421 Fax : 407229
27.	**Nitin Fire Protection Industries** 29, Vadhani Ind. Est., L.B.S. Marg, Ghatkopar (W), Mumbai 400 086.	5000392 Fax : 5002516
28.	**Zenith Fire Services** 15, Vadhani Ind. Est., L.B.S. Marg, Ghatkopar (W), Mumbai 400 086.	5000805
29.	**Electromech Firefighters Pvt. Ltd.** B/3, Laghu Udyog Kendra, I.B. Patel Road, Goregaon (E), Mumbai 400 063.	8734468 Fax : 8721331

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Mumbai - 400 016.
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181

PUBLICATION OF PEATA (INDIA) IN ASSOCIATION WITH MUMBAI FIRE BRIGADE

Published and Printed by :

Practising Engineers Architects and Town Planners Association (India)

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TELEPHONE : 444 59 98 • 444 28 97 • FAX : 444 29 83

In Association with :

Mumbai Fire Brigade
Municipal Corporation of Greater Mumbai

CITY H. Q. BYCULLA
SHAIKH HAFFIZUDDIN MARG,
BYCULLA, MUMBAI - 400 008.