NATIONAL ASSOCIATION OF FIRE OFFICERS

ISSUE 03 JULY-SEPTEMBER 2014

FIRE TECH

A QUARTERLY JOURNAL ON FIRE SAFETY BY
NATIONAL ASSOCIATION OF FIRE OFFICERS

ROLES AND RESPONSIBILITIES OF LICENSED AGENCIES AND REGULATORS

A CHECKLIST OF LAWS AND SECTIONS UNDER THE MAHARASHTRA FIRE ACT, WHICH LICENSING AGENCIES AND REGULATORY BODIES MUST KNOW.

WHAT ARE **AUTOMATIC SPRINKLERS,** AND WHY THEY ARE NEEDED

SAFE LIVING, MORALLY AND LEGALLY

A ONE-DAY SEMINAR ON **'MISSION: SAFE LIVING'** WAS ORGANISED BY MAHARASHTRA FIRE SERVICES IN MAY 2014.

MAHARASHTRA LEADS THE WAY IN FIRE SERVICE TRAINING

AN OVERVIEW OF THE GAMUT OF LEARNING THAT THE MAHARASHTRA FIRE SERVICES ACADEMY OFFERS.

Leslico™

INDUSTRIAL VEHICLES

"People who haven't experienced heat of 1,100 degrees have no idea how we tick."

We couldn't agree more.
And your commitment is what drives us.

The best firefighting equipment is made by firefighters. This is something that Conrad Dietrich Magirus, a passionate firefighter, knew 148 years ago when we founded our company. It is in this tradition that we build for your state-of-the-art and reliable turntable ladders, combined fire fighting vehicles, fire engines, industrial fire fighting vehicles, aircrash rescue vehicles, as well as pumps and portable pumps. Take for example the SUPERDRAGON X8, a new-generation airport firefighting vehicle. With its best-in-class acceleration, huge water capacity and pump performance, it is your insurance that you can always rely on in the airport. Having many trained firefighters aboard, we know precisely what you need for your emergency call-outs.

www.iveco-magirus.com

IVECO MAGIRUS

Joseph Leslie™ & CO. LLP

— A Legacy of Safety —

For any information on products, please contact:

Leslico House, 3rd floor, Prof. V.S. Agashe Rd, Dadar - W, Mumbai - 400 028. India
T +91 22-2422 7198 / 1880 / 1878 / F +91 22 -2430 6044 / E mumbai@josephleslie.com / W josephleslie.com

AN ISO 9001:2008 COMPANY

★ M V DESHMUKH ★

FROM THE PRESIDENT'S DESK

Dear Members,

I am happy to inform you that our transformed and renamed magazine, FIRETECH, has been very well received. It may be pertinent to inform you that it is forwarded to all Chief Secretaries in the Central and State Government offices, as well as to the heads of all Fire Services in India. We also forwarded copies abroad – to the IFE UK and to International Association of Fire Chiefs, USA.

In December 2013, Maharashtra State completed five years of implementation of the Maharashtra Fire Prevention and Life Safety Measures Act, 2006, which was notified and came into force on December 6, 2008.

Delhi has completed four years of implementation of the Act. The Delhi Fire Prevention and Fire Safety Act 1986 and Rules 1987 stand repealed by a more exhaustive act called Delhi Fire Service Act 2007 (Delhi Act 2 of 2009) and Delhi Fire Service Rules 2010 notified respectively.

The core committee and senior officers advised that we stress on Legislative Reforms for Fire Prevention and Safety in India.

Too often, the focus is on fire safety for high rise buildings as more and more skyscrapers are constructed in our urban areas. However, the incidence of fires and fatalities are often found more in low rise structures, viz the Carlton Tower (Bangalore), Mantralaya Building (Maharashtra), SRA Building (Vikhroli, Maharashtra), and several such fire incidents across the country.

In this issue, we have featured a wide variety of articles forwarded by fellow members, as also relevant news and information. Everyone has put in a splendid effort and worked hard for your reading pleasure. We look forward to your contributions in the form of case studies, incident reports and photos for publication in future issues.

On this note , welcome to this issue!

COMMITTEE MEMBERS

- >> M V Deshmukh (President)
- >> D K Shami (Vice President)
- >> R K Sharma (Vice President)
- >> S S Warick (Gen Secretary)
- >> S K Rane (Jt Secretary)
- >> K Hatyal (Jt Secretary)
- >> Y H Malu (Hon Secretary)

Founder President, NAFO

G B Menon,
B.A., F.I. Fire E (LIFE), F.I.F.E. (INDIA)
MSEI
Fire Advisor, Government of India (Retd.)
Life Fellow, Institution of Fire Engineers (U.K.)

NATIONAL ASSOCIATION OF FIRE OFFICERS

(REGISTRATION NO.: S-35438 OF 1999 UNDER SOCIETIES REGISTRATION ACT XXI OF 1860)

Office: C/o. Directorate of Maharashtra Fire Services, Maharashtra Fire Service Academy, Vidyanagari, Hans Bhugra Marg, Santacruz (East), Mumbai 400 098, Tel.: 2667 7555, Fax.: 2666 0287.
Email: nafoindia98@gmail.com, admin@nafoindiaw.org www.nafoindia.org

CONTENTS

ISSUE 03 ■ JULY-SEPTEMBER 2014

COVER STORY 32

THE MAHARASHTRA FIRE PREVENTION AND LIFE SAFETY MEASURES ACT, 2006

THE ACT IS NOW OPERATIONAL FOR OVER EIGHT YEARS. PRESENTING AN OVERVIEW OF THE ACT, WHAT IT ENTAILS, THE LAWS THAT GOVERN LICENSED AGENCIES, WHAT IT MEANS TO PROVIDE FIRE-SAFE HABITATION, AND THE FINER POINTS OF THE 'CONTRACT' INCLUDED IN THE ACT.

NEWS

WHAT'S INSIDE

NAFO is thankful to The Resource 24x7 for conceptualising and compiling this issue on an honorary basis.

Editor - **Vrushali Lad**

Design Director - **Jyoti Narkar**
Designer - **Vinayak Dhuri**

Address - B-10, Zaitoon Apts, Station Road, Goregaon (West), Near Filmistan Studio, Mumbai – 400062
Mobile No: 9892325250. Email - **theresource24x7@gmail.com**

Printed by: COMPACT GIANT (INDIA) PRIVATE LIMITED, Tel. : 2401 3175, Mob. 9821016828 / 9821412012 / 9768269159
E-mail : compactgiant@gmail.com

THE RESOURCE 24x7 MEDIA CONSULTANTS

>> MAJOR FIRE BREAKS OUT AT CONSTRUCTION SITE IN MUMBAI >> A MAJOR FIRE BROKE OUT AT A CONSTRUCTION SITE OF LEADING CITY-BASED REAL ESTATE DEVELOPER LODHA GROUP IN WADALA ON THURSDAY MORNING. ..... *Read More*

Indian train fire kills more than 20

Children among fatalities after busy train catches fire en route from Bangalore to Nanded

www.theguardian.com, December 28, 2013

AT least 23 people have been killed after a busy train caught fire in southern India, railway officials say. The train was on its way from the city of Bangalore to Nanded in the western state of Maharashtra in the early hours of Saturday. The driver stopped the train when he saw flames coming out of an air-conditioned coach at 3.45am. As the fire spread, many passengers broke windows and jumped from the train.

A rail spokesman, CS Gupta, said 67 passengers were in the two coaches when the fire broke out about a mile from the town of Puttaparthi in Andhra Pradesh state. The train was brought to a halt and the coaches were delinked from the rest of the train to prevent the fire spreading further.

Firefighters put out the blaze and retrieved at least 23 bodies, including two children. More than a dozen people were taken to hospital with injuries sustained when they jumped from the coaches, according to a railway official at the scene.

Firefighters had to force the doors open and make their way through the smoke-filled coaches to reach the dead. Many bodies were found near the jammed doors.

India's federal railways minister, Mallikarjun Kharge, said preliminary reports from the site indicated that the fire was caused by an electrical short circuit. Accidents are common on India's rail network, one of the world's largest with 18.5 million passengers travelling daily. Collisions and fires are mostly blamed on poor maintenance and human error.

Three killed in explosion in firecracker unit in Tamil Nadu

PTI, October 4, 2013

THREE persons were killed and 11 injured in an explosion at an unlicensed firecracker unit in Chengam, Tiruvannamalai district today, Fire and Rescue sources said in Chennai.

The premises were used for storage purposes and crackers were being packed into gift boxes when the mishap occurred.

Two of the deceased were identified but the body of the third was charred beyond recognition. "We found traces of sulphur on the spot. It is not known if the place was also used for making crackers," V Ramasamy, Tiruvannamalai Divisional Officer, Fire and Rescue Services told PTI.

Confirming that the unit was unlicensed, he said two fire tenders were pressed into service immediately to put out the blaze that had also partially spread to a nearby eatery.

The court held 10 people guilty in the Kumbakonam school fire accident in Tamil Nadu

Thanjavur:

THE much-awaited judgment in the infamous Kumbakonam school fire tragedy, which claimed the lives of 94 students, was pronounced by the principal district and sessions court on July 30, 2014, 10 years after the tragedy.

The owner of a school, his wife who was the head mistress and school principal are among 10 people found guilty. 11 others, including three teachers have also been acquitted.

A total of 94 children died and 18 others suffered severe burns when a fire broke out at the Sri Krishna aided primary school at Kasiraman street in Kumbakonam on July 16, 2004.

The police registered a case and arrested 24 persons, including Pulavar Palanisamy (84), founder of the school, his wife and correspondent Saraswathi, their adopted daughter and headmistress Santhanalakshmi, noon-meal organiser Vijayalakshmi, cook Vasanthi, education department officials and municipal authorities.

Though the police filed the chargesheet in the judicial magistrate's court in Kumbakonam in 2007, there was inordinate delay in conducting the trial, forcing the parents and relatives of the victims to file a petition in the Supreme Court. Meanwhile, much to the shock of dismay of the parents and relatives of the fire victims, three officials – the then director of school education A. Kannan, the then district education officer M. Palanisamy and the then tahsildar M. Paramasivam – were discharged from the case by the principal district and sessions court on July 30, 2010.

Hearing a case on May 5 this year relating to the school fire tragedy, the Supreme Court bench, allowed time till July 31, 2014 for the Thanjavur sessions court to dispose of the case.

45 killed in India bus crash, fire

AP, October 30, 2013

A packed bus crashed into a highway barrier and burst into flames Wednesday in southern India, killing 45 passengers who were locked inside the cabin after the driver escaped, officials said. The driver, a bus cleaner and five passengers managed to escape through a window in the front of the

overnight bus, according to the transportation minister of southern Andhra Pradesh state, Botsa Satyanarayana.

The other passengers were trapped inside the sleeper bus, which had an automatic locking system that could be controlled by the driver, said local police official Pradeep, who goes by one name.

Only three of the 45 charred bodies could be identified, state Information Minister D.K. Aruna said. "Authorities are gathering the DNA samples from the bodies" to use in identifying the rest, he said.

Police detained the driver and the bus cleaner for questioning, and filed charges including negligence against the bus operator, Jabbar Travels, the transportation minister said. The bus was carrying 50 passengers, seven over its capacity, he said. The bus, traveling overnight from Bangalore to Hyderabad, was passing another vehicle when it crashed into the roadside barrier in Mehabubnagar in Andhra Pradesh, police official Naveen Kumar Chand said. The diesel tank then caught fire, and flames engulfed the bus. The victims included a baby, a couple celebrating their 23rd wedding anniversary and several software engineers returning home to Hyderabad from jobs in Bangalore, the transportation minister said.

Angry relatives gathered at both the Bangalore and Hyderabad offices of Jabbar Travels, forcing police to send officers to keep order. Police were also searching for the company's owners in Bangalore, the main city in the neighboring southern state of Karnataka. India has the highest annual road death toll in the world, according to the World Health Organization. More than 110,000 people are killed every year in road accidents across the country, according to police. Most crashes are blamed on reckless driving, poorly maintained roads and aging vehicles.

Major fire breaks out at construction site in Mumbai

The Indian Express, November 21, 2013

A major fire broke out at a construction site of leading city-based real estate developer Lodha Group in Wadala on Thursday morning. So far no injuries have been reported. The fire broke out at around 10am on the roughly 23 acres 'New Cuffe Parade' plot. About 10 fire engines and eight water tankers have been rushed to the spot to douse the flames. In 2011, Lodha announced its investment in a Rs 10,000 crore project, titled 'New Cuffe Parade' comprising of both commercial as well as residential towers at Wadala in the island city. The project is slotted to be completed in five to seven years.

ANOTHER FIRE AT MUMBAI SLUM

A major fire broke out in a slum behind the World Trade Centre in Cuffe Parade, Mumbai on Thursday morning. Roughly 16 fire engines, 10 water tankers and two ambulances have been rushed to Ambedkarnagar slum in the Backbay area of Cuffe Parade. No injuries have been reported so far.

Heritage building housing govt. press in Chennai gutted

The Hindu, November 1, 2013

A major fire broke out in the Government Press on Mint Street in the early hours of Friday. The single-storeyed heritage structure, housing the printing and binding unit, collapsed in the fire that lasted nearly eight hours. Whatever was left standing was demolished completely by the Public Works Department late evening. None was injured in the accident.

The building was constructed in 1888 and it functioned as a gunpowder manufacturing unit and printing press for the British government. After 1947, the State government took it over and ran it as a printing press for official documents.

According to sources in the Tamil Nadu Fire and Rescue Services, the fire started around 2.10 a.m. following an electrical short from a recently fixed circuit for installing new printing machinery.

The intense fire and water from the fire hoses developed cracks on the building and damaged a few pillars, causing the structure to slant. According to sources in the Public Works Department that maintains the press, the remaining portion of the structure had to be demolished as it was damaged beyond repair and unsafe for the employees.

Napean Sea Road resident fights society to remove fire-trap terrace door

By Chaitanya Marpakwar, Mumbai Mirror, December 17, 2013

THE notorious aversion that Mumbai residents have towards implementing safety measures in their buildings, in the very teeth of danger to their own lives, has made matters very difficult for the conscientious few who think otherwise. Exemplifying this is Napean Sea road resident Mukul Mehra's lone three-year battle for removal of a door blocking entry to the terrace of his building Embassy, which is just a few blocks away from Kemp's Corner's Mont Blanc, where a massive fire killed seven and injured nine last week. While the fire brigade agreed the door was a fire hazard, Mehra says his own society members ignored the merits of his complaint and said it arose from his petulance at having lost the building society elections. The BMC, too, refused to take action, on the grounds that it was a "personal dispute".

Mehra had first written to the fire brigade in October 2010 about the door. "The department conducted a detailed inspection, and its report said the door was a fire hazard and must be removed immediately," he said. The 12 storey Embassy building has two wings and houses 48 flats. Mehra stays on the 11th floor. "If there is any fire or any other emergency, then we have to run to the terrace since that is the closest open space from my flat.

However, the entry to the terrace is always blocked. Our water tank and the fire fighting system are also located on the same terrace. How are we going to operate those?" asked Mehra.

>> FIRE AT COCA COLA STOCK YARD >> A FIRE BROKE OUT AT THE STOCK YARD OF THE COCA-COLA COMPANY IN UDYOGVIHAR PHASE I ON WEDNESDAY, DESTROYING PROPERTY WORTH LAKHS OF RUPEES..... ***Read More***

2 years on, BMC's fire dept to move proposal on beach safety equipment

By The Indian Express, June 10, 2014

AFTER a delay of nearly two years, the Mumbai fire brigade (MFB) will again present a proposal to acquire beach safety equipment worth Rs 2.69 crore to the BMC's standing committee on Wednesday.

The proposal was deferred by the corporators earlier in May owing to cost escalation in six of the 19 equipment.

"The committee had pointed six expensive

items in the list that we were going to prepare tenders for. So in the new proposal, we have removed those six items and are presenting a new proposal for 12 equipment," said a senior official of the fire brigade department.

The six items in the list include jet-ski buoyancy aid (18), rescue boards (9), binoculars (9), beach safety flags (36), watch-towers (7) and safety signs (36). The fire brigade will conduct a market study for identifying the actual cost of these items and re-tender.

In the new proposal, the fire brigade has listed semi-inflatable boats with OBM and trolleys (6), jet-ski with trolleys (7), jet-ski operator helmets (18), ring buoy (18), rescue spinboards (9), basic life support kits (9), surf boards (9), rescue tubes (18), hand sirens (9), life jackets (27), rechargeable torch/search lights (9), lifeguard chairs (7) and floating nylon ropes (18). These equipment will be used to fortify the city's six beaches.

"We raised questions against the proposal because BMC's planning with effect to acquiring the equipment was haphazard. We have to look into the new proposal again and asses the pros and cons. We will take a decision accordingly," said corporator Manoj Kotak of the BJP.

Tenders for the equipment were floated in June 2013, but Litmus Innovation Private Limited, that won the contract, refused to supply the items in the allotted amount of Rs 1.47 crore, citing cost escalation of Rs 1 crore. This forced the BMC to raise its budget.

Fire kills 15 at India fireworks factory

BLAZE IN CENTRAL INDIA ALSO SERIOUSLY INJURES FOUR OTHERS WHO ARE BATTLING FOR THEIR LIVES IN HOSPITAL.

By Al Jazeera, May 3, 2014

A fire at a fireworks factory in central India has killed at least 15 people and seriously injured four others, police have said. The blaze started at a manufacturing plant in Ujjain in Madhya Pradesh state when workers were making firecrackers, police officer Kishore Gurjar told the Associated Press news agency.

The four injured workers were battling for their lives in a

hospital, Gurjar said. Local media reports said the death toll was expected to rise. Police have said the cause of the fire was not immediately known and was being investigated. There are fatal accidents nearly every year in India as people work in makeshift factories, often employing children in the absence of proper safety standards.

India has a huge demand for firecrackers, which are used in religious festivals and weddings. Factories start producing crackers months before the nation's biggest Hindu festival, Diwali, or Festival of Lights, when people set off fireworks in celebration.

Fire at Mumbai High rise

Mumbai, June 21 (ANI):

A fire broke out today in an under construction building named Naman Towers situated in the city's South Mumbai office complex.

Television reports said that the blaze has been brought under control.

Further details are awaited.

Rescue operation continues after fatal passenger train derailment in India

AT least 19 killed and 120 injured after coaches come off tracks near Roha station in Maharashtra

By Associated Press, May 4, 2014A passenger train has derailed in western India, killing at least 19 people and injuring more than 100. The engine and four of the 20 coaches came off the tracks on Sunday near Roha station in Maharashtra state, 70 miles (110km) south of Mumbai.

The rescuers used cutting torches to open the derailed coaches to reach those trapped inside. Cranes lifted the coaches from the track. Two of the derailed coaches tilted on one side and one overturned.

The rescue operation is continuing and the death toll is expected to rise. A railway spokesman said that 123 injured passengers had been taken to hospital, some of them in serious condition.

The cause of the derailment was not immediately known. Rail authorities ordered an investigation into the accident. Train movement in the area was suspended as the derailed coaches and the rescue operation blocked an adjacent track as well. Rail accidents are common in India, which has one of the world's largest railway networks and serves 20 million passengers a day. Most accidents are blamed on poor maintenance and human error.

More than 50 large wildfires burn throughout western US

Officials list three fires in Montana as America's No 1 priority while out-of-control fire in Yosemite threatens 2,000 buildings

The Guardian, August 21, 2013

AN out-of-control forest fire threatening more than 2,000 structures near Yosemite national park was one of more than 50 active, large wildfiresdotting the western US on Wednesday. The remote blaze in Stanislaus national forest west of Yosemite grew to more than 25 sq miles and was only 5% contained, causing evacuations and threatening homes, hotels and camp buildings.

The fire was among the nation's top firefighting priorities, according to the National Interagency Fire Center in Boise, Idaho.

Fifty-one major uncontained wildfires are burning throughout the West, according to the center, including in California, Alaska, Arizona, Idaho,Montana, Nevada, Oregon, Utah, Washington and Wyoming. More than 19,000 firefighters were fighting the fires.

The center listed three fires in Montana as the nation's No 1 priority on Wednesday. They include a wildfire burning west of Missoula that has surpassed 13 sq miles, destroyed five homes, closed US highway 12 and led to multiple evacuations. The Lolo Fire Complex, which was 0% contained, also destroyed an unknown number of outbuildings and vehicles.

At least 19 other notable fires were burning across the state, leading Montana governor Steve Bullock to declare a state of emergency. In Oregon, a fire in the Columbia Gorge about 10 miles southwest of The Dalles grew to 13 sq miles, forcing evacuations and burning a third home. The fire was 15% contained. Strong winds continued to fan the blaze, pushing it into the Mount Hood national forest.

In Idaho, progress was reported in the fight against the nearly 169 sq mile Beaver Creek fire, which forced the evacuation of 1,250 homes in the resort area of Ketchum and Sun Valley. That fire was 30% contained, authorities said.

In Yellowstone national park in Wyoming, officials reopened a seven-mile section of road closed briefly by a wildfire. As of Wednesday, the Alum Fire had burned about 12 sq miles and was spreading slowly.

Germany Investigated The Tesla Fires And Found Nothing To Worry About

Business Insider, December 3, 2013

THE German Federal Motor Transport Authority, Kraftfahrt-Bundesamt (KBA) has concluded an investigation intot 3 recent Tesla Model S fires and found "no manufacturer-related defects," Tesla said today.

In a press release, Tesla said it provided the KBA with relevant data on the accidents, and received a letter saying "no further measures under the German Product Safety Act [Produktsicherheitsgesetz (ProdSG)] are deemed necessary." In November, the National Highway Transportation Safety Administration (NHTSA) opened an investigation into the three fires. Tesla said it has "requested" the process, but NHTSA Administrator told a House panel that was untrue, according to The Detroit News.

Hundreds of firefighters battle raging forest fire in Spain

Press TV, August 22, 2013

MORE than 200 Spanish firefighters have been called in to battle flames in northwestern part of the country, as three-quarters of the country is under extreme risk of fire. The fire raged on Friday close to the village of Villardiegua de la Ribera, near the border with Portugal and consumed a national park.

A spokesperson added that some 300 people were allowed to return to their homes after being evacuated on Thursday as the danger to residents had eased. Several other fires have also been reported recently.

The country's weather service placed on Thursday three-quarters of the country on a state of high alert due to fire risks. Spain is highly prone to forest fires during the summer months due to a combination of high temperatures, strong winds and dry vegetation.

In the beginning of August, over 550 firefighters were called in to put out a forest fire west of the capital, Madrid.

In addition, on June 28, a forest fire broke out in Valencia after people carelessly tossed away hot coals from a barbecue, forcing 700 people to evacuate their homes and indirectly causing a brief power cut at a nuclear plant.

American network NBC publishes map showing the whole of Australia is on fire

www.news.co.au, October 28, 2013

AMERICA, the nation which gave the world 307 Nobel laureates, has today shown that its media is about as smart as one of its famously dopey teen beauty pageant contestants. In a bizarre map produced by NBC News, pretty much the whole of Australia is depicted as being ablaze this week.

In all likelihood, NBC has taken the image from a Geoscience Australia product called Sentinel. Sentinel is a national bushfire monitoring system which uses satellite data to enable emergency service managers and other users to identify fire locations across Australia.

At any given time, the map will show hazard reduction burns, bushfires which pose no threat to life or property, plus of course much more serious bushfires like the ones we've seen this week.

That's the mistake which NBC appears to have made, taking every fire on the Sentinel map and assumed they are all part of the current emergency.

>> BLAZE DAMAGES NAIROBI'S INTERNATIONAL AIRPORT >> A HUGE FIRE BROKE OUT WEDNESDAY AND RAGED FOR FOUR HOURS AT NAIROBI'S INTERNATIONAL AIRPORT..... *Read More*

At least 114 dead after migrant boat sinks off Italian island

Fox News, October 3, 2013

A ship carrying African migrants to Europe caught fire and capsized off the Italian island of Lampedusa on Thursday, killing at least 114 people as it spilled hundreds of passengers into the sea, many of whom drowned from not knowing how to swim, officials said. Over 150 people were rescued but about the same number are still unaccounted for. The death toll in the accident passed 100 after rescue divers found at least 20 bodies near the sunken ship, an Italian coast guard official told Reuters.

Cmdr. Floriana Segreto said the coast guard found the boat on the sea floor at a depth of 130 feet, according to the Associated Press. She added that they are waiting for the weather to improve Thursday and will then divers start recovering more bodies. They have yet to go inside the boat.

It was one of the deadliest accidents in the notoriously perilous Mediterranean Sea crossing from Africa for migrants seeking a new life in the European Union. "We need only caskets, certainly not ambulances," Pietro Bartolo, chief of health services on the island, told Radio 24. He gave the death toll of 94 but told Sky TG24 he expected that to rise as search operations continued.

Only three of the estimated 100 women on the ship have been rescued and no children have been saved so far, Simona Moscarelli, a legal expert for the International Organization for Migration in Rome, told The Associated Press. "Most of (the migrants) can't swim. Only the strongest survived," she said, basing her comments on her group's early interviews with survivors.

Lampedusa is closer to Africa than the Italian mainland -- a mere 70 miles off the coast of Tunisia -- and is the frequent destination for smugglers' boats. Blue, white, green and black tarps covered the bodies at the port. Coast guard ships, local fishing boats and helicopters from across the region were combing the waters trying to find survivors, said coast guard spokesman Marco Di Milla. The boat left from Tripoli with migrants from Eritrea, Ghana and Somalia, he said. Italy's interior minister, Angelino Alfano, told reporters that 66-foot boat began taking on water after its motor went out. The passengers didn't have any cellphones to call for help so instead set a small fire to flag passing ships.

But because gas had mixed with the water flooding the ship, the fire then spread to the ship itself. Passengers fled to one side of the boat, flipping the ship, and some 450-500 people were flung into the sea, Alfano said. Pope Francis, who visited Lampedusa in July, quickly sent his condolences . It was the second shipwreck this week off Italy.

Hundreds of migrants reach Italy's shores every day, particularly during the summer when seas are usually calmer. They are processed in centers, screened for asylum and often sent back home. Those who aren't usually melt into the general public and make their way to northern Europe, where immigrant communities are bigger and better organized. In Italy, migrants can only work legally if they have a work permit and contract before they arrive. According to the U.N. refugee agency, 8,400 migrants landed in Italy and Malta in the first six months of the year, almost double the 4,500 who arrived during the first half of 2012.

The numbers, though, have spiked in recent weeks, particularly with Syrian arrivals.

Earlier, Refugees recorded 40 deaths in the first half of the year 2013 for migrants arriving in Italy and Malta, and a total of 500 for all of 2012, based on interviews with survivors.

The Associated Press contributed to this report.

Blaze Damages Nairobi's International Airport

The New York Times, August 7, 2013

A huge fire broke out Wednesday and raged for four hours at Nairobi's international airport on the anniversary of the attacks on the United States Embassies in Kenya and Tanzania, officials and witnesses said, bringing East Africa's busiest airport to a standstill and turning parts of it into charred ruins.

By midafternoon, Michael Kamau, a senior government transportation official, told reporters that the airport, Jomo Kenyatta International Airport, had been partly reopened for domestic and cargo flights, but that international passenger traffic was still suspended. The airport authorities planned to convert another part of the facility to a temporary terminal for international passenger flights, he said.

Visiting the gutted section of the circular, 1960s-era terminal, Kenya's president, Uhuru Kenyatta, said there was no loss of life but expressed dismay over the damage and disruption, said Manoah Esipisu, a presidential spokesman.

Kenya is a crucial Western ally, abutting troubled areas of neighboring Somalia. But Kenyatta and other Kenyan officials were reluctant to make any immediate link to terrorism.

Nairobi is an essential hub for sub-Saharan passenger traffic, transporting 6.3 million passengers a year on more than 40 international airlines from Europe, the Middle East, Asia and the rest of Africa. It is also a vital cargo link, particularly for the export of produce, cut flowers and other perishable goods from across East Africa — an important source of foreign currency.

Analysts said the quick resumption of international cargo traffic would probably minimize any immediate impact on the Kenyan economy, and the fact that some passenger flights had also resumed indicated that critical computer systems that handle ticketing, baggage processing and navigation systems were unaffected by the blaze.

"If the runway can operate and the control tower can operate, then the airport should be close to fully operational within a few days," said David Feldman, a managing partner at Exambela, an aviation consulting firm based in Paris.

Airport officials said the fire started around 5 a.m. Wednesday, when many flights to and from Europe and elsewhere were scheduled. Many incoming flights were diverted to Mombasa, on the Indian Ocean coast.

Kenya's civil aviation authorities gave clearance late Wednesday for the airport to operate international passenger flights from a part of the terminal normally reserved for domestic traffic.

Smoke continued to billow from the blackened, five-story terminal building late Wednesday, and an acrid stench lingered in the air. Hundreds of people, including airport workers and stranded travelers, milled outside a cordon set up near the remains of the international arrivals area, which also housed baggage-claim facilities.

Mr. Feldman predicted that the situation for air travelers was likely to remain chaotic for some time, as August is a peak month for Kenyan tourism, with thousands of visitors flocking to its beaches and game reserves.

"It will be a mess, probably operating in very uncomfortable, open-air conditions" with significant delays, Mr. Feldman said.

GERMANY CAVE RESCUE OPERATION

>> Two doctors have finally reached an injured man trapped in Germany's deepest cave - the Riesending - since Sunday, mountain rescue officials say.

>> Johann Westhauser, 52, was hurt by a rock fall in the 1,000m-deep (3,280ft) cave. The officials warn that the rescue operation is likely to last several days, negotiating the cave system's narrow passages and vertical shafts.

>> After medical checks the doctors will decide when Mr Westhauser is ready for the ascend. It is believed he will be moved gradually from one base station to another until he reaches the surface.

GERMANY CAVE RESCUE OPERATION

>> The 19.2km long and 1,148m deep Riesending cave - “massive thing” in German - is in the Unterberg mountain range on the border with Austria. Narrow tunnels can only be reached by abseiling down.

>> Rescuers were earlier flown by helicopter to the cave’s entrance...

>> They set up a tent camp serving as the headquarters for the rescue operation.

New Essex County Fire and Rescue Service trucks will keep things moving

THREE new trucks will go on the road in January as Essex County Fire and Rescue Service prepares to keep communities on the move.

The new Rescuemax vehicles will be used by retained firefighters to keep schools, GP surgeries and hospitals open, clear the way for charity and service organisations to maintain contact with the elderly and vulnerable and to make High Streets safe. While the Highways Agency and County Council will retain responsibility for clearing roads, crews will concentrate their efforts in clearing roads and pathways to public and community properties.

Under a new pilot, ECFRS will base the three vehicles initially at Wivenhoe, Hawkwell and Brentwood. In the winter they will be specially adapted with snow blades and salt spreaders working on an amber light while snow clearing.

Then in the Summer, the Service will capitalise on the vehicles' off road capability and built in water suppression systems to tackle field and grass fires on rough terrain.

Romania's awesome off-road fire and rescue truck

IF you're looking for an off-road vehicle in Romania, Ghe-O has you covered, offering rugged, trail-ready trucks. Now, Ghe-O has created the ultimate emergency vehicle to tackle just about any terrain. Looking like the oversized spawn of a Jeep Wrangler and Hummer H1, the Ghe-O Rescue was recently unveiled at the Bucharest Auto Show.

The Rescue is nearly three feet longer and about two feet wider than a Hummer H1, and weighs about 500 pounds less, too. Those mammoth dimensions allow the Rescue to carry 11 passengers, but its design makes it a go-anywhere vehicle with a vertical approach angle, excellent ground clearance, lockable axles and powerful powertrains. The biggest advantage of the Rescue, though, might be its available accessories like rear half-tracks, inflatable tire-mounted pillows for flotation, and water pumps with a tank to help fight fires. Military-spec Rescue models can also add electromagnetic and water protection for the engine.

Handheld toxic gas monitors

THESE handheld gas detection solutions are ideal for applications from entry pre-screening during refinery and plant maintenance, to hazardous material response, marine spill response and refinery downstream monitoring. They include methane, toxic gas and VOC sniffers.

Fire detection systems for bank vaults and vestibules

MODEL 7050 FROM FIRE DETECTION DEVICES LTD., CANADA

FIRE Detection Devices offers the standard CR 135 detector specially designed to respond to a rate of temperature increase resulting from an attack on a vault or safe door. The unit is calibrated to recognize a rate of increase of 4 Celsius degrees per minute. The Model 7050 complies with the requirements set out in UL 681. The Model 7050 is UL and ULC listed under control number 97Y8.

The Model 7050 is a combination Rate-of-Rise and Fixed Temperature detector. A set of normally open contacts will close when the surrounding air temperature increases at a (minimum) rate of 4 Celsius degrees (6 degrees F.) per minute. Closing the contacts initiates the alarm sequence. Independent of the rate-of-rise operation, the fixed temperature portion consists of a spring-loaded plunger retained by a fusible alloy that releases when the ceiling temperature reaches 57 degrees Celsius, (135 degrees F). When released, the plunger strikes the contacts and holds them closed.

The Model 7050 is installed on brackets on the door inside the vault, with the heat collector facing toward the door.

Rae Systems brings NeutronRAE II

Personal Radiation Detector

THE NeutronRAE II is immersible (IP67) in water for easy decontamination, and a concussion-proof case provides shock protection if the detector is dropped. The two-button operation is designed for use even in Level A protection suits with two layers of gloves.

The NeutronRAE II features fast response time for both the neutron and gamma radiation. Alarm modes can be set to operate in "Search Mode" based on local background radiation levels or "Safety Mode".

INSTITUTION OF FIRE ENGINEERS'S FIRE INDIA 2013 SEMINAR AND EXHIBITION

The 9th International Conference and Exhibition on the theme **'Fire Risk Mitigation: The Global Trends'** was held from October 24 to 26, 2013. Presenting a few snapshots of the event.


FIRE INDIA -2013
9th International Conference & Exhibition
24th - 26th October 2013
"Fire Risk Mitigation: The Global Trends"
Supported by:
Organized By
FIRE PROTECTION INDUSTRY IN INDIA
OSHKOSH
CEASE FIRE


Supported by:
AFS
igl
INSTITUTION OF FIRE ENGINEERS (INDIA)
MR. A.K. SHARMA
MENON
MR. M.V. DESHMUKH


AFS
All India Institute of
Local Self Governm


igl
All India Institute of
Local Self

WHEN FIRES ARE set on purpose

NASA's Aqua satellite captured images of fires in Punjab, India, and analysed the need for agricultural fires in the country's Northern region.

The following write-up has been sourced from the NASA website, June 5, 2013:

"The Indian state of Punjab has two growing seasons—one from May to September and another from November to April. In November, Punjab farmers typically sow crops such as wheat and vegetables; but before they do that, farmers often set fire to fields to clear them for planting. That was probably the case on October 18, 2013, when the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Aqua satellite captured this natural-colour image (*see pic above*).

Red outlines show the approximate locations of active burning. Punjab comprises only about 1.6 per cent of India's land surface, but thanks to fertile soils and the adoption of agricultural advances, the State grows about one-fifth of India's wheat. Preparing for planting with fire has the benefit of clearing out some pests that eat crops and turning crop residues from the previous season into fertilising ash.

But the smoke also can harm human health, aggravating heart and lung disease. Humans evolved in the presence of fire, and healthy young adults can generally withstand vegetation smoke. But older adults, children, and people with chronic health conditions are at risk. The smoke may include thousands of compounds, including carbon dioxide, carbon monoxide, nitrogen oxides and particulate matter. These components have the potential to affect human health, but exactly how different types of smoke affect people is not yet fully understood.

NASA's Aqua satellite collected this natural-color image with the Moderate Resolution Imaging Spectroradiometer, MODIS, instrument on June 5, 2013. Actively burning areas, detected by MODIS's thermal bands, are outlined in red.

SURVIVING A FIRE AND LEARNING FROM IT

A FIRE AT A 5-STAR HOTEL SHOWED **NSN MURTY** HOW PREMIUM INSTITUTIONS TAKE FIRE SAFETY FOR GRANTED.

In 2011, a friend and I were staying at a 5-star hotel in Ahmedabad, Gujarat. Now, when you check into a 5-star hotel, you assume that every care would be taken to ensure your safety and well-being.

How wrong my assumption was.

At about 3 am on November 18, 2011, the AC experienced an electrical failure and caught fire. Due to this, smoke entered all the rooms which were in that section; my colleague and I were in the same section. He was on the top most floor and I was on the floor below his.

Everyone came out as the thick smoke caused congestion, but since I do not switch on the AC at night, smoke did not enter my room. I remained unaware of the fire till my colleague raised an alarm with the house-keeping staff to evacuate me. I was evacuated at around 3.30 am, and the fire was controlled by 6.30 am. But even after the fire was controlled and we entered our rooms, and after the ACs were switched on again, all the accumulated soot entered the rooms via the ducts and damaged the clothes, files, electronic items etc. My colleague coughed out soot in the morning and had to be taken to the doctor. Again, fortunately, since I did not switch on the AC before and after the fire, my room remained clean.

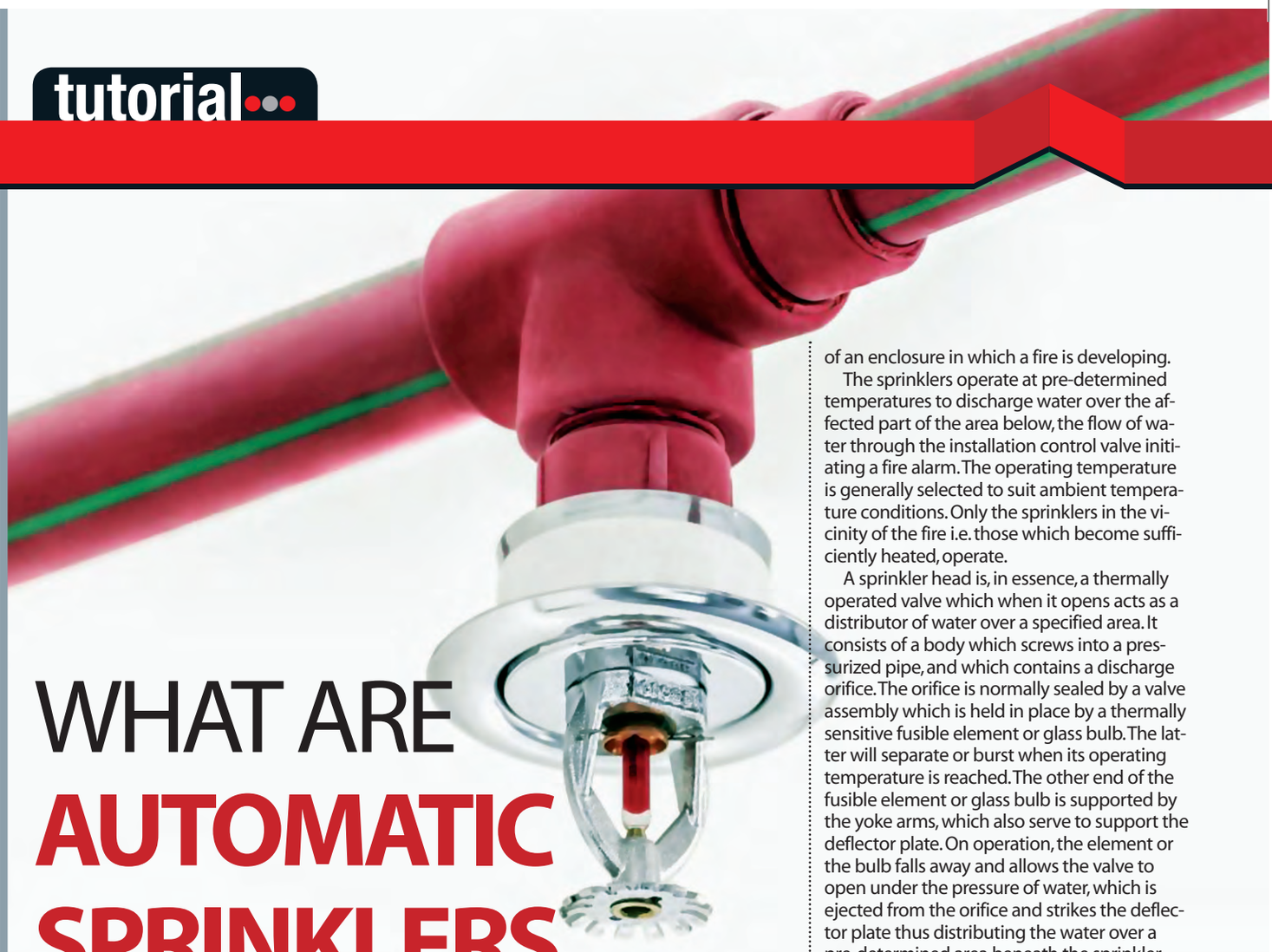
A FEW FACTS ABOUT THE FIRE:

- There was no evacuation management on the part of the hotel; they were not even aware of how many people were in the rooms or outside.
- The smoke detector and fire alarm did not function. There was no alarm at all.
- The entire hotel was closed from all sides, including every single window and door, hence it eventually became a gas chamber. Fire fighters broke several windows to let the smoke out. I had to force the housekeeping staff to break open the sealed window in my room.
- The EXIT signs were not glowing; hence no one was able to figure out where the exit doors/staircases were.
- The exhaust fans in the rooms were non-operational, so suffocation was multiplied after the fire when we re-entered our rooms.

LEARNINGS FOR PERSONAL SAFETY:

- Take a mind-map of the exit door whenever you check in. Most of the time, ask for a room closer to the exit door.
- Although I am a non-smoker, I always opt for a smoking room because the exhaust in the washroom works 24x7. This ensures that any smoke in the room is removed, and I am a little safer.
- Do inquire about the working condition of the fire-systems, glow signs and alarm systems while checking in.

>> **NSN Murty** is Business Development Leader, Govt Industry, IBM.



WHAT ARE AUTOMATIC SPRINKLERS, AND WHY THEY ARE NEEDED

TRA KRISHNAN WRITES ON THE CURRENT STATUS OF AUTOMATIC SPRINKER INSTALLATIONS

A sprinkler system consists of a water supply (or supplies) and one or more sprinkler installations; each installation consists of a set of installation control valves and a pipe array fitted with sprinkler heads. The sprinkler heads are fitted at specified locations at the roof or ceiling, and where necessary between racks, below shelves, inside ovens or stoves or below obstructions and other special occupancies like concealed space, Attics, Atriums, Inside machinery etc.

A sprinkler has two functions to perform. It must first detect a fire, and must then provide an adequate distribution of water to control or extinguish it. Each function is performed separately and one is independent of the other except insofar as early detection makes extinction easier because the fire has not grown large. The classic use of the sprinkler is in the hot gas layer which forms beneath the ceiling of an enclosure in which a fire is developing.

The sprinklers operate at pre-determined temperatures to discharge water over the affected part of the area below, the flow of water through the installation control valve initiating a fire alarm. The operating temperature is generally selected to suit ambient temperature conditions. Only the sprinklers in the vicinity of the fire i.e. those which become sufficiently heated, operate.

A sprinkler head is, in essence, a thermally operated valve which when it opens acts as a distributor of water over a specified area. It consists of a body which screws into a pressurized pipe, and which contains a discharge orifice. The orifice is normally sealed by a valve assembly which is held in place by a thermally sensitive fusible element or glass bulb. The latter will separate or burst when its operating temperature is reached. The other end of the fusible element or glass bulb is supported by the yoke arms, which also serve to support the deflector plate. On operation, the element or the bulb falls away and allows the valve to open under the pressure of water, which is ejected from the orifice and strikes the deflector plate thus distributing the water over a pre-determined area beneath the sprinkler.

2. Factors affecting performance of sprinklers

The performance of a sprinkler is dependent upon several factors, only one of which is its temperature of operation. The various factors are as listed below:

a) Actual operating temperature of the sprinkler.
b) Thermal capacity of those parts of the sprinkler which affect its operation.
c) Ease of transfer of heat from the surrounding air to the affected parts of the sprinkler.
d) Rate of growth of fire in terms of its convective heat output.
e) Height of the ceiling below which the sprinkler is mounted.
f) Shape of the ceiling - gable, paneled, flat, curved, north light etc. and obstructions below sprinklers
g) Thermal characteristics of the ceiling assembly.
h) Distance between the sprinkler and the ceiling.
i) Horizontal distance of sprinkler from the fire.
j) Rate of rise of air temperature surrounding the sprinkler.
k) Any other specific factors at the site of installation affecting the pattern of flow of the hot gases from the fire to the sprinkler liftshafts, staircases, airdraft,

venting facilities.

The various factors described above can be controlled in the following ways for optimum performance of a sprinkler.

i) Design of the sprinkler - The design of the sprinkler shall control factors 'a, b and c' above.

ii) Design of the Building and also the layout of the sprinkler installation shall control items 'e, f, g, h, i and k' above.

iii) Item 'c' largely depends on the type of combustibles involved in the fire, method of storage etc. which vary enormously with different classes of occupancies

The influence of item `ii` above and that of factor 'd' should result in the specific value of factor 'j' and this shall determine, in conjunction with factors 'a, b and c', the actual time of operation of the sprinkler after an outbreak of a fire.

3. Theoretical determination of the 'Time of response' for sprinklers

Assuming that a) the sensitive element of the sprinkler gains heat by convection from the surrounding hot gases, but does not lose heat by conduction or radiation, b) a constant velocity airflow in the vicinity of the sprinkler, c) the temperature of the element increases at a linear rate, the equation for the time of response is represented as under :

to = (e0/b) + (C/HA) where

H = Convective heat transfer co-efficient of the element
A = Effective area of the element
C = Effective thermal capacity of the element
b = Rate of rise of temperature in °C per second
to = effective time for which the element was subjected to a constant velocity airflow, (in seconds) upto time of operation
e0 = Temperature rise of the element, in °C

Hence the time of operation of a sprinkler to is equal to the quotient of eo/b plus a quantity C/HA which is known as a time constant.

From the equation, following important points arise:

3.1 At low rates of temperature rise (b), (e0/b) is very high and hence the time constant C/HA is not of much significance for the time of operation of the sprinkler.

3.2 For a rapid developing fire, (e0/b) is very small and hence time constant becomes dominating. To decrease the time taken by the sprinkler to operate, the time constant shall be kept as low as possible.

3.3 To achieve reduction of time constant, improvements should be made in the heat transfer the sensitive element- either by making the element more readily available to the hot gases or by increasing the heat collecting area surrounding the element.

4. TYPES OF SPRINKLERS

Sprinklers can be discussed under the following types.

4.1 Sprinklers according to release mechanism

Fusible element sprinkler : A fusible element sprinkler is opened under the influence of heat by melting of a component.

Glass bulb sprinkler : A glass bulb sprinkler is opened under the influence of heat by the bursting of the glass bulb through pressure resulting from expansion of the fluid contained therein.

4.2 Sprinklers according to mounting pattern

Pendent sprinkler: A sprinkler intended to be installed so that its deflector is located below the orifice and the water flows downward through the orifice.

Upright sprinkler: A sprinkler intended to be installed so that its deflector is located above the orifice and the water flows upward through the orifice.

4.2 SPRINKLERS ACCORDING TO TYPE OF DISCHARGE

Conventional sprinklers: The conventional sprinkler has a spherical water distribution directed towards the ground and the ceiling over a definite protection area. A conventional sprinkler shall discharge from 40 to 60% of the total water flow initially in a downward direction.

These are usually built with a universal type deflector enabling the sprinklers to be installed either upright or pendent. It is also possible to designate them for upright or pendent for certain applications.

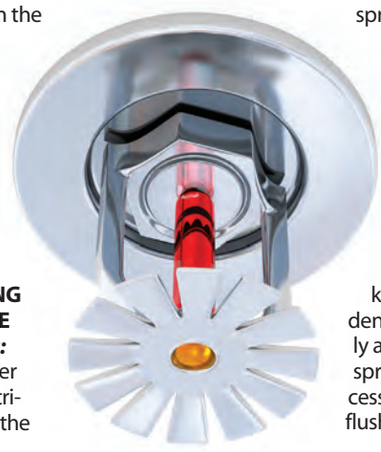
Spray sprinkler: The spray sprinkler has an umbrella shaped water distribution pattern directed towards the ground over a definite protection area. A spray sprinkler shall discharge almost 100% of the total water flow in a downward direction towards the property below. These are built both ways i.e. upright or pendent.

Sidewall sprinkler: These sprinklers are designed to produce a downward paraboloidal discharge and the special deflector fitted to the sprinkler causes most of the water to be discharged on the opposing wall and floor with a little of water discharging on the wall behind the sprinkler.

Ceiling or flush and concealed type of sprinklers: These sprinklers are designed for use with the concealed pipework and are installed pendent with plate or base flush to the ceiling with the heat sensitive element below the ceiling line.

Horizontal sprinkler (Sidewall only): Horizontal sprinklers are designed to give the specified distribution when the jet of water is directed horizontally against the deflector. This applies to sidewall sprinklers only.

4.3 SPECIAL SPRINKLERS



Flush sprinkler: Flush sprinklers are installed in a pendent position close to the ceiling, such that part of the body may be above the ceiling line, and the heat responsive element is completely below the ceiling line.

Recessed sprinklers: Recessed sprinklers are installed in a pendent position partly or wholly above the ceiling line. The sprinkler is fitted into a recess cup, the rim of which is flush with the ceiling.

Concealed sprinklers: Concealed sprinklers are installed in a pendent position above the ceiling line. The concealed sprinkler incorporates a recessing cup and ceiling plate which enclose the sprinkler, such that the ceiling plate is flush with the ceiling and conceals the sprinkler.

Intermediate sprinkler: A sprinkler installed below, and in addition to roof sprinklers with a specific purpose of local protection of property below..

Detector sprinkler: A sealed sprinkler mounted on a pressurized pipeline used to control a deluge valve. Operation of this sprinkler causes loss of air pressure

A CONVENTIONAL SPRINKLER SHALL DISCHARGE FROM 40 TO 60% OF THE TOTAL WATER FLOW INITIALLY IN A DOWNWARD DIRECTION. THESE ARE USUALLY BUILT WITH A UNIVERSAL TYPE DEFLECTOR ENABLING THE SPRINKLERS TO BE INSTALLED EITHER UPRIGHT OR PENDENT.

which opens the deluge valve.

Extended coverage (EC) sprinkler: A sprinkler intended 1) for use at greater than standard spacing, 2) operation of heat responsive element and release mechanism at standard spacing are equal to or less than standard sprinkler, 3) to discharge water over a specified coverage area having a ceiling without obstructions at a specified water flow rate, The classification of an EC sprinkler specifies coverage area dimensions, minimum operating water flow rate, orifice size and the 'K' factor.

Large Drop Sprinkler: A type of specific application control mode sprinkler that is capable of producing characteristic large water droplets.

Flow control (FC) sprinkler: A sprinkler that is intended to control water flow by automatically cycling open and closed within a specified temperature range.

Rack Storage sprinklers : Sprinklers equipped with integral shields to protect the operating elements from the discharge of sprinklers installed at higher elevation.

Dry Sprinklers : Sprinklers secured in extension nipples that has seals at the inlet ends to prevent water from entering the nipples until the sprinklers operate. These are employed for use in applications where sprinklers and/or connecting piping may be exposed to freezing conditions, or the sprinkler system is seasonally drained.

Dry upright sprinkler: Same as dry sprinklers above installed in an upright position on special rise pipes. These pipes are kept free from water.

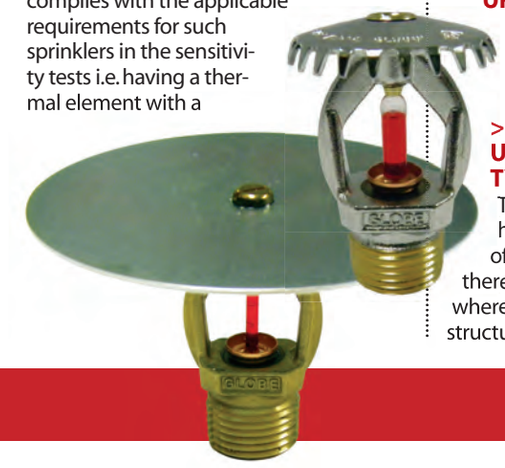
Dry pendent sprinkler: Same as dry sprinklers above installed in a pendent position on special drop pipes. These pipes are kept free from water.

Corrosion resistant sprinkler : A sprinkler fabricated with corrosion resistant material, or with special coatings or platings, to be used in an atmosphere that would normally corrode sprinklers.

Open sprinklers : These sprinklers have no fusible element/glass bulb and are permitted to be used in deluge systems.

4.4 SPRINKLERS WITH RAPID RESPONSE

Fast response sprinkler: A sprinkler that complies with the applicable requirements for such sprinklers in the sensitivity tests i.e. having a thermal element with a response time index (RTI) of 50 (meters-seconds)1/2 or less. (Standard response means RTI of 80 (meters-seconds)1/2 or more.)



Early Suppression fast response (ESFR) sprinkler: Same as fast response sprinklers as above but also having capability to provide fire suppression also.
ESFR sprinklers are used only in wet pipe systems and allowed to be used in building where roofs have a slope within 17%.

Residential sprinklers: A type of fast response sprinkler that has been specifically investigated for its ability to enhance survivability in the enclosure of fire origin and is listed for use in dwelling occupancies.

Quick Response (QR) sprinkler: A type of spray sprinkler that meets with the requirements otherwise of a fast response sprinkler.

> STANDARD PENDENT AND UPRIGHT SPRINKLERS (SPRAY TYPE) SHALL NOT BE USED IN HIGH HAZARD, HIGH PILED STORAGE RISKS AND ALSO IN CASE OF ORDINARY/HIGH HAZARD CLASS RISKS

4.2 APPLICATION

Various types of sprinklers mentioned above shall be selected for use according to the occupancy and its configuration. All types of sprinklers shall be positioned and installed as per various clauses in this section. Following are various types of sprinklers that are covered under this section

a. Standard pendent and upright sprinklers
b. Sidewall spray sprinklers
c. Extended coverage sprinklers
d. Open sprinklers
e. Intermediate or rack sprinklers
f. Early suppression fast response (ESFR) sprinklers
g. Large drop sprinklers

>> STANDARD PENDENT AND UPRIGHT SPRINKLERS (CONVENTIONAL)

> These sprinklers can almost be used for any type of application.

>> STANDARD PENDENT AND UPRIGHT SPRINKLERS (SPRAY TYPE)

These shall not be used in high hazard, high piled storage risks and also in case of ordinary/high hazard class risks where there is exposed structural steel work or where the roof or ceiling or its supporting structure is of combustible material.

>> CEILING OR FLUSH AND CONCEALED TYPE OF SPRINKLERS

These shall be installed only in light or ordinary hazard risks and not for the high hazard class. Common applications are Hotels, boardrooms, offices retail stores etc., where the aesthetic appearance is of value. The deflectors are normally integral with the assembly and retracted types of deflectors are also acceptable if approved for the purpose while listing.

>> SIDEWALL SPRAY SPRINKLERS

These shall not be installed in high hazard applications or above suspended ceilings. These are not substitutes for standard sprinklers but may be used as below only in offices, hotels, halls, lobbies, corridors, Conveyor housings etc. Sidewall sprinklers are also available with extended discharge types.

a) corridors/passage in any hazard
b) cable ducts
c) columns and structural members in Ordinary Hazard (OH) and HH storage facilities
d) light Hazard (LH) and ordinary hazard (OH) without storage.
e) where sidewall sprinklers are used for general protection purposes they may only be installed under flat ceilings, unless approved for protection otherwise.
f) sidewall sprinklers shall not be installed in HH installations or OH storage areas or above suspended ceilings for general protection purposes.
g) Extended coverage sidewall sprinklers: Their use should be restricted to rooms with low fire loadings such as hotel bedrooms and individual offices.

>> EXTENDED COVERAGE SPRINKLERS (SPECIAL)

a) These types of sprinklers shall be used as follows:
b) Unobstructed construction consisting of flat or smooth ceiling with slope not exceeding 1 in 6 (about 17%)
c) Unobstructed or non-combustible obstructed construction if specifically approved for such use
d) Under smooth or flat ceilings with slope not exceeding 1 in 3 (about 33%) if specifically approved for such use

>> OPEN OR CUT-OFF SPRINKLERS

Normally used in deluge systems where all the sprinklers work in tandem to protect specific hazards or locations.

>> EARLY SUPPRESSION FAST RESPONSE (ESFR) SPRINKLERS (SPECIAL)

These types of sprinklers work on suppression mode and shall be used as follows:

a) High challenge storage hazards where storage and ceiling heights are high like 12M and 14M respectively. Normally, provision of ESFR sprinklers are not backed up by the intermediate or rack sprinklers unless listed otherwise
b) Permissible for installation in buildings with

obstructed or non-obstructed construction

c) They are used only in wet systems unless specifically approved for use in other types of systems.

>> LARGE DROP SPRINKLERS (SPECIAL)

These types of sprinklers work on control mode and shall be used as follows:

These sprinklers are used for high challenge fires like storage akin to ESFR sprinklers at heights 10.5M AND 12M respectively for storage and ceiling heights. These sprinklers,normally shall need the backup intermediate or rack sprinklers unless listed otherwise. It is permissible to install these in wet, dry or pre-action systems.

>> INTERMEDIATE OR RACK SPRINKLERS

These are standard sprinklers only and used in conjunction with roof sprinklers for storage application in racks when height of storage exceeds 4M.

5. Additional information

Performance of the sprinklers is determined by the following two important variables i.e. K Factor and Deflector design.

5.1 ***K Factor :-*** As the flow through a sprinkler increases, the pressure at which it flows should also increase to eject that water out of the sprinkler. The relationship between the flow and the pressure at the orifice of the sprinkler can be expressed as under:

$Q = K[P]1/2$ where Q = Flow through sprinkler in LPM (Liters per Minute), P = Pressure in Bars and K = Measure of the ease of getting water out of the Sprinkler Orifice expressed as a factor.

In the past in India, Sprinklers were manufactured to three different K Factors i.e. 57, 80 and 115 corresponding respectively to 10, 15 and 20mm orifice sizes of sprinklers. This means sprinklers having 10, 15 and 20mm orifice sizes will deliver 57, 80 and 115 LPM of water respectively at 1 bar pressure. These sprinklers give a reasonably good performance for controlling though not effectively extinguishing fires. In the last decade, there has been a tendency to go for higher K factors worldwide and currently sprinklers are being installed for special applications with K factors 160, 200, 240 and upto 360. Most important reason for this trend is to achieve a higher discharge than in a smaller orifice but at the same pressure.

For example, TAC/BIS codes call for flows ranging from 22.5 to 30 LPM/M2 for high hazard occupancies on an area of operation of say 9M2. This is equivalent to a discharge of 200 to 275 LPM respectively from the sprinklers. For providing these conditions, pressure at the inlet of the sprinkler (K Factor 115) shall be 3 bars to 4.75 bars respectively which are substantially high.

The same conditions can be met a) by sprinklers having a K Factor of say 200 at a pressure of 1 bar to 1.9 bars respectively and b) by sprinklers having a K Factor of say 240 at a pressure of 0.7 bars to 1.3 bars respectively. Typical applications are for the protection of high hazard Storage occupancies with height of storage in excess of 9M and the like with Large drop sprinklers, Extended coverage sprinklers and ESFR sprinklers. Typical design of protection systems for these systems use 12 to 20 sprinklers only and water storage is considered for one hour requirement of pumping capacity. Besides offering excellent protection and suppression, such systems are also economical to install. It may be even possible that installation of a sprinkler pump is not necessary if appropriate sprinklers are selected and installed. Overhead tanks of adequate capacity and height would suffice.

Sprinklers with larger K Factors are allowed in the protection of special occupancies in all the international standards with detailed guidelines on the protection methodology. Protection of property with these types of sprinklers are encouraged and the local bodies. BIS is also in the process of revising their existing standards and incorporate the guidelines.

5.2 ***Deflector design :-*** Once the water is discharged from a sprinkler, the deflector breaks the water into different sized droplets (i.e. large and/or medium and/or small) and distributes the droplets in a pre-determined pattern over the protected property. Larger droplets penetrate through the high intensity fires, medium ones pre-wets the area adjoining to the fire area by distributing water at the edges of the fire area while the smaller ones absorb the heat from the fire and maintain cool ceiling temperatures. Deflector design is highly technical as they play a paramount role in containing the fires.

In case of Large drop sprinklers and ESFR sprinklers, water droplets are invariably large which enable deeper penetration (into the fire) easier and control the same. In case of ESFR sprinklers, the larger droplets penetrate the fire with a great velocity and this in addition to the fast response, provide excellent protection to high hazard fires. Besides certain ESFR sprinklers eliminate the need for provision of intermediate sprinklers in case of high hazard racked storage when installed as per guidelines specified in international standards.

6. Installation procedures

The installation requirements basically encompass the following important criteria:

a) Spacing between the sprinklers (minimum and maximum)

b) Spacing between the sprinklers and the boundary walls

c) Distance between deflectors and the protected property below

d) Adjustment in spacing on account of types of building constructions – with beams, bays, type of roof etc.

e) Location of sprinklers in relation to various obstructions that affect their discharge pattern.

All the above parameters differ for various types of sprinklers and according to the type of hazard and building configuration for each and thus there is no uniform procedure for installation. Internationally, there are four types of hazard classification namely Light, Ordinary, High and Storage hazards.

7. Design area and density of application

The design density and the assumed maximum area of operation for various types of hazards are as specified below:

LIGHT HAZARD

The density of water discharge and design area of operation shall be a minimum of 2.25LPM/M2 over a maximum area of 84M2. If area concerned is less than 84M2, then density applicable shall not be reduced. Protection area per sprinkler is 21M2

ORDINARY HAZARD

The density of water discharge and design area of operation shall be between a minimum of 5LPM/M2 at 360M2. If area concerned is less than 360M2, then density applicable shall not be reduced. Protection area per sprinkler is 12M2

HIGH HAZARD

The density of water discharge and design area of operation shall be between a minimum of 12.2LPM/M2 at 260M2. If area concerned is less than 260M2, then density applicable shall not be reduced. Protection area per sprinkler is 9M2

STORAGE HAZARD

Density of water application for storage areas is determined by the flow and pressure requirements based on the type of sprinkler selected. Density of application is normally high, in the range of 25-50LPM/M2. Protection area per sprinkler is about 9M2.

The design density, design area and protection area are again different for special types of sprinklers discussed earlier. These are for normally used pendent and upright sprinklers. Codes shall be referred to know the parameters for all types of sprinklers.

8) Piping installation

Piping is a big science though not a complicated one. Usually pipe sizes are determined by the hydraulics and pressure requirements at the remote sprinklers or set of remote sprinklers. Pressure required at the extremities is always available in the codes for various types of sprinklers used in the installation

Piping array shall be designed in such a way that there are several identifiable segments in the distribution instead of a single tree type with multiple branches. This is essential in large installations where pressures at the remote areas and proximate areas fluctuate wildly. It is possible to insert orifice plates or any other suitable pressure reducing mechanism at inlets of each segment to maintain uniform pressures anywhere in the large installations.

Codes provide pre-calculated pipe sizes depending upon the number of sprinklers and the array arrangement. Fully calculated systems shall be installed for large installations and compulsorily for all high/storage hazard areas.

9) Alarm valve

The entire installation is controlled by alarm valves. The provision and number of alarm valves shall be based on the following:

Maximum sprinklers that can be fed by one system (one alarm valve) in one or more floors shall not exceed the figures as below (as per existing standards):

Light hazard	**10000M2**
Ordinary hazard	**12000M2**
High Hazard	**9000M2**
Storage hazard	**9000M2**

Alarm valves shall be installed in the exterior and adjoining to the buildings which they protect. The area should be habitable so that personnel in the vicinity can hear the alarm gong sound when sprinklers operate.

10. Pumps are sized according to demand from the installation of various types.

For example, for ESFR types of sprinkler system demand is for 12 sprinkler operation. Let us assume flow per sprinkler is 300 LPM at 2 bars, the pumping requirement shall be a minimum of 3600 LPM though it could be slightly more. The pressure at the discharge outlet of the pump shall be determined by pressure loss calculations from remote sprinklers till the pump discharge.

11. Basic concepts of ESFR Technology:

It is important to understand the difference between the concept of fire control and fire suppression. Traditional sprinklers whether conventional or spray type operate only In a fire control mode. The main objectives of these sprinklers are :

- Provide sufficient discharge to retard fire spread;
- Reduce the fire intensity;
- Pre-wet combustibles to retard their ignition level;
- Cool the building structure to prevent their collapse.

THERE IS NO UNIFORM PROCEDURE FOR INSTALLATION. INTERNATIONALLY, THERE ARE FOUR TYPES OF HAZARD CLASSIFICATION NAMELY LIGHT, ORDINARY, HIGH AND STORAGE HAZARDS.

The insurers, in the above case, consider that the damage would extend to the design area of the sprinkler and would be suppressed only by the fire fighting staff.

On the other hand, ESFR sprinklers operate in a suppression mode and the objectives are

- to operate sprinklers much earlier in case of fire;
- to provide a spray thrust which can penetrate to the seat of fire;
- suppress the fire before a severe plume is allowed to develop.

In the above cases, fewer sprinklers will operate and water damage will also be less.

The response time index or RTI is a measure of the sensitivity of the fusible element of the sprinkler head. Sprinklers with a low RTI will operate faster in a growing fire. The discharge is then operating on a smaller fire thus improving its effectiveness.

The required delivered density (RDD) is the minimum amount of water flow rate that is required to suppress a fire in a given commodity. This is dependent on the size of the fire when water is applied. The actual delivered density (ADD) is the measure of the rate at which the water is actually deposited on the horizontal surface of the burning array. It is thus a measure of the sprinkler water distribution pattern and its penetration capability in the presence of a fire plume. If ADD is more than RDD, sufficient water will penetrate the fire plume and reach the seat of the fire. As the fire grows, the RDD increases and becomes greater than the ADD and thus insufficient water will hit the plume. This is why the sprinklers have to respond rapidly, allowing very little increase to RDD.

The insurers overseas are happy and appreciative of ESFR systems for the underwriting of large storage risks as the residual losses are low. Another great advantage with these sprinklers is the elimination of the in-rack type of sprinklers under certain situations. The insurer need not bother about the changes brought about in the risk and variety of storage methods in case of ESFR sprinklers and these are invariably of "one system fits all" type. The hazards are hardly increased with the packaging are of plastic, cramped storage areas or improper aisle storage.

Because of the very low residual losses associated with ESFR type of protection, some insured (again overseas) are able to retain the sizable risk by opting for larger deductibles. This has resulted in less premium outgo.

Fast response technology combined with larger water droplets resulted in a sprinkler having the ability to provide direct and sufficient water application that penetrates the water plume delivering water on to the burning surface. As much as 80% of the water from the sprinkler reaches the seat of the fire resulting in quick suppression. There are three types namely two of pendent types and one of upright type. ESFR sprinkler system shall need to be designed for 12 sprinklers operation at a time. The above sprinklers are listed to protect wider commodities besides plastics and aerosols. In addition these sprinklers can also protect varieties of storage from on pallets to racks when installed as per the international standards. The ESFR sprinklers in a way fit into most of the applications. These are for use only on wet installations.

>> **TRA Krishnan** has worked as a Risk Assessor and has been a member of several committees of Bureau of Indian Standards.

TRA KRISHNAN WRITES ON THE RATIONALE FOR INSTALLING PASSIVE SYSTEMS IN FIRE PROTECTION FOR BUILDINGS.

The need for PASSIVE SYSTEMS in fire protection

There has been a growing acceptance among the people responsible for safety that a passive fire protection facility makes sense. It is in place, ready to go at all times and if fire broke out, it would activate itself. It is therefore increasingly realised to be a more effective means of fighting fire than placing total reliance on an active fire protection system and the like. The latter, besides needing constant maintenance/checking, depends on uninterrupted water/power supply, manpower etc. In effect, the interface operations required to start the 'Active' system normally render them 'Dependents'.

Passive systems are primarily designed to limit the spread of fire through the openings in Fire resisting walls and floors that are necessary for the passage of building and communication services. The need to maintain the integrity of fire resistant walls and floors, to meet the building regulations, to meet the insurance requirement and to prevent the spread of fires in building construction cannot be overstressed.

Times change and fires, with them. Highly volatile materials are stored in the most innocent occupancies, let alone factories and computer rooms, increasing the severity of a fire and the speed at which it spreads. And while escape ways are now provided for personnel as a matter of course, they are useless if fire doors become too hot to handle. Indeed, the old type of fire door could glow white hot and transmit radiant heat, may cause spontaneous combustion of materials on the safe side of the door. It may be well understood that providing a fire door is not an 'open and shut' affair.

Again, it is particularly true that openings in compartment walls and floors where mechanical/electrical services pass from one area to other areas are often overlooked. Regrettably, cable trays out of sight under floor or riser ducts above suspended ceilings sometimes go out of the mind.

The first step in ensuring total protection is to identify the problem areas. Certain hazards or risks are easily identifiable and factors such as flame propagation and toxicity levels shall be well documented along with the appropriate method of containment, it is imperative that only materials tested to prove their performance should be used. The severest test comes in the event of an actual fire by which time, it is too late to find out whether a locally devised system will work or not. All passive fire systems available shall have proved their performance in recognised test laboratories as per Indian or equivalent overseas standards.

The basis of passive protection systems is to construct plants in a compartmentalised form. But the system breaks down if the compartments are breached by penetrations, or through holes in floors and walls to make way for electric cables, air ducts, steam/air pipes and the like to pass from one area/floor to another. These breaches are ever present fire hazards.

These difficulties pronounce ever-present danger to high rise buildings which contain variety of shafts for services, running from basement level to the terrace levels. It is, therefore, vital to seal such penetrations (horizontal or vertical) with a medium which both

stops fire and is impermeable to smoke. It is again very necessary to ensure that the sealing materials should be easy to apply, have a good life expectancy, easy to maintain and above all, should be available in the proximity. Also they should be modifiable and changes retrofit shall be possible on a future date. Lastly, it is needless to mention that the passive systems are only as good as the proficiency of the installing personnel and length of their experience.

To sum up, an ideal passive protection system shall comprise of the following:

a) Selection of the right system for the risk configuration concerned.
b) Fire rating evaluation by the appropriate authority.
c) Experience of the installation.
d) Record of behaviour of passive system at risk under question.
e) Availability of passive system in the neighbourhood.
f) Modifiability of the system in respect of removal or addition of cables, pipes etc.
g) Cost of the passive system.
h) The fire rating of the passive system shall be at least equivalent or greater than the rating of building elements whereon they are installed.

Now let us have a look at the variety of Passive systems available in the world and the contribution of each towards loss minimisation.

2. VARIETY OF PASSIVE PROTECTION SYSTEMS

To make the discussion easier, the products can be grouped under following headings :

a) Fire proof doors,
b) Wired glass windows,
c) Dampers,
d) Protection to the cable entries,
e) Fire proofing materials,
f) Miscellaneous Products.

The above are the broad headings for various products and we will so through each item above in detail.

3. FIRE PROOF DOORS

3.1 FUNCTION OF THE FIRE PROOF DOORS

Fire doors are critically important as, these in actual fire conditions, are required to:

a) Maintain 'Compartmentation' of the building to contain the fire to the area of origin. b) Allow the "Passage of people or goods" between one compartment to other in fire conditions. c) Allow 'Smoke free' access to the escape routes, both vertically and horizontally without any loss of fire resistance in the structure forming the routes, namely - protected corridors and shafts.

3.2 TECHNICAL REQUIREMENTS OF FIRE PROOF DOORS

Fire resistivity of the door is expressed in hours for which it is required to comply with the following performance criteria:

a) ***Stability:*** The fire door shall not collapse during the rated period of fire under the specified fire conditions.
b) ***Integrity :*** The fire door shall not allow the passage of flames or hot gases through the rebate or gap between the door frames and shutter or through the holes developed in the shutter during a fire.
c) ***Insulation :*** The mean temperature of the fire door on its unexposed side shall be such that quicker escape of people without radiation problems is possible and also that the hazard of combustion to the flammable goods lying on the unexposed side is not likely to exist.

> IT IS AGAIN VERY NECESSARY TO ENSURE THAT THE SEALING MATERIALS SHOULD BE EASY TO APPLY, HAVE A GOOD LIFE EXPECTANCY, EASY TO MAINTAIN AND ABOVE ALL, SHOULD BE AVAILABLE IN THE PROXIMITY.

3.3. TESTING AND APPROVALS

The governing specifications for fire proof doors are as under:

a) Fire check doors : IS:3614(PART II)
b) Fire proof doors and shutter assemblies : As per specifications laid out in Building regulations Published by the Tariff Advisory Committee.
c) Fire test on Buildings and structures : IS:3809 : BS:476(Part 8)
d) Fire tests on elements of Building Construction : ISO:834
e) Fire tests on doors and shutter assemblies : ISO:3008
f) Fire doors and windows : NFPA:80

Fire research laboratory of Central Building Research Institute at Roorkee is one of the renowned laboratories in World and they are equipped with the facilities to conduct full scale fire tests as per BS:476(Part 22), IS:3614(Part II), ISO:3008 and IS:3809. The Manufacturers are awarded Fire rating of their doors in hours.

3.4 TYPES OF FIRE DOORS AND SHUTTERS

Fire doors can be of sliding type, swing type, rolling type. Following are the doors, normally manufactured and supplied in India.

a) Steel plate - sliding door (single leaf only), b) Steel plate - Hinged door (single leaf and double leaf, c) Rolling shutters, d) Armoured door sliding (single leaf only), e) Armoured door Hinged (single & double leaf), f) Composite doors, sliding or hinged, g) Proprietary doors, sliding or hinged.

In their "Building regulations" booklet published for the guidance in regard to insurance requirements, Tariff Advisory Committee, India have listed out various requirements for fabrication and installation of various types of Fire proof doors. The rules relate mainly to plate type - sliding and swing doors, rolling shutters etc. The proprietary doors are normally tested my M/s. CBRI, Roorkee for fire rating and no specific guidelines are published in respect of fabrication. There is a ceiling in respect of area of protected openings and also a limit for size of the openings (Length/breadth/height) which is applicable to all types of doors.

3.5. IN CASE OF PROPRIETARY DOORS,

the doors and frames are filled with insulation materials rolled in steel sheets bonded to the insultated core. There are variety of methods using high grade tested materials, heat activated seals, proprietary fire resistant compounds and surface coatings. Asbestos is not permitted in the construction. All the fire proof doors irrespective of their type; shall need to be evaluated by M/s. CBRI, Roorkee for ascertaining fire resistant capabilities.

4. WIRE GLASS WINDOWS

Windows are integral fabricated units, placed in an opening in wall and are primarily intended for the admission of light or light and air and not primarily intended for human entrance or exit. Wired glass windows are windows having glass with wire netting embedded in it. Wired glass windows are not permitted in perfect party walls (Fire walls). They are primarily intended to protect the openings in external walls of a building from exposure to risks of the adjoining, opposite or otherwise segregated buildings.

The Tariff Advisory Committee regulations restricted usage of wire glasses as under :

a) Area of the openings shall not exceed 50 Sq.ft (4.65M2)

b) Size of window panes shall not exceed 400 Sq. on. (2580 CM2)

The windows protected by wired glass shall be of a fixed type and they should be deemed as allowed for admission of light only. The window fixed with wired glass are expected to have a rating of 30 to 45 minutes which shall be substantiated by a fire test. M/s. NFPA/M/s. UL have devised standards for such windows vide NFPA-80L, which may be referred to for guidance.

5. DAMPERS

Fire dampers are normally provided on air/gas ducts (sometimes material ducts also) to control flow under normal circumstances and segregate areas connected by duct from the fire affected area.

Dampers are normally fabricated with Single flap or multilouvers. These are connected through suitable linkage to an actuating device - electrical or solenoid valves or pneumatic system or fusible links. In addition manual over-rides are required to quickly isolate sections of ducts in case of failure of auto- operations during a fire.

The characteristics expected of "Dampers" are as below :

a) Suitably shaped design to reduce the leakage factor considerably.

b) Suitable infill of dampers on fire exposed surface.

c) Endurance at high temperatures.

d) The design of flap/louvers to enable Thermal expansion without affecting the sealing area.

e) Proper spring loaded return device.

f) Efficient sealing system.

g) Closing efficiency.

h) Asbestos free as far as possible.

M/s. CBRI, Roorkee have the required testing facilities to evaluate the fire rating of dampers and the tests normally conducted are Fire endurance and hose stream test, closing reliability test, spring closing test etc. The rating provided is upto 90 minutes.

The construction, performance and testing parameters are normally governed by the UL Specification No.555 on Fire dampers.

6. CABLES AND CABLE ENTRIES

The importance of electrical cables in industries and high rise buildings should be fully appreciated. In the former, they are the nerve cords of the industry and in the latter, they are essential for operating lifts, pumps, emergency lighting and communication systems.

Apart from electrical cables, other services like water pipes, ducts for air etc. also pass through floor to floor like cables in shafts or otherwise through the building. Where no alterations are anticipated in future, such openings in either floors or walls can be fully concreted or covered with suitable passive materials discussed in this paper.

PVC insulated cables by virtue of their electrical properties and economy find extensive use in power plants, to feed power to auxiliaries and to carry control and signalling currents for the control, instrumentation and protection systems.

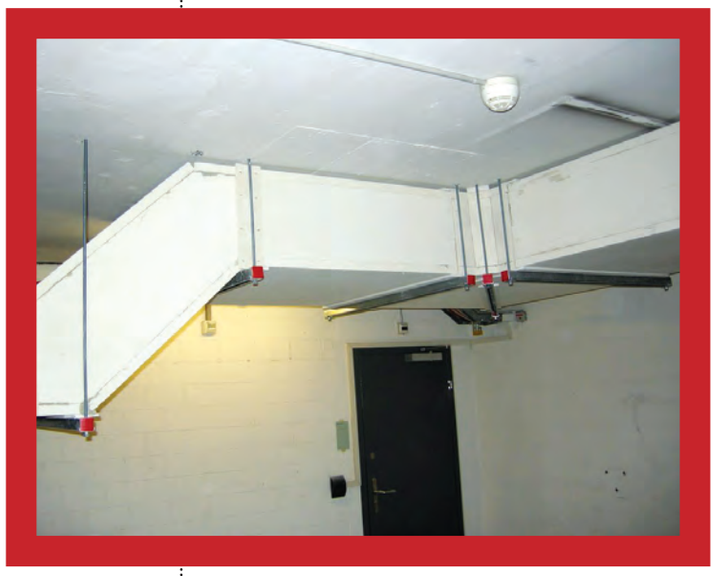
When PVC cables are involved in a fire, the fire is known to propagate at speeds upto 20 mtrs. per minutes, starting fresh fires in all directions wherever the cable-runs cross each other or bifurcate. On combustion, every kilogram of PVC produces 1000 cubic metres of highly dense smoke which mainly contains hydrogen chloride fumes sufficient to produce one litre of commercially concentrated hydrochloric acid.

In combination with the moisture which is present in the atmosphere, these fumes condense on the cooler metallic surfaces of the plant equipment, sophisticated instruments and are also absorbed by the hygroscopic materials of the building construction. The spread of fire and acidic fumes is further facilitated by the "Chimney effect" which displaces huge quantities of air through the unsealed cable openings in walls and floors. It is to be borne in mind that the power based industries incorporate several kilometres of cables containing huge quantity of combustible PVC (150 to 400 kgs. per metre length of cable run). For example, a typical 2 x 210 MW/Thermal Power Station is estimated to use almost 1250 kilometre length of cable costing between Rs. 18 to 22 Crores. Besides direct equipment and shutdown losses, the devastating effects of the post-fire irreversible damages caused by the acidic fumes like corrosion, depletion in load bearing strength of building structures etc. come to light only during a long spread-over period after the fire occurrence.

The importance of fire safety in cable runs has been well recognised. Bureau of India Standards has also formulated Code of Practice for fire safety vide IS:12459-1988 which calls for fire protection to cables by way of compartmentation by sealing the floor/wall openings etc. and also compartmentation of long galleries. Cables in vaults are also recommended for coating by suitable fire retardant compounds to retard the spread of fire as also coating on other critical areas.

Now let us discuss the various passive systems pertaining to the cable protection.

APART FROM ELECTRICAL CABLES, OTHER SERVICES LIKE WATER PIPES, DUCTS FOR AIR ETC. ALSO PASS THROUGH FLOOR TO FLOOR LIKE CABLES IN SHAFTS OR OTHERWISE THROUGH THE BUILDING. WHERE NO ALTERATIONS ARE ANTICIPATED IN FUTURE, SUCH OPENINGS IN EITHER FLOORS OR WALLS CAN BE FULLY CONCRETED OR COVERED WITH SUITABLE PASSIVE MATERIALS.



6.1 MASTICS

6.1.1 There are quite a few Mastic compounds available, for example one type of Mastic is a PVC compatible compound of wa-

ter based Thermoplastic resin, flame retardant chemicals and inorganic incombustible fibres. The formulation is resistant to hydrocarbons, acid, alkali attack and becomes ceramic and refractory at elevated temperatures and thus providing good degree of protection to grouped cables. There are other types on a water based intumescent compound, providing protection for runs of cables, providing short circuiting delay.

These compounds are appropriate for areas where there is a need to maintain supply during a fire e.g. Airports, lift controls, computer industry etc.

6.1.2 ***The characteristics expected of the Mastics are as under:***

- Prevention of flame spread along grouped horizontal/vertical cables.
- Delay fire damage to cables and keep them functional for an additional time even under severe exposure.
- Ampacity of the cables not affected.
- Flexibility sufficient to absorb the temperature induced movement of cables.
- Non-hygroscopic, totally humidity and moisture resistant and weather resistant for exterior use.
- Durable with a life expectancy similar to the cable itself.
- Asbestos free.
- Easier application.
- Non-toxic, Non-solvent based.
- Reasonable shelf life.
- Reasonable mechanical strength.
- Permits removal of any individual cable out of a bunch.

The coating can be applied by brush as well as spray to the minimum recommended thickness. Surface preparation, method of coating, coverage etc. may be carried out as per the recommendation of the Manufacturer and as laid in the specifications.

6.1.3 M/s. CBRI, Roorkee have the required testing facilities like Flammability test, Fire Survival test, Ampacity test, Accelerated Ageing and Insulation test etc. and rating is provided with respect to fire resisting time. The specifications concerning the tests are as follows :

a. Tests for Building Materials : IS:10810 (Part 53), IEEE:383
b. Code of Practice for fire safety in cable runs : IS : 12459
c. Fire Survival test, Electrical Integrity test : IEC:331
d. Tunnel Test, Chimney Test, flammability tests etc : ASTM D-2863, ASTM D-3806, ASTM E-69, ASTM D-1230, BS : 3119, IS : 11871

6.1.4 ***Critical areas requiring cable coating are as below :***

a) PROXIMATE TO CABLE JOINTS:
About one metre on either side of cable joints will be useful to prevent damage to the cables in case of fire.
b) HIGH TEMPERATURE ZONES :
Cables in high temperature areas like Boilers, Furnaces and other area where temperature is likely to be 50 degree centigrade or more, may be entirely coated to prevent flame licking and propagation.
c) CABLE ENTRIES TO CONTROL CENTRES:
Normally the cables enter into the control centres from trenches at the bottom. By coating the cables (incoming as well as outgoing) for a length based on judgement would be very advantageous in protecting the cables as well as panels.
d) CABLES IN VULNERABLE LOCATIONS:
Cables which are likely to be affected by the spillage of lubricating oils, grease, coal dust, saw dust etc. need coating. These cables are likely to catch fire due the deposition of above rapidly. Hence, coating is recommended.
e) CABLES PASSING THROUGH FIRE WALLS & FLOORS:
It is recommended to coat the cables on either side of such walls/floors for atleast 1.5m to 2m for prevention of flame propagation due to fault in the cable itself.
f) CABLE CROSSINGS:
In view of conglomeration of cables, it is very much advisable to coat the cables based on site limitations and sound judgement.
g) Bunched Cables in Cable Galleries:
Compartments should be created by coats between bunched cables without separating the cables in a bunch.
It is however important to bear in mind that the Fire rating of the coating shall not, in any case, be less than the rating for the building components where the cables are used.

IT IS HOWEVER IMPORTANT TO BEAR IN MIND THAT THE FIRE RATING OF THE COATING SHALL NOT, IN ANY CASE, BE LESS THAN THE RATING FOR THE BUILDING COMPONENTS WHERE THE CABLES ARE USED.

6.2 CABLE FIRE BARRIER SYSTEM:

Cable Fire Barrier System, otherwise known as "Cable Fire Stop System" effectively seals the openings through walls, floors, trenches, cable vaults, etc. to provide an effective compartmentation with a definite fire rating of not less than the rating of the compartment itself. The concept of Fire stops is based on the principle that the fire proof sealing alone is not enough. Essentially, the sealing system should be smoke & gas tight, mechanically sound besides being an efficient fire stop. It should also be capable of withstanding shock loads, such as : In case of breakage of trays during a fire, the cable load may come on the Fire stops, Operating personnel may step on to the Fire stops installed on a floor, Fire fighting water jet may be directed on the Fire stops, Positive pressure within the Compartment during a fire may act on Fire stop.

6.2.1 Components of a Fire Stop
The following are the major components of a Fire Stop system for cables:
a) Encasing panels and supporting frames, b) Cavity fill or penetration seals, c) The Fire Seal (to achieve air/smoke/gas tightness), The Supporting Frames shall be non combustible, water resistant, rot/vermin proof and anti-rodent. The panels shall be formed of high temperature resistant materials, have a capacity to maintain structural stability despite long exposure to fire and shall be immune to ageing. Penetration or Cavity seals inside the encasing panels comprise of an infill materials of specified thickness coated with intumescent mix designed to give a suitable fire rating. The infill material is normally a blend of modulated rock fibres in inorganic binders. The material has a good fire resisting characteristics and grips the walls of cavity and does not permit the passage of flame and provides full integri-

ty. The Fire seals are used to close the openings of areas around the cables and the joints of support frames and serves the purpose like a gasket. This also provides retrofitting to the system. Under fire conditions, they swell and carbonize into a hard crust and enhance the integrity.

6.2.2 ***The characteristics expected of a Fire Stop system are as under:***

a) Resistant to fire, smoke, moisture, humidity and chemicals.
b) Retrofit design facility.
c) Durability and anti-ageing properties.
d) Possibilities of insertion or withdrawal of cables without impairing performance.
e) Asbestos free.
f) Impact resistance and resistance to termite, vermin and rodents.
g) Non-Toxic and non-solvent based.

6.2.3 Installation

Provision of Fire stops and their installation differs from site to site due to the variety of circumstances based at each site, normally, Fire stop assemblies and encasing panels are sized larger than the actual civil opening to provide a overlap around all sides. The panels are mechanically fastened to the masonry work to eliminate dislocation of the system due to vibration or expansion, the panels are filled with the required quantity (Fire rating) of intumescent mix and then sealed with Fire Seal to provide a good degree of integrity.

6.2.4 M/s. CBRI, Roorkee have the required testing facilities, like Fire resistance test, Accelerated ageing test, impact test etc. and rating is provided with respect to fire resisting time. The relevant specifications in respect of testing & evaluation of Fire stop system are as under :

a) Building materials Testing : BS:476 (Part-8)
b) Building Construction materials -Fire Testing : ASTM E 119
c) Through penetration Fire Stops : ASTM E 814
d) Fire stop penetration- Fire Test : UL-1479
e) Fire tests - elements of building construction : ISO-834
f) Fire tests on Buildings and structures : IS:3809
g) Method of fire test of fire stops : IS-12458
h) Code of practice for fire protection of cable runs : IS-12459

The fire rating of Fire stops ranges from 60 minutes to 240 minutes.

6.2.5 ***Installation of Cable Fire stops is very important for the following applications :***

a) Entry/Exit areas of cable/cable trays in the common walls between compartments having differential fire loads. b) Cable openings in Control rooms and also for cable galleries in basements. c) Where cable fires may go unnoticed initially until it is too late. d) Cable entries for EDP, Computer and allied expensive equipment rooms. e) Cable entries between Control centres and process/ storage blocks.

7. FIRE PROOFING MATERIALS

The use of Fire Proofing Materials is a reliable method of protecting steel structures, flammable liquid processing units and storage vessels against the damaging effects of fire. Fire test criteria normally use 1000 degree F (540 degree C) as the failure temperature for the protected steel member. At this temperature , steel retains only 60% of its yield strength. When the Steel is fully loaded to design values, its failure is imminent at around 1000 degree F. For conditions of complete engulfment at combustion temperature in the range of 1800 degree F to 2400 degree F (980 degree C to 1300 degree C), collapse would occur in a few minutes with lighter members becoming first victims. For structures and equipment which are designed to higher loading levels, a level of 750 degree F to 800 degree F (400 degree C to 430 degree C) is the permissible temperature. In case of Aluminium (used extensively in shore platforms due to weight advantage), as it loses strength at much lower temperatures, 390 degree F (200 degree C) is generally taken as the upper limit.

For example consider an LPG Storage vessel (bullet or sphere), the potential for massive release of chemical energy in the form of very rapid combustion of depressurised liquids forming gases is very high. During fire conditions, the combination of increased internal pressure and reduced steel wall strength due to increased temperature will eventually cause the vessel to fail structurally. This type of failure is often referred as "BLEVE". It may be of interest to note that the vessels which are nearly empty will fail under design pressures strictly from loss of steel strength whether or not local liquid boiling occurs. Hence the problem is compounded in the ullage space. Similarly, the supporting legs of these vessels can be quickly weakened by the fire, collapsing the vessels. Tests have demonstrated that the portion of wall of the vessels above the liquid (ullage space) must be generally limited to 800 degree F (427 degree C) and internal pressures maintained at or below the relief valve setting.

Fire proofing materials can prevent or delay such failures depending upon the nature of fire, type & thickness of Fire proofing components and other circumstances. Active systems like water spray systems can provide adequate protection provided sufficient flow rates are available backed up by ample water supply and most importantly good coverage of all the steel members is ensured. As discussed in the preamble, the active systems are dependent on maintenance, manpower and interface operations and in event of breakage of any of the factors, the system becomes unreliable. It is also an usual practice that active & passive systems are installed in tandem in the larger interest of loss prevention.

7.1 EXPECTED CHARACTERISTICS OF FIRE PROOFING MATERIALS

A critical factor in judging the suitability of a fire proofing material is its ability to withstand the environment to which it is going to be exposed. If a material can do this, it will be able to provide the fire resistance level to which it was rated. The factors include Heat, Cold, Temperature cycling, Sulfuric acid, Chlorine, acids, bases, moisture, solvents and other human abuse. More severe the environment, the more resistant the material system must be.

Some important considerations are as follows :

a) The materials shall be non-porous, chemically inert, b) Corrosion resistant properties, c) Insecticide, fungicide, solvent-resistant properties, d) Durability after the installation, e) Flame retardent properties, f) Fire resistance on ageing, g) Ease of application, h) Good intumescent properties, i) Resistance to frequent atmospheric variations, j) Moisture penetration resistant properties, k) Cost of installation.

7.2 METHODS OF FIRE PROOFING

There are several methods available to achieve fire proofing, but each method has certain drawbacks and cannot stand alone as the only protection material used. Rather, each has its role in a broader safety and protection system. Hence it should be understood in no uncertain terms that passive fire proofing materials represent only one important segment of the overall loss prevention effort.

The variety of materials used for fireproofing are concrete, panel system, board foam insulation, endothermic wraps, epoxy and other intumescent mastics, masonry and light weight cementitious plasters. It is possible that each of the labove has a place where it may be the best bet for a given situation. A brief description of some of the commonly adopted methods is as under:

7.2.1 Reinforced Concrete & gunnite fire proofing.

These have been used for years as fire proofing means. Tough and dense, they provide long term protection for most environments. Thermal protection is provided by mechanisms of heat absorption through sensible energy rise and break-down of the chemically attached water in the cement. Their mass is likely to provide a heat sink for upto 3 hours in most of fire environments.

Gunnite is a mixture of sand and cement. This is pumped and sprayed into reinforcing mesh around the steel. It has a less appealing finish than formed concrete. If properly formulated and applied, both the materials can actually prevent corrosion of substrate. If concrete is prepared with salt water, the potential corrosion inhibiting mechanism will be severely compromised. Similarly, if concrete is porous or if cracks have formed, corrosionbecomes a big problem.

7.2.2 Light weight cementitious fire proofing.

These have evolved over the years into fairly standard systems with various loadings of insulative fillers, reinforcing fibres and some decomposing compounds for energy absorption. Application involves painting of substrates, installation of lkath and a multicoat application of materials to achieve desired thickness. Top coating will be required for installation in humid climates. Thermal protection is afforded in the same way as in concrete. Because of porosity, the durability of the material and the lath may be compromised. However, in dry, arid climates, these provide efficient service but not in sea coast areas. The installation is fairly straight forward and least expensive.

7.2.3 Epoxy Intumescent Mastics

These systems are latest entrants in the field of fire proofing and initial cost of installation is high. The cost is offset by its long durability, resistance to corrosion and other hostile environments. Thermal protection is afforded by expansion during heating and

formation of an insulative layer of char. The quality of the char and resistance to oxidation defines the performance of the material. A positive mechanical reinforcement is required to ensure integrity during heating, as these materials must undergo a liquid layer phase before the formation of char. These may not be suitable on surfaces with continuous operating temperatures in excess of the thermal stability level of the material. Stringent surface preparation is required. It is essential not only that the porimer coat is chemically compatible with the intumescent coating, but, alsoto bond efficiently with the substrate.

7.2.4 Pre-fabricated Panel Systems

These are gaining popularity in view of the built-in quality and convenience of installation for many applications. Construction is usually box against contour and good systems have stainless steel fasteners to retain the panels. Very little or no surface preparation is required. These are not well suited for complicated steel joints or small sections due to the tailoring required. Panels can be made out of variety of materials and most commonly used are based on portland cement.

7.3 CHOICE OF RIGHT MATERIAL FOR RIGHT APPLICATION

Selection of any passive material should be done on a sound judgement after ascertaining the situations. Some clues are as under :

a) It is a prime consideration to determine what shoud be the fire resistance level, b) Look around to see the environmental conditions. In factories, where corrosive chemicals are used or corrosive environment is in the neighbourhood, epoxy coatings are comparatively better. If the environment is dry or arid, cemenitious materials are better and so on, c) What is to be fire proofed? Small complicated steel structure does not go with concrete or panel systems. Storage vessels are best done with eposies and so on, d) The material selected shall be proven for the application, e) For the same site, different materials can be used if situation warrants, f) Following are the other criteria to be borne in mind before selecting a material:

Durability	Skin irritation
Top coatability	Metal lathing
Flame resistance	Intumescent properties
Appearance	Hose Stream resistance
Corrosion protection	Temperature cycle variation
Fire resistance	Amenability to exterior use
Ease of application	Cost

g) Finally, it is the workmanship that determines the quality of fire proofing and it should be ensured that the people responsible for the work shall be quality conscious and experts in the execution of the jobs.

7.4 THE PASSIVE MATERIALS HAVE TO BE EVALUATED IN RECOGNISED LABORATORIES FOR FIRE RESISTANCE AND RATINGS PROVIDED IN TERMS OF MINUTES.

The specifications concerning the tests are as follows :

a) Fire endurance ratings	ASTM E-119,
b) Fire tests on Building materials	UL 263
c) Fire test for intumescent coatings	BS 476(Part 8)
d) Fire test and evaluation of mate	rials UL 1709
e) Flame spread ratings Building materials	ASTM E 84
f) Standard methods of fire tests of building construction and materials	NFPA 251
g) Code of practice for the assessment of coating systems	BS 8202(Part 2)

7.5. INSTALLATION OF FIRE PROOFING MATERIALS is a reliable method for the protection of process structures, pipe supports, equipment supports in the

process blocks particularly in high hazard risk applications. It is very necessary to protect the hydrocarbon storage tanks (pressurised LPG in Bullets & Spheres), legs & saddles, supports of such tanks. It may be noted that such passive materials find their application increasingly in off-shore structure, ships etc.

8. MISCELLANEIOUS PRODUCTS

The other products which are available in the world market for one type of passive protection or other are briefly discussed as under :

8.1. BULK HEAD SEPARATION

Buld head is designed to limit the spread of fire through the openings in the fire resisting walls and/or floors that are necessary for the passage of building and communication services. It consists of one or more layers os specially prepared high density mineral insulating material slab that is cut into pieces to fit into the openings. The pieces are bonded togehter and to the services using a non-hygroscopic intumescent compound.

Bulk head system is easy to install, suitable for penetrations of any construction and for openings to any irregular shaps and it also enables retrofitting on a later date.

Bulk heads are designed to act as fire resisting barriers that can accomodate range of pipes, ducts, trunking, electrical, communication cables and supporting frame works, trays, ladders, etc. encountered in buildings. PVC pipes reqauire special considerations to avoid a breach in the fire wall when such pipes fail under fire situations. It may be necessary to use independent sleeves.

The bulk heads provide definite fire rating and the same can be tested in accordance with BS:476, ISO:834, DIN:4102, ASTM-E:114 etc.

8.2. FIRE COLLARS/PILLOWS

The intumescent fire collar is a pre-assembled unit engineered to limit the spread of fire through the openings in the fire resisting walls and/or floors that are necessary for passage of building and communication services.

The intumescent pillows are used to seal the recesses in between bunch cables when the cables run through in an unplanned or zig-zag manner. The above methods provide fire resistance rating and can be evaluated in accordance with ISO-R-834, DIN:4102, BS:476 (Part 8), UL:1479 and IS:3809. The pillows are evaluated by M/s. CBRI, Roorkee.

8.4 FIRE & CORROSION RESISTANT PAINT

The above is normally a rubber based air drying intumescent paint, which has good acid/alkali resistant properties in addition to fire retardant characteristics. Normally used synthetic enamel or epoxy paints pose a considerable fire hazard in industries, offices, residences etc. as these are flammable. Besides, they add heavily to the heat of combustion, aiding rapid propagation of fire.

The paint can be used to protect variety of substrates like steel, wood work, metallic and cement surfaces. The paints are made in different colours and as such they can provide decorative finish, if required, as in the case of office furniture, partitions, cabins etc. The paints are made to resist dampness. Though they are made to resist acid/alkali substances, they are not intended to be in continuous contact therewith. They are meant to protect substrate from fumes and liquid splash while in use. Hence, the paint is more useful in industries like process houses in cotton mills, chemical industries, paper mills, coastal areas etc. where corrosion to the steel structures is a poser. The paint shall be made to meet kwikth IS:157, IS:159 & IS:160 for corrosion resistance kand BS:476 (Parts 6,7 & 8) for fire resistant properties and also ASTM E:662-79, ASTMD:1360-79 & IS:12777.

8.5 HEAT RESISTANT PAINT

The above is normally a silicon based paint for exterior coaktings which show good heat resistant properties when subject kto continuous heating including radiated heat. the paint can withstand upto a temperature of 9800 degree celsius though intermittently, it may withstand 50 deg. beyond the specified limit. These paints are very useful for applications in Boiler Houses, ovens, Hot Plates/Gas Ovens, Chimneys etc. and can be made kto different colours. The paint shall be made to meet with the equirements of IS:161.

8.6 FIRE RESISTANT COATING FOR THERMOCOLE

Thermocole, otherwise known as expanded polystyrene is available in three forms - Plain Thermocole, Thermocole TF (Treated for fire) and Thermocole SE (self- extinguishing). Plain Thermocole is flammable and poses serious fire hazards. In fact National Building Code has recommended against the use of the same. The other type of Thermocoles specified have improved characteristics in respect of flammability and fire hazard. Thermocole may also be coated with fire resistant materials to improve the retardent properties. The Coating should substantiate comprehensive strength, thermal stability, water vapour performance etc. and meet with the requirement of IS:4671. The coated Thermocole is meant for indoor application only and prone to water damage.

8.8 FLAME PROOFING OF FABRICS

Flame-proofed fabrics are those, which when in contact with fire, only char but do not ignite or spread flames. In general, curtains, furnishing fabrics, carpets etc. which are sources of fire hazard, can be flame proofed to minimise fire risk. There are two forms fof flame proofing i.e. one is wash resistant and other is non-wash resistant. The process is a simple dip/spray and dry & uncomplicated. The weight of the fabric increase by about 20% after flame proofing. Flame proofing shall meet with the requirements of BS:3119 and BS:3120. M/s. CBRI< Roorkee certificate is available for flame-proofing of fabrics. Another application is for wrapping of air-conditioning ducts. The National Building Code has excluded usage of combustible wrapping around ducts. Flame proofed hessian cloth duly certified by CBRI, Roorkee and meeting with requirements of BS:3119 and BS:3120 can be accepted as a wrap for the air-conditioning ducts. Besides, flame-proofed hessian is a useful packing materials.

CONCLUSION

They variety of methods of passive protection systems have been discussed i.e. the paper. Quite a few of them are being manufactured in India. Unless such materials have evaluated by recognised laboratories like M/s. CBRI, Roorkee, they should not be considered for installation. It is always advisable to select the right material for the right application after studying the concerned parameters and decide the nature of protection required on sound judgement. As stated in the paper, proof of having been protected lies in the quality of the workmanship.

>> **TRA Krishnan** has worked as a Risk Assessor and has been a member of several committees of Bureau of Indian Standards.

HOW AN IDEAL FIRE LIFT SHOULD BE DESIGNED

Sandeep Patil, Chief Engineer, PWD, Maharashtra, tells Fire Tech about the importance of fire lifts and the various things to consider when designing them.

THE FIRE BRIGADE SHOULD TAKE A MORE PROACTIVE ROLE IN ISSUING NOCS TO LIFTS IN BUILDINGS. "IF THE REQUISITE NOCS AND PERMISSIONS ARE NOT GRANTED, THUS MAKING THE LIFT UNUSABLE, THE DEVELOPERS WILL START TAKING THINGS MORE SERIOUSLY"

MAHARASHTRA'S MAJOR CITIES – MUMBAI, PUNE, NAVI MUMBAI – BOAST OF SEVERAL HIGH RISE TOWERS AND SKYSCRAPERS. AS BUILDINGS GO VERTICAL, THE INCLUSION OF FIRE LIFTS BECOMES CRUCIAL. "THESE ARE LIFTS THAT ONLY FIREMEN SHOULD USE IN CASE OF A FIRE OR OTHER EMERGENCY."

It is often the most crucial element of any building's design plans, but is, unfortunately, it is included as an afterthought. "Designers and planners build swanky building towers, huge high rises with all the possible amenities – and put in lifts as the last thing," says Sandeep Patil, Chief Engineer in the Public Works Department (PWD), Maharashtra State. "There are hardly any buildings in Mumbai, the city that has the most numbers of skyscrapers in the State, which have fire lifts. Planners and designers, and hence the end users, just don't think it is important to have fire lifts."

The need for fire lifts

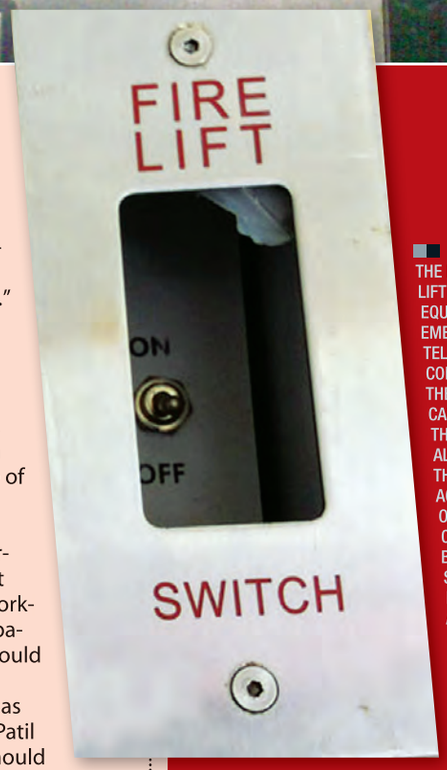
Maharashtra's major cities – Mumbai, Pune, Navi Mumbai – boast of several high rise towers and skyscrapers. As buildings go vertical, the inclusion of fire lifts becomes crucial. "These are lifts that only firemen should use in case of a fire or other emergency," Patil explains. On a grim note, he adds that he has not found a single lift in Mumbai that is fire-ready.

Most developers and builders, Patil says, are simply unaware of, or unwilling to install, fire lifts with the correct fire ratings and all the proper elements that make a good, serviceable fire lift. A fire rating of one hour, he explains, means that the lift's doors will stop the spread of fire for one hour, in which case, occupants can remain safe for an hour. "Despite all the regulations in place, however, developers and builders do not take these factors into account. They feel that any lift can be serviced in the case of an emergency – this assumption can potentially cause havoc in times of rescue."

He feels that the fire brigade should take a more proactive role in issuing NOCs to lifts in buildings. "If the requisite NOCs and permissions are not granted, thus making the lift unusable, the developers will start taking things more seriously," he muses, adding that even the PWD must be very strict when inspecting and certifying lifts in the State.

What a good fire lift should be like

A fire lift is different in design and function



THE INSIDE OF THE LIFT SHOULD BE EQUIPPED WITH AN EMERGENCY TELEPHONE THAT CONNECTS WITH THE WATCHMAN'S CABIN OUTSIDE. THERE SHOULD ALSO BE A SWITCH THAT A USER CAN ACTIVATE IN CASE OF A FIRE THAT CAN ALERT THE BUILDING SECURITY PERSON THAT AN EMERGENCY EXISTS.

The fire lift door must have a fire rating of one hour, the lift must have a speed of one minute (i.e. the rescue team should reach any floor within one minute of travel), they must be easy to find at the ground floor, and if it is a dual carriage lift, the partition between the two must have a fire rating of four hours.

from an ordinary passenger lift. It is more sturdy, can carry heavier weights (though, not more than 8 passengers while going up or coming down), the lift shaft must be pressurised such that smoke cannot enter the lift, and should include copper wires in the circuitry.

"Speed, fire rating, pressurisation and design are the four basic elements of fire lift design," Patil explains. "At the most basic level, what must be remembered is this – the fire lift door must have a fire rating of one hour, the lift must have a speed of one minute (i.e. the rescue team should reach any floor within one minute of travel), they must be easy to find at the ground floor, and if it is a dual carriage lift, the partition between the two must have a fire rating of four hours."

Additionally, he says, the inside of the lift should be equipped with an emergency telephone that connects with the watchman's cabin outside. "There should also be a switch that a user can activate in case of a fire, to alert the building security that an emergency exists. In the event of a fire, normally all electrical supply is cut off, which stops all lifts from working. A fire lift should have a separate electrical supply which should never be switched off."

'Inside control' of a fire lift is as important as 'outside control', Patil insists. "For example, people should be able to manipulate the lift controls on receiving instructions from rescue personnel or watchmen outside. It is dangerous to keep the lift passenger at the mercy of outside assistance only."

In conclusion...

Patil says that builders are only adding floors and offering amenities without considering the safety aspects for the same. "Say a fire occurs on the 10th floor of a 20-floor building. How do people trapped on the upper floors come down? Does the lift stop at every floor? Are medical emergencies taken into account? Users are aware of good lift usage, but in the case of fire lifts, there are many transgressions," Patil explains.

Additionally, residents must insist on periodical lift inspection and servicing." However, people are unhappy when lifts are closed for inspection. This makes the implementation of lift rules difficult. People are also unwilling to have the lifts inspected by professionals, because they are unwilling to spend money. The awareness of safe lifts has to increase among people," he signs off.

6,000: Number of new lifts that come up in Maharashtra every year.

514: Lift inspectors all over the State of Maharashtra. They are expected to inspect four lifts per day.

2: Lift inspectors In Maharashtra. They issue lift licenses.

12: Assistant lift inspectors go on site and inspect lifts.

64: Engineers advise repair work wherever needed.

G + 7: The height at which a lift must be installed in the building.

A ONE-DAY SEMINAR ON **'MISSION: SAFE LIVING'** WAS ORGANISED BY MAHARASHTRA FIRE SERVICES IN MAY 2014.

SAFE LIVING, MORALLY AND LEGALLY

A one-day seminar and knowledge sharing discussion forum was organised on May 24, 2014 at Hotel Grand Hyatt, Mumbai by the **Directorate of Maharashtra Fire Services** in association with **Fire Protection Association of India** and the **Maharashtra Fire Services Personnel Welfare Association**, along with major fire services in Maharashtra.

The theme for the seminar was 'Mission: Safe Living, Moral and Legal Responsibility'. The objective of the seminar was to establish a unified approach of the regulators and licensed ggencies to drive Mission Fire Safe Maharashtra.

An overview of the Maharashtra Fire Prevention and Life Safety Measures Act, 2006: This was an Act promulgated to make more effective provisions for the Fire Prevention and Life Safety measures in various types of buildings in different areas in the State of Maharashtra.

Hence in 2011, MFS started issuing licenses to the companies who specialise in providing System Installation, Integration and Maintenance of Fire Detection and Protection systems within Maharashtra. The licensees were issued on pre-requisite conditions as per the Fire Act.

➜ MV DESHMUKH, DIRECTOR, MAHARASHTRA FIRE SERVICES, WELCOMED AND FELICITATED THE CHIEF GUEST MANGAL PRABHAT LODHA, CMD, LODHA GROUP AND THANKED HIM FOR HIS ENCOURAGEMENT TO THE FIRE FIGHTING SERVICES.

Since the issuance of MFS licenses to the companies called as 'licensed agency' to conduct the business, MFS has regularly conducted many workshops, knowledge sharing forums to create awareness and enhance the knowledge of products and services of the business.

Over the years, the Maharashtra Fire Prevention and Life Safety Measures Act, 2006 has been implemented rigorously, thus forcing the licensed agencies to keep abreast with the latest technologies and rules and regulations.

Mangal Prabhat Lodha, CMD, Lodha Group, graced the seminar as the Chief Guest, accompanied by his son Abhishek Lodha, ED of Lodha Group.

MV Deshmukh, Director, Maharashtra Fire Services, welcomed and felicitated the Chief Guest and thanked him for his encouragement to the fire fighting services.

➜ NITIN SHAH, PRESIDENT, FPAI WELCOMING THE DELEGATES

The other dignitaries and sponsors were also felicitated with mementos and bouquets.

Nitin Shah, President, Fire Protection Association of India, welcomed and thanked the Chief Guest and esteemed dignitaries on the dais for their presences. He said that the seminar should be a platform for the delegates to take the knowledge of the topic which would be presented in the programme and practised in their business. He expressed his vision of making the country 'fire safe' and hoped that the same vision would be shared by the fire gighting fraternity.

MV Deshmukh, Director, MFS, welcomed the Chief Guest and other dignitaries.

In his keynote address, he mentioned that this event was held to share the knowledge of modern fire fighting technology and help keep abreast with the latest technologies and rules and regulations.

➜ MV DESHMUKH DELIVERING THE KEYNOTE ADDRESS

Deshmukh said, "When a fire fighter responds to a fire call, every fire incident differs and the Fire Officers always start visualising the readily available plan. However, the plan which is a creative design from the architect's point of view, is perceived differently by the Fire Officer. People have a pessimistic opinion about the Department, but as a Fire Officer he sees 'pessimistic planning' is best for optimistic execution.

"Mission Safe living is a very big commitment with great responsibility. Whenever it is discussed in the society, it is always felt that the protection of citizens is the responsibility of the Government," he added.

Deshmukh was pleased to inform the audience that the Central Government was very serious on these issues and was planning to bring in a Central Fire Safety Legislation after 65 years of Independence and as the political scenario was changing, the Legislation was not far away from the dream of forming a Cadre of Fire officers.

> "WHEN A FIRE FIGHTER RESPONDS TO A FIRE CALL, EVERY FIRE INCIDENT DIFFERS AND THE FIRE OFFICERS ALWAYS START VISUALISING THE READILY AVAILABLE PLAN. HOWEVER, THE PLAN WHICH IS A CREATIVE DESIGN FROM THE ARCHITECT'S POINT OF VIEW, IS PERCEIVED DIFFERENTLY BY THE FIRE OFFICER.
>
> ~
>
> **MV DESHMUKH,**
> **Director, MFS**

After taking charge as Director of Maharashtra Fire Services, with the support from his team, CFOS of all cities of Maharashtra and Fire Professionals from the industry, The Maharashtra Fire Prevention and Life Safety Measures Act, 2006 was introduced. With their effort, they could do a Gap analysis programme in major and small cities in Maharashtra and with the planned scheme, more than 100 fire stations were erected in small Municipal Councils and in the last five years, about 25 Fire Stations are established in the industrial belts of Maharashtra and almost 300 Fire Stations will be built by end of 2014.

MIDC has currently a total of 26 Fire Stations from the earlier mere two stations in 1986. There are another 10 stations scheduled for inauguration this year.

Having the drive for this kind of mission, one has to work with dedication , and thanks to the support from all the Fire chiefs

from Maharashtra and the 350 licensed agencies , Deshmukh was confident of accomplishing the mission of making Maharashtra fire safe.

He advised the architects and MEP consultants present to guide the industry with proper implementations of the guidelines, and not play with the lives of the inhabitants. With proper guidance, best of technologies can be used. "In the developed countries, every condominium has sprinklers and they live with ease, which is not the case in India. Here it is assumed as a hindrance in the houses," he explained.

Abhishek Lodha, in his address, said that it was a pleasure being amongst the bigwigs from Fire departments, large gathering of fire Consultants and high quality industry present in the programme.

He mentioned about his early days in the USA, where in fire fighters were looked upon with highest respect and considered as the most important members of the society. "They are one community in public service who risk their own lives to save human beings, just like policemen and armed forces sacrifice their lives in protecting fellow citizens.

He expwressed the fact that the large sacrifices made by these uniformed fire soldiers to protect complete strangers should be acknowledged with thanks, especially for the selfless protection they provide us.

> THEY ARE ONE COMMUNITY IN PUBLIC SERVICE WHO RISK THEIR OWN LIVES TO SAVE HUMAN BEINGS, JUST LIKE POLICEMEN AND ARMED FORCES SACRIFICE THEIR LIVES IN PROTECTING FELLOW CITIZENS.
>
> ~
>
> **ABHISHEK LODHA,**
> **ED of Lodha Group**

"We as a society should respect and acknowledge the role of fire personnel, only then we can encourage more youth with good talents to come into firefighting fraternity and join the services," Lodha added. "With fast growing urbanisation with tall buildings, the awareness about fire safety is very much needed to safeguard its inhabitants and common public."

As India is evolving and the National Building code is well written and implemented, there is scope for the parts of International Building Regulation (IBC) which is followed in many counties to be considered for special category buildings like hospitals, large offices, tall building which is specified in the codes over and above the National Building code.

Mangal Prabhat Lodha applauded the good work done by Deshmukh by focusing on the

THE TECHNICAL SESSION WAS MODERATED BY PRAFFUL SANGHRAJKA, MD, TECHNOFIRE PROTECTION SERVICES PRIVATE LIMITED. INTERESTING PRESENTATIONS WERE MADE ON THE FOLLOWING TOPICS:

1) Installation and maintenance of sprinkler systems by KR Easwaran,

2) Installation and maintenance of detection systems by Iswar Iyer.

3) Passive fire protection (pressurisation) by Pankaj Dharkar.

> "WE AS A SOCIETY SHOULD RESPECT AND ACKNOWLEDGE THE ROLE OF FIRE PERSONNEL, ONLY THEN WE CAN ENCOURAGE MORE YOUTH WITH GOOD TALENTS TO COME INTO FIREFIGHTING FRATERNITY AND JOIN THE SERVICES
>
> ~
>
> **ABHISHEK LODHA,**
> **ED of Lodha Group**

upliftment of fire services in Maharashtra with such great vision and passion. He conveyed his best wishes for the seminar.

The question and answer session saw a good participation from the delegates.

Legal session Post Lunch

DN Chaudhari, ex Chairman, Law Commission, GoM, chaired the legal session as a moderator and he addressed the audience.

Chaudhuri decorated key positions in the Government as Principal Secretary, Law and Judiciary, Government of Maharashtra, Special Election Commissioner, Government of Maharashtra and lastly he was Chairman, State Law Commission.

He expressed his happiness at being part of a programme which was so conscious about fire prevention and life safety measures. This Legislation was drafted by him, and it is one of its kind in India.

In the current scenario, with the robust growth of infrastructure and taller buildings, the consultants, builders and architects are showing total disregard towards ensuring life safety measures. Most of the buildings do not comply with the Fire Safety measures, thus rendering the buildings unsafe for living. As responsible consultants, they should carry the message of moral and legal responsibility towards society and put in place business practices to accomplish the mission of safe living.

Sunil H Nesarikar, Deputy Chief Fire Officer, presented 'Synopsis of Maharashtra Fire Act-2006'.

AP Mandke, Chief Fire Officer, Thane Fire Brigade, emphasised 'The Roles and Responsibility of Licensed Agency and Regulators' in his presentation.

Mandar Tambe, Legal Luminary, educated the participants with his presentation, 'An Overview of Indian Contract Act'. This was followed by a panel discussion and wrap up of the whole day's programme.

➜ MR.ABHISHEK LODHA WITH HIS INAUGURAL ADDRESS

➜ IN THE GROUP FROM LEFT, PRAFFUL SANGHRAJKA, SHERWIN NAZARETH, K.P.DOMINIC, SUNIL, NESARIKAR, M.V DESHMUKH, NITIN SHAH, SANDIP SHAH, D POTPHODE, MANDAR TAMBE, DN CHAUDHARI, AP MANDKE. MUKESH M SHAH, ISWAR IYER, MUKESH D SHAH, HARISH DHARAMSHI.

Roles and responsibilities of licensed agencies and regulators

AP Mandke

PRESENTS A CHECKLIST OF LAWS AND SECTIONS UNDER THE MAHARASHTRA FIRE ACT, WHICH LICENSING AGENCIES AND REGULATORY BODIES MUST KNOW.

ROLE AND RESPONSIBILITY OF THE LICENSING AGENCY:

Licensed agency is empowered to carry out the work of providing fire prevention and life safety measures.

It has the power to grant license to act as Licensed Agency (Rule No. 13, Form No. M)

THE AGENCY ISSUES THREE TYPES OF LICENSES:

1. ***Fire Fighting system installation such as hydrants, sprinklers, pumping etc.***
2. ***Detection and fire separation system***
3. ***Passive protection such as cable protection, fire doors etc.***

THE PROVISIONS OF DC RULES ARE AS UNDER:

- B.M.C.:– Rule No. – 5.3(vi)
- T.M.C.:– Rule No. – 15
- Navi Mumbai:- Rule No. – 6.3.7
- Nagpur:- Rule No. – 6.2.6.1
- Pune:- Rule No. – 6.2.6.1
- Nasik:- Rule No. – 6.2.6.1
- MIDC:- Rule No. – 40

THE AGENCY NEEDS TO ASK THE FOLLOWING QUESTIONS:

- Who will design the fire prevention and life safety measures?
- Which standards/codes are to be followed?
- Who will carry out the work of fire prevention and life safety measures?

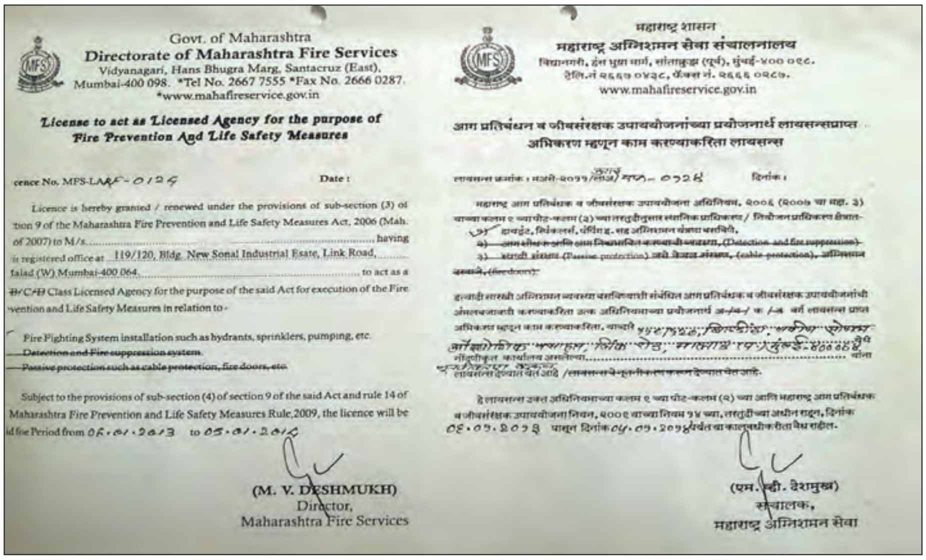
What authorities have observed in recent times:

- Licensing Agencies are more interested in new installations.
- Invalid license copies are submitted.

❖ Attachments with the form ("A" or "B") are incomplete
❖ Fire prevention and life safety measures work is not carried out as per the design.

UNDER SECTION 36: OFFENCES AND PENALTIES

1) Sub-section 1 and 4 of Section 3
2) Sub-section 2 of Section 4
3) Sub-section 3 of Section 5
4) Section 6
5) Sub-section 2 and 4 of Section 8
6) Sub-section 1 of Section10
7) Sub-section 1 and 2 of Section 14



Govt. of Maharashtra
Directorate of Maharashtra Fire Services
Vidyanagari, Hans Bhugra Marg, Santacruz (East), Mumbai-400 098. *Tel No. 2667 7555 *Fax No. 2666 0287.
*www.mahafireservice.gov.in

License to act as Licensed Agency for the purpose of Fire Prevention And Life Safety Measures

cence No. MFS-LARF-0129 Date :

Licence is hereby granted / renewed under the provisions of sub-section (3) of tion 9 of the Maharashtra Fire Prevention and Life Safety Measures Act, 2006 (Mah. of 2007) to M/s. .... having is registered office at 119/120, Bldg. New Sonal Industrial Esate, Link Road, Malad (W) Mumbai-400 064. .... to act as a B/C/D Class Licensed Agency for the purpose of the said Act for execution of the Fire Prevention and Life Safety Measures in relation to -

Fire Fighting System installation such as hydrants, sprinklers, pumping, etc.
~~Detection and Fire suppression system~~
~~Passive protection such as cable protection, fire doors, etc.~~

Subject to the provisions of sub-section (4) of section 9 of the said Act and rule 14 of Maharashtra Fire Prevention and Life Safety Measures Rule, 2009, the licence will be valid for Period from 06.01.2013 to 05.01.2014

(M. V. DESHMUKH)
Director,
Maharashtra Fire Services

महाराष्ट्र शासन
महाराष्ट्र अग्निशमन सेवा संचालनालय
www.mahafireservice.gov.in

➜ WHAT A LICENSE LOOKS LIKE

WE LOOK AT SOME OF THE PENALTIES:

❖ Rigorous imprisonment for the term of not less than 6 months but which may extended for the term of three years (minimum 3 months), and
❖ With fine which shall not be less than Rs. 20,000/- (minimum Rs. 10,000) which may extend to Rs. 50,000/-, and
❖ For a continuing offence, a further fine which may extend Rs.3000/- (not less than minimum Rs.1000/-) may be levied every day.

THE REGULATORS: POWER OF INSPECTION SUB-SECTION 1 & 5 OF SECTION 5:

❖ **Sub-section 1:** Three hours notice to the owner or occupier
❖ **Sub-section 5:** Report of Inspection to the Director or CFO

Section 6 & Rule 9(1): Notice regarding fire prevention and life safety measures. Minimum 7 days or maximum 120 days.

Section 8: Power to seal the building.

❖ **Sub-section (1) of Section 8:** Building is in imminent danger to person or property
❖ **Sub-section (2a) & (2b) of Section 8:** Not compliance of subsection (1) of section 8
❖ **2a** – Directives shall be given to disconnect the electricity or water supply
❖ **2b** – Police officers to remove such persons

- Sub-section 3 – Seal the building

Section 11: Imposition of fees

❖ **Schedule: II,** Notification No.: FFS/2012/CR-42/UD-20, dated 3rd March, 2014 (By Subsection 1 of section 11)

❖ **Schedule : II**
❖ **Part: I;** Fire service fee structure for municipal corporation;
❖ **Part: II;** Fire service fee structure for municipal councils;
❖ **Part: III;** Fire service fee structure for SPA and other areas beyond SPA and municipal limits.

Section 12,13 & 15:

❖ Section 12: Procedure to follow the enhancing order reducing enhanced fee
❖ Section 13: Imposition of annual fee (1% of min. fee)
❖ Section 15: No fees for Central, State or any authority building.

Section 25: Constitution of Special Funds, 'Fire Protection Fund', as per G.R. No. A.S.S.-2009/P.K.230/NV-20, dated 12 March, 2010

Section 32 & 33:

❖ Section 32: Appeals (15 days or 45 days)
❖ Section 33: Procedure for filing appeals

Section 35: Bar of jurisdiction of courts

❖ Preferring an appeal

❖ No court shall entertain

Section 36: Offences and penalties

1) Sub-section 1 and 4 of Section 3
2) Sub-section 2 of Section 4
3) Sub-section 3 of Section 5
4) Section 6
5) Sub-section 2 and 4 of Section 8
6) Sub-section 1 of Section10
7) Sub-section 1 and 2 of Section 14

PENALTIES:

❖ Rigorous imprisonment for the term of not less than 6 months but which may extended for the term of three years (minimum 3 months), and
❖ With fine which shall not be less than Rs. 20,000/- (minimum Rs. 10,000) which may extend to Rs. 50,000/-, and
❖ If the offence continues, a further fine which may extend to Rs.3000/- (not less than minimum Rs.1000/-) shall be levied every day.

SECTION 45: APPOINTMENT OF FIRE OFFICER OR SUPERVISOR IN CERTAIN BUILDINGS.

Building with height more than 30 meters and used for,
a) Hotel
b) Hospital
c) Business
d) Mercantile
e) Mix Occupancies.

>> **AP Mandke** is Chief Fire Officer, Thane Fire Brigade, Maharashtra.

A QUICK LOOK AT WHAT CONSTITUTES A 'CONTRACT' UNDER THE CONTRACT ACT 1872

THE 'CONTRACT' IN THE ACT

As per the Section 2 (h) of the Contract Act 1872, 'Contract' is defined as:
"AGREEMENT ENFORCEABLE BY LAW IS A CONTRACT. THIS COMPRISES:
- Set of RECIPROCAL promises
- persons COMPETENT to contract
- FREE consent
- LAWFUL consideration
- LAWFUL object
- not declared as VOID.

How a contract is formed:

Agree with the same thing in the same sense, either orally, in writing, by action or by reference.

How to structure a contract:

It should be 'easy to understand, easy to implement'. Also:
- Bifurcate supply and service contracts.
- Define milestones.
- Milestone based payments.
- Dispute resolution.

Goldmines in contract:

Extra/new supply, if any
Extra/new work, if any
Interest on delayed payment
Change in original proposal

Landmines in contract

- Sudden termination
- Hidden damages
- Price fluctuations
- Market/time
- Exchange fluctuations
- Reputational damage

Solutions:

- Market hedging
- Contractual hedging
- Price adjustment clause
- Exchange rate adjustment clause
- Maximum limit for damages
- Time validity
- Restrict warranty
- Pass through warranty
- Insurance
- Identify/limit liability

Dispute resolution

- Mediation 'institutionalised'
- Arbitration 'institutionalised'
- Court

MEMBERSHIP SUBSCRIPTION RATES 2013 ***

Annual / Ordinary Membership Rs 500/--
(renewable every year)

ELITE MEMBERSHIP (FOR A DECADE) RS. 3,000/--

RENEWABLE AFTER 10 YEARS FOR NOMINAL PAYMENT OF RS 500/-
-

For all Members;
Membership Processing Fees Rs NIL

Special Amnesty period declared up to 31st December for members who are in arrears. Please hurry and join afresh by paying your Subscription fee.

*** As per Managing Committee meeting dated 13th Oct., 2012

PREPARING FOR EFFECTIVE RESCUE

Part II

THE CONCLUDING PART OF A TWO-PART SERIES ON MITIGATING DISASTERS, BOTH MAN-MADE AND NATURAL.
BY **SUBHASH K RANE**

...continued from last issue, which discussed the types of disasters, manmade and natural.

INTRODUCTION:

Response time is the key for disaster mitigation. You may call for columns or battalions from the State or Federal Headquarters, but the globally-accepted norm is to strengthen the fire services at the local level.

In countries like the US, Austria and Germany, the response time to an emergency has been found to be three to five minutes; this is well shouldered by the fire fighters who respond to any contingency, whenever life and property is in danger. Unfortunately, the fire service structure at the block level is weak.

In this part, I continue with my discussion on effective mitigation strategies in the event of man-made disasters.

NUCLEAR WARFARE:

Use of nuclear technology as a weapon for mass destruction is called 'Nuclear warfare'.

If nuclear weapons are use in a more populated area there is a likelihood of a large number of people being decimated & many fires taking place. Survival strategy is of paramount importance in such disaster.

DEFENSE MEASURES AGAINST NUCLEAR BLAST:

- If in an open place, away from shelter lie flat on ground covering body with the hands.
- Do not look at the fire ball.
- Take shelter in tunnels or basements.
- Do not wear inflammable clothes. Avoid dark clothing.
- Do not keep consumables in the open.
- Take shelter from radioactive fallout by covering your nose by four-fold cloth.
- Do not stand near the window.
- Turn off lights and air conditioners.
- Listen to the radio or TV.
- Do not keep the telephone busy.
- Keep potassium iodide (K.I. stable iodine) tables handy to reduced water contaminants.

BIOLOGICAL WARFARE:

Biological warfare can be defined as "The use of harmful or deadly microorganisms as weapons of mass destruction." This causes injury/death through contact with skin, inhalation, and ingestion of contaminated food/water.

How community could be prepared for such biological attacks:

- On hearing report of biological agent release, stay indoors.
- Shut all windows and doors and turn off fans and air-conditioners.
- A gas mask can provide an excellent respiration protection.
- Reach for medical help



- Boil your drinking water
- Ascertain and check your vegetables and food items.

CHEMICAL WARFARE:

Chemical warfare is one in which chemical agents are used as weapons of war. This agent can kill many people and are considered as weapons of mass destruction.

IMMEDIATE CARE:

- Evacuate the area immediately and dial disaster management control room.
- Chemical agent has been used indoors exist the building as quickly as possible.
- If you exposed to toxic substance remove your clothes, which remove 80 per cent of contamination hazards.
- Take bath quickly or rinse affected part quickly.
- Remain calm.

- Seriously affected people are to be given medical attention immediately.
- Evacuate the seriously exposed first.
- Use wet towel to avoid affect an eyes, face.
- Inform police if you notice unusual activity or a person causing contamination.
- Shut all the doors and windows of your house. Switch off fans and airconditioners.
- Stay indoors
- Listen to the radio/ TV news and announcements.
- Have a bath immediately on entry
- inside house and keep the clothes in a plastic bag.
- Keep gas mask handy.

BOMB BLASTS:

Disaster occurring due to Bomb explosion is a clear form of man-made disaster. This is mainly carried out to spread terror among the ordinary citizens.

Action to be taken when you sight a suspicious object:

- Report to police first and alert the fire

brigade
- Inspect surrounding – find out escape route-evacuation start without panicky with help of local authorities.
- Alert people without panic and rumours.
- Ensure availability of medical and paramedical services.
- Take consideration of secondary hazards, such as gas or petrol depot.
- Keep safe distance from suspected object after evacuation.
- No one should be allowed to enter the cordoned area.
- Always keep in mind possibility of a series of bombs.
- Remain alert, agile and active and protect yourself.

THINGS TO DO IN THE EVENT OF BOMB SCARES / BOMB THREAT CALL:

- Communicate the threat received to controllers, police and other authorities.
- Clear path for an emergency exist.
- People who might have been affected should be alerted and advised not to panic.
- After evacuation, search every place to locate any suspicious objects.
- Wait for bomb disposal squad to endorse the clearness if nothing is found.

Action on arrival of bomb disposal squad:

- Provide information properly
- Describe suspected object
- Give details of precautions taken
- Aware them about secondary hazards.
- Inform them about witnesses.
- If you have important information informs them properly.

COMMUNAL RIOTS:

This is manmade disaster caused by very sensitive issues related to any two different/ same religious groups, which can cause serious damage to human beings and property.

POINTS TO REMEMBER

The member of disaster management

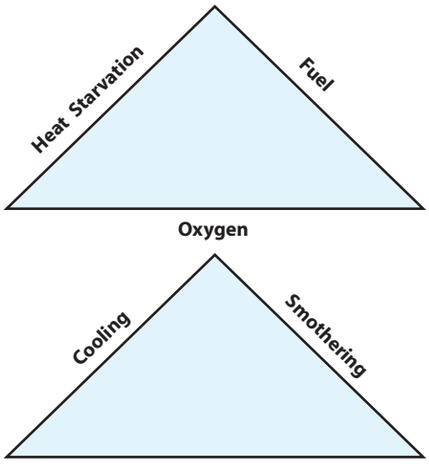


group and mohalla committees should first secure their own lives and came together for collective decision and take cohesive action in diffusing tension and bringing back a near normal situation as fast as possible.

- Quash rumors.
- Reduce fearful atmosphere with the help of authorities
- Build up faith, courage and moral amongst people to create peace and restraint.
- Give personal touch

FIRE:

"To minimize the loss, prevention is key"



Fire is defined as a chemical process in which substances combine chemically with the oxygen in the air, in the presence of suitable temperature. This process is capable of producing heat, light & flame.

Thus, three things are necessary for fire to take place,

1) Fuel 2) Oxygen 3) Heat

If any of these are suppressed or removed, fire will automatically die down.

II. Classification of fires

Fires can be classified in many ways, commonly used classification include-

A. Generally, in a layman's terms, fire is classified into either

I. Manmade
II. Natural;

I. **Manmade-** This can be further divided into:

A) Urban fires- which includes fires caused due to negligence in handling, mfg. & transporting hazardous and inflammable materials like liquid chemicals, petrochem products, compressed gases, etc. It also include fires caused by faulty electrical installation, negligence electrical maintenance, leading to short- circuit in houses, high rise bldgs. shops, etc.

B) Village fires: This includes fires caused because of negligence in maintenance & storage of agricultural storage, improper storage of wood, thatched wooden houses, haystacks lying around, etc.

C) Forest fires: Normally, it is classified as a natural fire but sometime this fire can occur due to human negligence & carelessness.

D) Other fires: Includes fires caused by terrorist acts, explosions, bomb blasts, gas leaks, etc.

II NATURAL FIRES:

Forest or jungle fires are classified as a type of natural fire. it happens due to severe climatic conditions, like extremely high temperatures. These fires are usually not noticed immediately, since they are in the forests, but , by the time they are detected, they have already spread in the surrounding forest areas. These fires cause a lot of ecological damage.

An example of a natural geological disaster is a mine fire, which occur due to sudden rise in temperature in the mines, causing ignition of highly inflammable poly-carbons, petroleum products, coal, gases, etc .

SOURCES OF FIRES:

- Heat
- Fuel
- Electric Sources
- Over heating
- Sparks
- Friction
- Static Electricity
- Spontaneous Ignition
- Short Circuits
- Others – Inflammable liquids, oil rags, unventilated place etc.

General Public awareness:

- How to inform fire brigade
- Knowledge of our building considering safety & evacuation
- Knowledge of using extinguishers.
- Shutting of Electrical power supply
- Raising the alarm in case of fire
- Knowledge of utility services safety such as L.P.G. and C.N.G. and electrical appliances.

TRIAGE AND FIRE SERVICES:

For fire services triage means Immediate assessment of disaster and determining the hazard and emergency made a sequence and with minimum time gives maximum help to control the disaster with sorting various emergencies according to need provide help to them and for which control room is brain of our fire service.

…Series concludes.

> **Subhash K Rane** is Ex-Divisional Fire Officer, MIDC, Mumbai.

LEARNING FROM THE MONT BLANC BUILDING FIRE

Laxmikant Khare takes stock of all that went wrong during the fire at Mont Blanc, a high rise in south Mumbai, and how basic fire safety precautions were ignored in the run-up to the incident.

It was December 15, 2013. At about 7.30 pm, a fire that broke out in a flat at the south Mumbai-based Mont Blanc high rise building, soon turned into a massive blaze. By the time it was brought under control, seven persons were killed and several more injured – of the injured, six were fire personnel who were injured during rescue and firefighting operations.

THE INCIDENT

The fire started on the 12th floor of the 26-storey Mont Blanc building in upscale Kemps Corner, Mumbai. Huge flames were seen emanating from the floor. The fire was first noticed in the flat no 1201, which was under renovation. The fire was first noticed at around 7.30 pm by a few occupants of the building who were in the garden at the time. The fire brigade was immediately summoned.

The fire brigade control room initiated first level emergency turnout from Gavdevi and Byculla fire stations. The fire engine from Gavdevi arrived at the site first at about 7.55 pm. By this time, the fire had grown rapidly due to the presence of flammable materials (such as thinners, turpentine and paint) that were present in the flat under renovation, and engulfed the entire drawing room. Five carpenters saw the flames and rushed to the farthest bedroom in the house and locked themselves from the inside. The fire alarm system at the lobby got activated and an alarm was sounded, but it was ignored by all.

Meanwhile, the fire reached the lobby area rapidly due to high wind velocity and the flames were visible even from a distance. The fire brigade personnel used BA sets and the evacuation process started. The occupants above the affected 12th floor were taken to the upper floors. Six firemen and two officers laid the hose line from the ground floor and reached the lobby area on the 12th floor, but firefighting couldn't be commenced since hose couplings repeatedly opened. Addition-

Five carpenters saw the flames and rushed to the farthest bedroom in the house and locked themselves from the inside. The fire alarm system at the lobby got activated and an alarm was sounded, but it was ignored by all.

ally, the fire brigade pumps were not able to generate pressure.

During this time, an LPG cylinder kept in the lobby level adjacent to flat 1202 exploded due to extreme heat. This was at about 10.20 pm. The fire brigade control room summoned a major emergency turnout.

THE ENTIRE 12TH FLOOR WAS ENGULFED IN FIRE. EFFECTIVE FIREFIGHTING BEGAN ONLY AFTER 9 PM FROM OUTSIDE THE BUILDING USING 80 METRE SNORKEL CABIN FIRE MONITOR. MOREOVER, ABOUT 2,50,000 LITRES OF SWIMMING POOL WATER WAS UTILISED FOR FIREFIGHTING.

The explosion complicated matters – fire fighters and the occupant of the flat, Anand Jaising, who was helping the fire fighters, sustained burn injuries and flames reached inside the flat 1202. The occupant of that flat, Dinesh Gandhi and two of his domestic helps, died on the spot inside the flat. Gandhi's wife, who was approaching her house by the lift to alert her family, also died with the liftman on the affected floor. The entire 12th floor was engulfed in fire. Effective firefighting began only after 9 pm from outside the building using 80 metre snorkel cabin fire monitor. Moreover, about 2,50,000 litres of swimming pool water was utilised for firefighting.

Building fire pumps were started, but were ineffective in providing sufficient discharge to sprinkler nozzles. The pump also stopped working due to a water pool that formed due to fire water coming from the upper floors in the basement. The fire brigade used loudspeakers to instruct occupants above the 12th floors to stay up and not attempt to come down. The fire was finally brought under control at about 10.30 pm.

Two more bodies were recovered from the 16th and 22nd floor lobbies. However, five carpenters escaped unhurt from the 12th floor bedroom during the search and find operation.

WHAT WENT WRONG

The incident bore the stamp of a major lapse in safety awareness on the part of the building residents. Trouble started with a lack of supervision over the carpenters working in the premises – there was no checking to see if the electrical connections they were using were safe or not, and what to do in case there was a short circuit and a fire. The entire floor was strewn with drums of paint and thinners, and these combustibles were also present near the main distribution board.

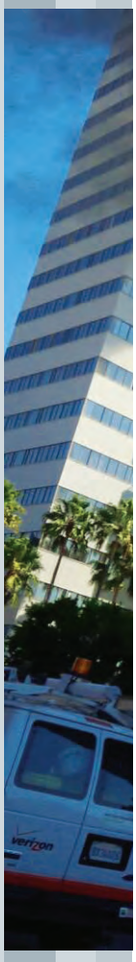
When the fire broke out, the carpenters working in flat 1201 did not attempt firefighting or alerting other occupants on the floor. Even more surprisingly, the fire alarm was ignored by occupants. The building residents were thoroughly unprepared and not trained for firefighting, nor were they aware of the use of firefighting systems lodged in the premises, or effective evacuation techniques. The entire building power was switched off after the fire, leading to pitch darkness inside the building. To add to rescuers' woes, there was no emergency power supply. The internal firefighting systems did not work, leading to a delay in initial firefighting. This caused a longer time for the fire being brought under control.

Another big factor was the LPG cylinder that was kept negligently in the lobby. Once it exploded, it resulted in a rapid spread of fire and caused casualties. The approach of fire vehicles was blocked due to vehicles parked on the road. This delayed the firefighting efforts by at least half an hour. Add to this the fact that the fire brigade pumps initially failed to generate sufficient pressure to reach the 12th floor.

After the incident, it was discovered that there had been no fire audit conducted for the building – either by building-appointed competent personnel or the local fire brigade – in the last five years.

LEARNINGS FROM THE INCIDENT AND A FEW RECOMMENDATIONS:

- No modification work involving carpentry/welding/cutting/handling of flammable material is to be done without proper supervision. Electrical distribution board is to be kept away from combustibles / flammables.
- The fire alarm should never be ignored.
- LPG cylinders are to be kept in designated safe locations only.
- Firefighting systems are to be tested periodically and training must be imparted to all occupants. Housing societies shall take initiatives and arrange such programmes regularly.
- Electric power should be switched off only at affected or selected floors. Switching off the entire power supply may hamper rescue operations and emergency response. This causes further chaos and casualties.
- Firefighting/life safety systems are to be commissioned and maintained ready to operate at all times. Fire audits must be conducted every six months by licensed vendors or a competent authority, and the reports must be submitted to the fire department.
- Emergency power: Reliable source of emergency power must be installed in the building at par with the fire codes and practices, so that even if the main power source is switched off, life safety systems, lifts, emergency lighting, peripheral lights etc. shall be provided with uninterrupted power. This shall result in rapid and effective emergency response.
- Almost all staircase landings were found dumped with old/scrap material that belonged to the residents. This helped the fire spread rapidly. All staircases should be kept free of obstructions all the time.
- Since the staircase directly opened in the lobby at all floors, once the LPG cylinder exploded, heat waves and smoke travelled vertically through open fire doors. This resulted in burn injuries and deaths at other floors. Such fire doors shall be of a self-closable type, and maintained in the same self-closable condition.
- All emergency staircases and lifts should open in an enclosed lobby to avoid vertical smoke and flame travel. At least one emergency staircase shall open directly outside the building at the ground floor for safe evacuation and rescue.
- Fire vehicle approach: Approach and peripheral roads must be designed to cater to provide a 20 meter turning radius to the fire tender and hydraulic ladders. They should be capable of taking 40 ton load of the fire vehicle. Vehicle parking must be allowed only at designated locations.
- Fire brigade fire pumps have limitations and take considerable time to generate sufficient pressure to operate when systems are dry or kept dry intentionally due to leakage problems. Firefighting systems should always be kept pressurised by auto-activated jockey pump.
- The snorkel can only reach up to 22 floors (at a height of approximately 65 metres). Rescue and firefighting beyond this level from outside the building is impossible.
- Fire pumping systems should be installed in the basement with proper drainage systems, away from the staircase opening. A ramp must be erected at the entrance door to avoid water entry inside the pump room.
- Periodic evacuation or mock drills must be conducted to train occupants.
- Few occupants may tend to do 'heroic' or daredevil actions that endanger their own lives or the lives of others. This misguides other occupants and may even result in casualties.
- Wind velocity at elevated floors spreads fires very fast. False ceilings may create a syphoning effect and fires may take lesser time to get controlled than expected.
- Since all utility/electrical shafts were closed at every floor ceiling and openings were sealed with fire retardant insulation, flames could not travel vertically to upper floors from the inside.
- *Chajjas* or projections provided over windows outside the building also effectively obstruct flames from reaching the upper floors via windows.



>> The writer is General Manager, Fire and Safety, Reliance Industries Limited.

LOS ANGELES HIGH RISE FIRE SIMILAR TO MUMBAI HIGHRISE ONE

It took two hours, over 200 firefighters and a battle to reach stranded occupants of a 25-storey apartment building in Los Angeles before a fire was put out on the 11 floor.

A lack of awareness about fire rescue protocol and the need to stay alert to the smallest alarm is not just an Indian problem, it seems – in October last year, a fire that broke out on the 11th storey of a 25-storey apartment building in Los Angeles, America took longer to contain because residents ignored the ringing fire alarm and decided to stay indoors.

The local fire brigade unit was alerted after passersby noticed thick plumes of smoke emanating from the 11th floor of the Barrington Plaza Complex located at Wilshire Boulevard. Firefighters immediately swung into action – but were stunned to discover that residents had ignored a fire alarm that had started ringing after smoke started flowing all over the 11th floor. Firefighters were forced to conduct a complete search of the entire complex to rescue residents on the 11th floor – they had stayed back in their apartments and completely ignored the fire alarm.

Flames were seen shooting from the windows. Five people landed in hospital following the incident. The list of injured also included three firefighters who sustained burns during the rescue effort. About 20 minutes after the fire was put out, three more people including a toddler were brought to the building's roof for medical treatment.

Residents' apathy

As per news reports, firefighters said that the residents of the complex were curiously slow in responding to, and reporting the crisis. A woman came across a small child and an older man near a stairwell (after the fire had started) but she returned to her flat. However, something made her come out again and she found that the child and the man had fallen unconscious. Some other residents later admitted that they had heard the fire alarm on the floor going off, but that they had ignored it and stayed in their apartments.

It was not clear what caused the fire, but it was said to be "localised" to "one unit" on the 11th floor. 214 firefighters reported on duty to douse the flames – some even used the balconies of neighbouring buildings to reach the affected area quickly.

Take a few simple steps TOWARDS RESILIENCE

Sumit Khanna,
Consultant – International Codes and Standards Group
– details how improperly designed or malfunctioning valves in sprinkler systems can wreak havoc in case of a fire

Asia is the world's fastest growing economic region and hence a preferred manufacturing place for many multinational companies. However, how sustainable are these businesses and have they taken risk factors into account when they talk of sustainability?

To create sustainable businesses, owners invest a lot of money in legal compliance and fire protection systems to protect the lives of employees, their business and the livelihood of employees. Many examples have repetitively proved that all three components are affected by fire. Can this be prevented? Yes, as we believe that a majority of losses are preventable.

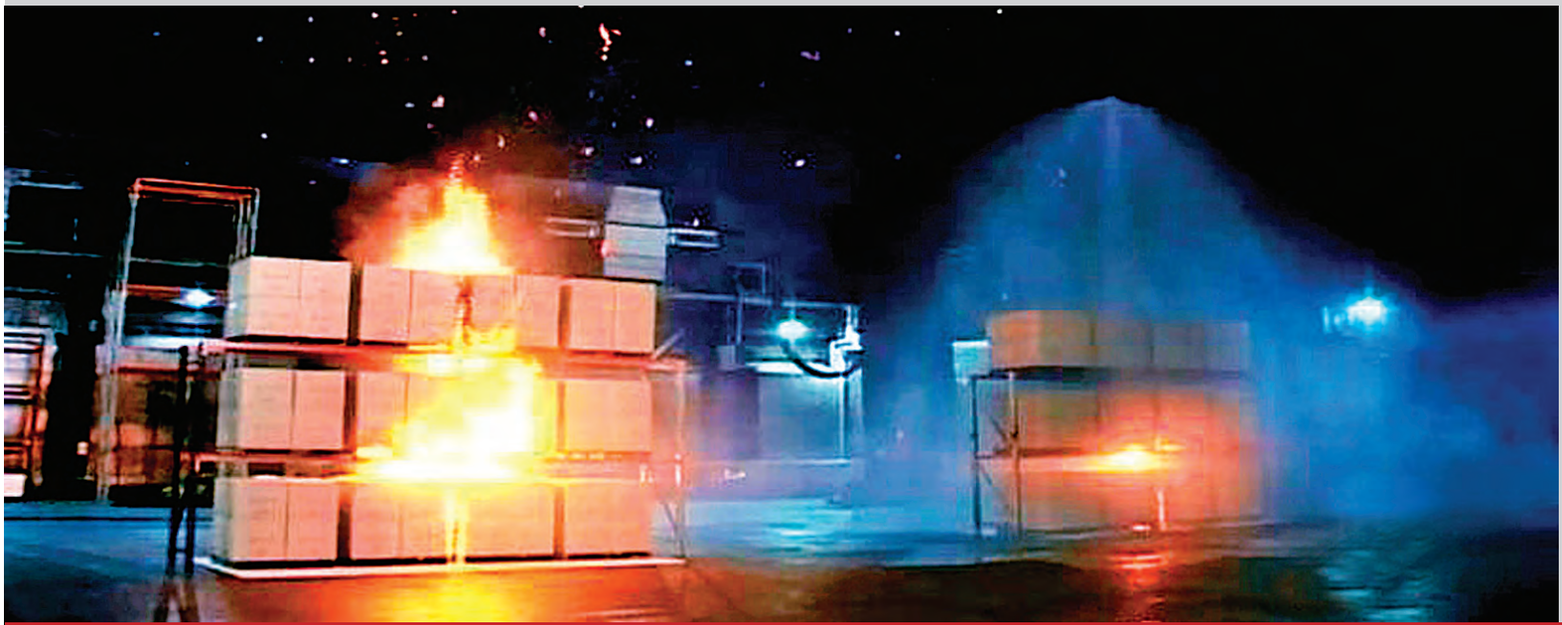
The question of valves

Why is such a small thing like a valve in a fire sprinkler system a critical element? A sprinkler valve can control the flow of water to as many as 500 sprinkler heads, thus making them 'mini fire fighters' sitting right above your head, or to as few as two or three sprinklers. Valves are needed to shut off the water flow for maintenance purposes on alarm check valves, piping, and for relocating sprinkler heads. The valve is also needed when sprinkler or piping leakage occurs from impact or freezing conditions. When a fire occurs and is controlled by the sprinkler system, the valve will also need to be shut to replace fused sprinkler heads.

Sprinkler Comparison (in figure 1) - The two fires shown in picture below represent the 'Tale of two properties'. In one case, the property owner has invested in properly designed sprinkler protection and has implemented the necessary inspection, testing, and maintenance practices to ensure that the sprinklers operate when needed. In the other case, the property owner has invested in properly designed sprinkler protection as per mandatory building requirements but has given the importance to maintenance of the system. The presence of a fire detection system which will raise an alarm and prompt someone from the plant to open the closed valve 'when needed' has given them a sense of security.

As the sprinkler over one array or property begins to gain control over the fire, there is minimal fire, water, and smoke damage and operations will be largely unaffected.

However, at the other property, a major fire is slowly unfolding. Ceiling temperatures are now exceeding 540 Degree Celsius and the overhead steel begins to lose its strength. Steel can withstand these temperatures for no more than 10 minutes and the



BEING VULNERABLE IS A CHOICE. BY INVESTING IN PROPERLY DESIGNED SPRINKLER PROTECTION AND TAKING GOOD CARE OF THE INVESTMENT SO IT WOULD WORK WHEN NEEDED, THE PROPERTY OWNER CHOSE TO BE RESILIENT.

higher the temperature gets, the shorter the 10 minutes become. Meanwhile, the 'someone' who was to open the shut valve 'when needed' might be absent or might have run away to save his life or the fire brigade is still 10 minutes away. By the time they arrive, the building will be full of smoke, the location of the fire will be uncertain, and the structure will be collapsing. They will have no choice but to save people and set up a defensive firefighting strategy in an attempt to prevent fire from spreading to other buildings.

Why are valves closed?

1. Sprinkler system repair.
2. Building alterations.
3. Maintenance.
4. Cold weather.
5. Human error (Not realising that valves are part of the sprinkler system).
6. Maliciousness (including arson intent)

FM Global history of losses says there are many instances where valves were supposed to be closed temporarily but remained closed for weeks, months, even years in some cases.

An improperly closed valve is one that is:

1. Closed without authorisation.
2. Closed with authorisation but for longer than necessary.
3. Mechanically damaged.

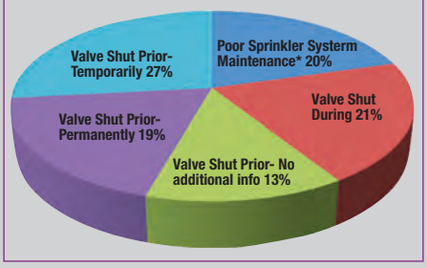
A shut valve (even a partially shut one) can render a sprinkler system useless. There are many reasons that valves have been intentionally shut and become Improperly Closed Valves (ICVs). Valves can also fail mechanically. For example, the valve gate in some types of valves can detach from the valve stem due to corrosion or stem to gate failure, allowing the gate to drop into the piping, completely blocking the flow of water. Only regular physical checks of these types of valves can show whether the valve is working properly or not.

FM Global has recorded shut valve fires for many years. Shut valve fires have included some of the largest fires reported to FM Global. As far back as 1924, closed valves were the single leading cause of sprinkler system failure. That is no longer the case, due to some of the facilities and intense efforts to closely monitor valve closures, and to prevent unauthorised ones.

This can be achieved by utilising something like the FM Global 'Red Tag Permit System' to monitor valve impairments when work needs to be done on a sprinkler system. FM Global also recommends locking valves to prevent unauthorised closure, followed by weekly documented valve checks. Even a Rs 1 crore sprinkler system can be rendered useless if someone fails to open the valve after completing work on the system, or because someone didn't want to pay for a Rs 100 sturdy lock and chain to keep an arsonist at bay. Shouldn't you do everything possible, therefore, to protect the investment in your fire protection and business by ensuring that a device as simple as a valve is always left open?

The most frequent reason for an ICV occurring at the time of a fire is the valve being

1985-2012 Global Loss History of Fire in % Number of Losses



temporarily shut prior to the fire. These valve impairment-related fires account for 47 per cent of all shut valve fires (Figure 2). Simple weekly valve inspections could have discovered a large percentage of these shut valves prior to the fire. Another 21 per cent of ICVs occurred after the fire had started. Proper impairment handling procedures could have eliminated many of these losses also. Approximately 19 per cent of the valves were shut permanently.

Now let us compare the situation in India with the rest of Asia.

The situation is not good. The figure below shows how many ICVs we found in Asia and the percentage contribution of ICVs in India. 35 per cent of total improperly closed valves are from India which means 308 locations had ICVs. We were fortunate enough to observe those and get them corrected. How about other facilities which do not follow any valve supervision and impairment procedure? It is a matter of time before we get to hear news of fires in the media.

To be effective against fire, automatic fire sprinklers need to have sufficient water delivered to them through a piping arrangement which includes yard main, lead-in and sprinkler riser. A valve closed anywhere in the water supply system can prevent water flow to the sprinklers.

FM Global valve supervision programmes have also been followed by other insurance organisations and adopted to a certain extent by the NFPA and fire codes.

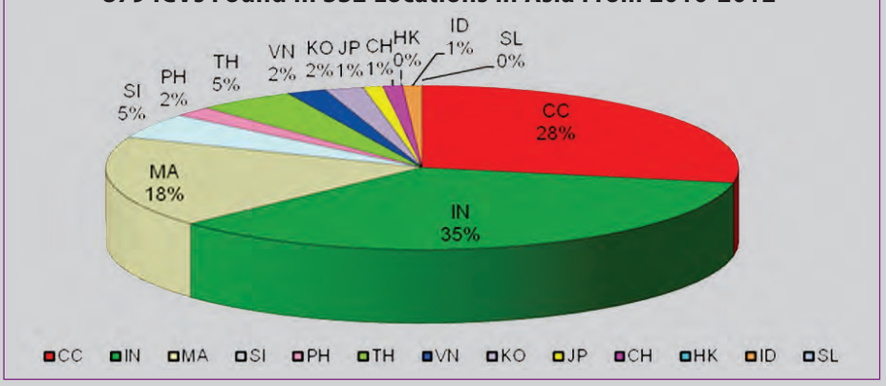
Shut valve fires

FM Global loss history also tells us that the Emergency Response Team (ERT) can play an important role in ensuring that there are no shut valves during the course of a fire. An effective ERT should have, among other things, a 'dedicated sprinkler control valve operator'. The operator should know the location of all sprinkler control valves, what sprinkler systems they control, when not to shut them off, and how to replace fused sprinkler heads. That person should be ready to direct the fire department to shut the valve off when the fire is under control, or to shut off valves in buildings that have been lost to fire (if safe to do so) in order to maximise water flow to those buildings still worth salvaging. That person should also be ready to open the valve should a fire rekindle.

The cost of fire has, however, far larger impact on the community, environment, life safety and sustainability which is not covered by insurance companies, hence actions should be taken considering the larger societal impacts of fire.

> **Sumit Khanna** is a consultant, International Codes and Standards Group, FM Global, a commercial and industrial property insurance company.

879 ICVs Found in 332 Locations in Asia From 2010-2012



The Liquefied Natural Gas (LNG) Industry and Fire Protection Regulations

Harri Kytomaa, Ph.D., P.E. and Trey Morrison, Ph.D., P.E., Exponent Inc. | courtesy Fire Protection Engineering

INTRODUCTION

Liquefied Natural Gas (LNG) facilities are constructed according to "Liquefied Natural Gas Facilities: Federal Safety Standards" and regulated by the Federal Energy Regulatory Commission (FERC). FERC has worked closely with the Pipeline and Hazardous Materials Administration (PHMSA), part of the U.S. Department of Transportation (DOT), to provide interpretations and guidelines to meet these regulations. The U.S. federal regulations incorporate NFPA 59A, which is a prescriptive standard. The objectives of the U.S. federal regulations and NFPA 59A are to keep the fire and explosion hazards onsite (i.e., within the facility boundaries) in the event of a loss of containment event.

When liquefied, natural gas is a refrigerated cryogenic liquid that boils at -162°C. Spills of LNG from low-source pressures can be conveyed safely to impounding areas or a sump to minimise the size of resulting flammable vapour clouds as the cold liquid boils on the warmer ground. Pressurised releases may produce liquid sprays or flashing jets, which can create larger flammable vapour clouds.

In either case, natural gas vapour clouds are unlikely to produce damaging overpressures if ignited. There have been very few major incidents involving LNG terminals or shipping. The most severe incident occurred in Cleveland, Ohio, in 1944. A more recent incident occurred at the Skikda facility in Algeria in 2004 when the vapours of a flammable refrigerant release were ingested by a steam boiler. The flammable vapour cloud explosion killed 27 workers onsite.

NFPA 59A prescribes a series of 10-minute-duration design spills (also called single accidental leakage sources), which must be analysed to prove that the contour of the ½ LFL methane (i.e., 2.5% concentration on a volumetric basis) vapour cloud does not cross the property boundary that can be built upon.

Practically, the property boundary that can be built upon has been treated as the line beyond which the facility no longer has administrative control. In addition, the radiant heat flux from pool fires within impoundment areas must be shown not to exceed 5 kW/m2 (1,600 BTU/hr ft2) across this boundary. The areas within these boundaries are termed "exclusion zones" where the potential fire hazard exists, and the public cannot be exposed to this hazard.

FERC specifies that only passive mitigation strategies can be applied to meet the exclusion zone requirements and does not allow for active systems to be used to meet the criteria. Thus, shorter duration releases based on detection and emergency shutdown procedures have not been acceptable, even though NFPA 59A does address this option, and such technologies are widely used.

Many of the exclusion zone analysis requirements are stated broadly in NFPA 59A and require considerable interpretation for the spill and leak scenarios that need to be considered. Over the past decade, FERC has clarified its interpretation of the federal requirements by means of formal letters, less formal precedent setting memoranda as well as data requests to specific projects requiring certain analyses to be performed. These interpretations continue to evolve over time, with the continual introduction of new analytical tools and new hazard criteria by FERC.

The 2013 edition of NFPA 59A and recent FERC interpretations, memos, and guidance have introduced risk-based analysis approaches that deviate from the original prescriptive approach in the 2001 edition of NFPA 59A. The new Chapter 15 "Performance (Risk Assessment) Based LNG Plant Siting" is not entirely consistent with traditional Quantitative Risk Assessment (QRA) approaches.

Risk-based approaches such as QRA assign risk by aggregating the likelihood or probabilityof scenarios with the consequence in terms of injury or fatality of susceptible populations. QRA is required by the European code. FERC requires release scenarios to be selected according to FERC-generated generic failure rates without consideration for the consequence portion of the risk assessment.

FERC has also expanded the consequences to be analysed to include vapour cloud explosion hazards of flammable refrigerant releases from liquefaction processes, which were not present in import terminals because they only vaporized LNG. Although the changes to the required analyses of fire hazards are complex, some change has been necessary due to the anticipated growth of the U.S. LNG liquefaction infrastructure. This article provides a brief background of changes in the LNG industry in the U.S. and the evolution of current passive fire protection and facility siting guidelines.

LNG IN THE U.S. BACK THEN: IMPORT TERMINALS

The North American LNG industry experienced a surge in growth in about 2003 when the industry believed that existing North American natural gas production was

going to be overtaken by increasing demand from power generation, chemical feedstock applications, and domestic use. At that time, there were only four operating LNG import terminals to provide the gas supply: Cove Point, MD; Everett, MA; Elba Island, GA; and Lake Charles, LA.

The worldwide shipment of LNG occurs via ocean-going tanker ships. Import terminals receive the LNG, store it in large cryogenic tanks, and vaporise it into the nation's gas pipeline network. In 2004-2005, the need to import gas into the U.S. prompted a major effort to develop the terminal infrastructure to receive imported LNG.

At its peak, around 2006, dozens of terminals on the West, East and the Gulf Coasts sought to receive permits for construction. The first to be constructed was the Cheniere LNG terminal in Sabine Pass, LA, and others followed on the East and Gulf Coasts. Unfortunately for the owners, the expected gas demand did not materialise, causing many of the projects to stall and new terminals to remain underutilised.

Import Terminal Fire Protection Considerations

During this time period, FERC applied the 2001 edition of NFPA 59A to identify single accidental release scenarios that needed to be analysed as part of the application process. Two types of hazardous outcomes were analysed: radiant heat flux from LNG pool fires and flammable vapour dispersion. LNGFIREIII is the PHMSA-approved software package for modelling LNG pool fires. The software calculates the radiation heat flux for LNG pool fires based on a prescribed surface emissive power (SEP) and a cylindrical flame geometry that is based on the impoundment area. FERC recently confirmed that this approach adequately represents the radiant heat from LNG pool fires based on recent large-scale LNG pool fire tests conducted by Sandia National Laboratories. LNGFIREIII remains the primary code for calculating heat flux, but the requirements for calculating vapour dispersion have undergone many changes.

LNGFIREIII IS THE PHMSA-APPROVED SOFTWARE PACKAGE FOR MODELLING LNG POOL FIRES. THE SOFTWARE CALCULATES THE RADIATION HEAT FLUX FOR LNG POOL FIRES BASED ON A PRESCRIBED SURFACE EMISSIVE POWER (SEP) AND A CYLINDRICAL FLAME GEOMETRY THAT IS BASED ON THE IMPOUNDMENT AREA.

In mid-2005, at a time when only import terminals were being considered on U.S. shores, FERC required evaluations of vapour dispersion from full cross-section pipe breaks at the tanker ship unloading line and from high-pressure flashing jets at small-diameter attachments to the transfer piping for instrumentation or pressure relief, at flanges, and at valves or other equipment connections. Based on these requirements, a wide variety of single accidental leakage sources, ranging from valve packing and flange leaks to full cross section ruptures of ship unloading lines, were analysed by applicants in their FERC submittals.

The primary analytical tool used at that time for the analysis of vapour dispersion was the integral vapour dispersion model, DEGADIS. DEGADIS was used to compute the vapour dispersion from evaporating LNG that was spilled into sumps or impoundment areas. The practice was to calculate the source term based on a rate of evaporation that was determined by transient heat conduction from the concrete

surface. This vapour source was then input into a code called SOURCE5 that accounted for vapour hold-up within the impoundment area. This gave a time delay and a rate of spill of vapours out of the impoundment area, which was input into DEGADIS to calculate the extent of the ½ LFL cloud.

LNG IN THE U.S. TODAY: EXPORT TERMINALS

Around 2010, industry began to develop plans for natural gas liquefaction facilities to export LNG as a result of the natural gas surplus from recent production of natural gas from shale formations. Many of the proposed liquefaction facilities were put forth by previously approved LNG import terminals, the first being Cheniere's Sabine Pass terminal. It was followed by Freeport LNG and Cameron LNG, among others.

Previously, North America only had one LNG export facility. It was in Alaska on the Kenai Peninsula, approximately 100 km from Anchorage. The Kenai LNG plant began operating in 1969, and was recently taken offline.

Refrigeration processes and the associated plants that are used to liquefy natural gas are considerably more complicated than import regasification terminals. FERC's limited experience with liquefaction and industry's rush to develop this new infrastructure forced FERC and DOT (PHMSA) to re-evaluate their requirements. Over a period of two to three years, FERC issued a sequence of new interpretations for required fire and explosion hazard analyses. The most significant changes required a new approval methodology for vapour dispersion software tools, a new method of identifying single accidental leakage sources, and the introduction of vapour cloud explosion calculations for flammable refrigerants.

IMPROVED VAPOUR DISPERSION MODEL REQUIREMENTS

An absence of consistent guidelines on the performance of vapour dispersion software prompted a study sponsored by the Fire Protection Research Foundation. The final report of this study proposed a formal process for the approval of analytical tools for vapour dispersion at LNG facilities. The resulting Model Evaluation Protocol (MEP) requires prospective models to be compared to a database of spill tests on ground and water, and associated vapour dispersion measurements that were conducted over the past decades. The National Association of State Fire Marshals (NASFM) commissioned an independent review of the MEP to assist local and state emergency response officials. This review in part concluded that the MEP was unnecessarily long and complex.

Four years after publication of the MEP, two commercial software products were approved by DOT (PHMSA) in 2011. These were the PHAST Version 6.6/6.7 and FLACS Version 9.1 computer codes. The MEP review process was elaborate, and it took considerable time for the respective software developers to compile their MEP cases and for the regulators to approve them. In addition to DEGADIS, these two software packages are approved for vapour dispersion analyses today. PHAST is commercial software that uses the Unified Dispersion Model (UDM) to calculate vapour dispersion following a two-phase pressurised release or an unpressurised release. It models near-field and far-field jet dispersion, droplet evaporation in the air, rainout (droplets hitting the ground), liquid pool spread, vaporisation and subsequent heavy gas dispersion. These features have been essential for analysing FERC-required pressurised LNG or liquid refrigerant jetting and flashing scenarios. PHAST only accounts for flat ground, and therefore cannot accommodate complex geometries such as tanks, buildings, and walls that are typically present at LNG facilities.

The FLACS software can model vapour dispersion scenarios and vapour cloud explosions in three dimensions. This CFD model discretises the domain using a rectangular grid. FLACS has a routine called FLASH that can be used to model high pressure jetting and flashing releases. It also contains a liquid spill model to calculate the spread of LNG or refrigerants over the ground. The model calculates heat transfer to the liquid and its evaporation. Currently, FLACS is the only model approved by FERC that can be used to model the vapour clouds resulting from liquid spills into trenches. FLACS also is the only approved model that can be used to determine the effect of structures and vapour fences on the flammable vapour cloud dispersion.

The Latest Single Accidental Leakage Requirements

In 2010 and 2011, FERC's single accidental leakage scenarios were prescriptive in that the hole size had to be chosen based on pipe size and later pipe length. These criteria were superseded in 2012 by the requirement that single accidental leakage sources be selected for analysis if the likelihood of failure is greater than 3x10-5 failures per year. A detailed discussion of the criterion's development and application is provided elsewhere.

FERC staff provided a table of yearly failure rates for piping and other equipment.

All single accidental leakage sources that need to be considered are now selected based upon the length of the piping system and the resulting failure rate for a given hole size. Once selected, the scenarios are analysed using the approved commercial software.

This latest change was a paradigm shift from a strict prescriptive approach to one that is based on a probabilistic criterion, even though the consequences remain prescriptive: the exclusion zones must remain within the boundaries of the facility. This paradigm shift constitutes a step closer towards the European Standard, which is entirely based on Quantitative Risk Analysis (QRA).

Vapour Cloud Explosion Hazards

Unlike LNG regasification - only facilities, liquefaction plants contain flammable refrigerants in significant volumes. Common refrigerants include chlorofluorocarbons, ammonium, carbon dioxide, and non-halogenated hydrocarbons. In most refrigeration cycles, the mixed refrigerant may include varying concentrations of nitrogen, methane, ethane, ethylene, propane, and iso-pentane.

Some of the refrigerants are generally more reactive than natural gas. That is particularly the case with ethylene, which can undergo vapour cloud detonation. As a result, refrigerants introduce the risks of vapour cloud explosions that did not previously exist with import terminals. The January 19, 2004, Skikda Algeria liquefaction plant accident involved a refrigerant vapour cloud explosion that killed 27 workers.

NFPA 59A does not address this risk. FERC now requires applicants to analyse vapour cloud explosions associated with worst-case flammable gas releases, to identify the 1 psi (7 kPa) over-pressure boundary and to analyse the associated offsite consequences of 1 psi (7 kPa) and greater overpressures.

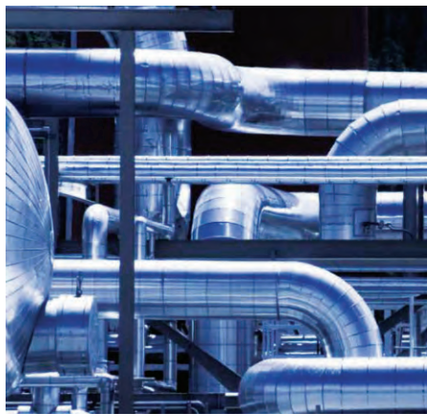
PASSIVE MITIGATION TECHNIQUES

Passive mitigation techniques that are often used to contain the ½ LFL cloud within the property include the following:

- Relocation of LNG and refrigerant storage and piping elements to increase the distance to the property boundary.
- Changes to the LNG and refrigerant flow design, by changing the size of piping, capacity and number of pumps, and process conditions. These can reduce the worst case release flow-rate.
- Changes to the refrigerant storage capacity and the amount of refrigerant that can be released.
- The use of vapour fences and other obstacles to contain the LNG and refrigerant vapour cloud during a release.

Terminals have adopted various vapour fence strategies in the past, including long and tall fences, placing fences near the source to reduce its momentum, as well as using short fences to increase turbulence and mixing the cloud with air.

In conditions where an impoundment area, sump, or conveyance trench is located near a property boundary, the extent of the vapour cloud from a spill into this area can be addressed by selecting a concrete mixture that has a low thermal conductivity. Cryogenic liquid spills on concrete evaporate due to heat conduction from the substrate to the cold cryogenic pool. This is the dominant mode of evaporation in the early stage when evaporation rates are at their highest. Therefore, by selecting low density, heat capacity, and thermal conductivity concrete, the ½ LFL clouds can be shortened considerably.



>> **Harri Kytomaa** and **Trey Morrison** are with Exponent, Inc.

MAHARASHTRA LEADS THE WAY IN FIRE SERVICE TRAINING

AN OVERVIEW OF THE GAMUT OF LEARNING THAT THE MAHARASHTRA FIRE SERVICES ACADEMY OFFERS.

Few careers across the globe offer prospects that are as exciting and challenging at the same time. In fire safety service, no two days are alike. Each sunrise has the potential of bringing with it a whole new challenge that will make great demands on your mental agility, physical ability and technical prowess.

The fire and emergency services are not for the weak or faint hearted. It is for razor-sharp minds with nerves of steel, for those who let adversity bring out the very best in them. It calls for a mix of man management, rigorous training, skill development, constant practice and teamwork. It takes desire, discipline and dedication. Being part of the fire and emergency services force isn't just about fighting fire. It's about fire safety and fire prevention, too. It's about driving home the message of safety first; advising businesses on preventive

THE ACADEMY EXPECTS TO CONTRIBUTE SIGNIFICANTLY TO THE GROWING DEMAND FOR SKILLED PROFESSIONALS ACROSS THE ORGANISATIONAL SPECTRUM. FROM JUNIOR OFFICERS TO HIGH RANKING OFFICIALS WHO WILL PROVIDE LEADERSHIP IN THE FIELD OF FIRE AND RESCUE TO THEIR RESPECTIVE ORGANISATIONS.

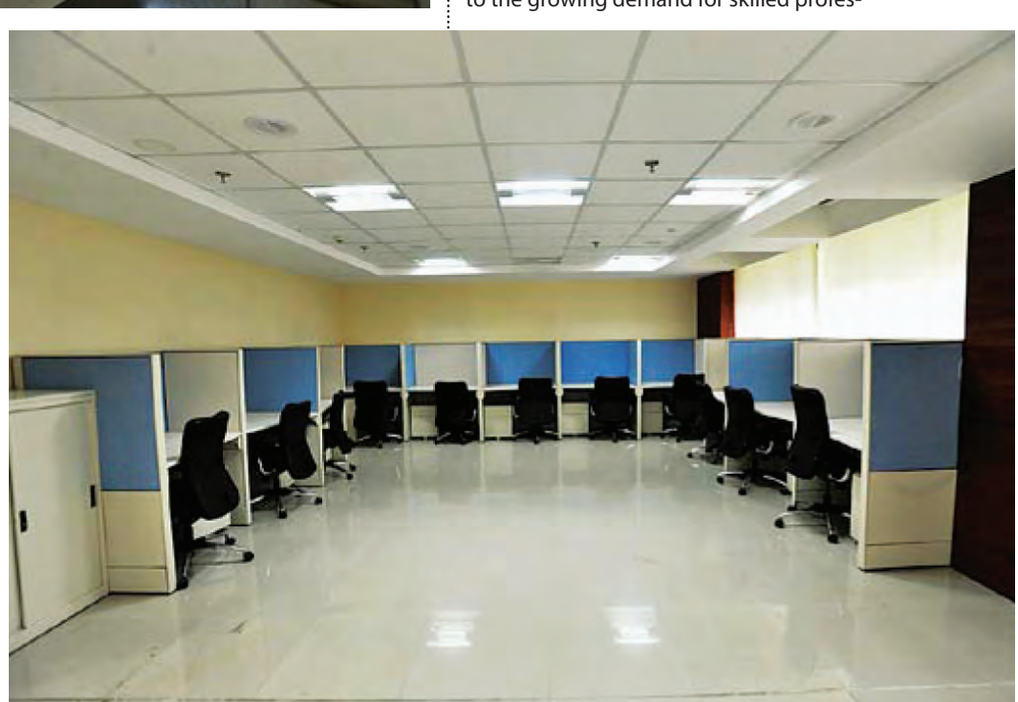
has announced substantial financial outlays to modernise and augment the fire services infrastructure across the nation. At the micro-level, the Government of Maharashtra is following through by putting in place several measures to reinforce, upgrade and supplement its fire forces and regional fire service centres across the State.

To make optimum use of the expanding infrastructure, the Directorate of Maharashtra Fire Services, Government of Maharashtra, was quickly off the blocks in leading the way. It set up a world class facility at Kalina, near Vidya Vihar, Mumbai, for creating a resource pool of high quality talent for the nation's fire force and industrial safety divisions in the public and private sector. The academy expects to contribute significantly to the growing demand for skilled profes-

THE FIRE AND EMERGENCY SERVICES ARE NOT FOR THE WEAK OR FAINT HEARTED. IT IS FOR RAZOR-SHARP MINDS WITH NERVES OF STEEL, FOR THOSE WHO LET ADVERSITY BRING OUT THE VERY BEST IN THEM.

measures, educating communities on their role and responsibilities, creating new safeguards, and finding innovative means to make the world a safer place.

According to the 13th Finance Commission of India, there's a yawning gap between the demand and availability of fire personnel across the country – a whopping 96 per cent, to be precise. To address the shortfall, at the macro level, the Government of India



There's also a great demand for high-quality trained professionals within Urban Local Bodies (ULBs), Special Planning Authorities (SPAs), the Airports, Seaports, Electricity Boards, Mines, Refineries, Petrochemical complexes, corporates and industries situated across India. There's much scope for landing key positions in the safety divisions of industrial heavy-weights in Private and Public Sector India's Petroleum and Oil majors, automobile engineering, manufacturing units, fire equipment manufacturers and fire system contracting firms.

sionals across the organisational spectrum. From junior officers to high ranking officials who will provide leadership in the field of fire and rescue to their respective organisations such as Urban Local Bodies (ULBs), Municipal Corporations, Municipal Councils, Nagar Panchayats, Special Planning Authorities (SPAs) like MIDC, CIDCO, MMRDA, other small medium and heavy industries and corporate, etc.

Maharashtra Fire Services Academy's stringent selection process (including a Competitive Criteria Test and Physical Test) is designed to draw the finest. Only those candidates who display leadership potential and an ability to thrive in a stimulating academic environment will make the grade. Maharashtra Fire Services Academy has been conceived as a world-class learning centre. The courses, far-reaching in their scope, are a combination of a rigorous curriculum, in-depth practical training and extensive exposure to real world challenges.

Guided by a team of highly qualified and dedicated faculty, the period of stay turns into an experience of personal and professional transformation for the students at the Academy. As the springboard to a career dealing in complexities related to fire safety and emergency services, the Maharashtra Fire Services Academy (MFSA) offers students an opportunity that is one of its kind.

GUIDED BY A TEAM OF HIGHLY QUALIFIED AND DEDICATED FACULTY, THE PERIOD OF STAY TURNS INTO AN EXPERIENCE OF PERSONAL AND PROFESSIONAL TRANSFORMATION FOR THE STUDENTS AT THE ACADEMY.

The sheer diversity of environments available in Mumbai - be it airports, sea ports, petroleum refineries, high-rise buildings, hospitals, educational institutions, malls, atomic energy research centre, hotels, fun fairs, amusement parks, theatres, slum areas, high density residential complexes – enables the MFSA to provide what no other academy in the country can. It opens numerous avenues to study and research from close quarters a variety of potential fire hazards and emergency handling methodologies. The added advantage of being able to mobilise experts in every related speciality places the Academy in an enviable position. What it offers is no ordinary short-term, quick fix training, but experiential learning of a level unlike any other. From access control systems to well-appointed classrooms to sophisticated technologies installed in various sections, it is every inch what a premier international management institute ought to be.

Being a Government of Maharashtra recognised MFSA certified professional earns students a place among a select group of high-calibre talent. They become the preferred choice for filling up significant positions in Government fire departments, urban local bodies or companies in the corporate domain in India and abroad. Being a successful MFSA student puts an upward slant to their growth curve – students stand more than a fighting chance to make the rapid rise from a Sub-Fire Officer to Chief Fire Officer in the Government, or from Supervisor to Vice President - Safety in the corporate sector. The opportunities just unfold.

There's also a great demand for high-quality trained professionals within Urban Local Bodies (ULBs), Special Planning Authorities (SPAs), the Airports, Seaports, Electricity Boards, Mines, Refineries, Petrochemical complexes, corporates and industries situated across India. There's much scope for landing key positions in the safety divisions of industrial heavy-weights in Private and Public Sector India's Petroleum and Oil majors, automobile engineering, manufacturing units, fire equipment manufacturers and fire system contracting firms.

There are even avenues for self-employment in specialised fields like being a fire surveyor for the insurance sector, a fire consultant for industries and commercial enterprises, or even becoming an entrepreneur in the business of fire protection, fire equipment and safety equipment manufacturing or fire detection and suppression systems installation. Students can stay ahead of the pack of job seekers by investing their time in this emerging field and creating a great career path for themselves.

A HUGE TRAGEDY IN THE COUNTRY'S FINANCIAL CAPITAL

A BLAZE IN AN OFFICE BUILDING IN ANDHERI, MUMBAI, CLAIMED THE LIFE OF ONE FIRE FIGHTER AND DESTROYED THE TOP TWO FLOORS OF THE BUILDING. THE INCIDENT HAS SPARKED DEBATE ON FIRE FIGHTERS' WORKING CONDITIONS AND CITIZENS' CARELESSNESS ABOUT BASIC FIRE SAFETY MEASURES.

Culled from various news sources

It started as a small fire, and within minutes, it caused large-scale destruction. In the end, it resulted in the death of one fireman and injuries to dozens, apart from untold loss of property. A dozen firemen were trapped for hours on the rooftop of a burning Mumbai high-rise after a fire they had put out started again. The fireman, Nitin Ivalekar, died reportedly due to smoke asphyxiation.

The incident

The blaze started on the 21st floor of the Lotus Business Park on Andheri Link road, and later spread to the 20th floor, according to fire brigade officials.

"We got a call at around 11 am that a fire had broken out in the commercial building. We initially thought it was a Grade-1 fire and sent four fire tankers to the spot. The fire was then upgraded to Grade 2 and deployed 12 fire engines and nine water tankers at the site," a fire brigade official said.

It turns out that the fire broke out at around 9.30 a.m. in the canteen on the 21st floor and was not adequately contained. Fire authorities surmised that a short circuit may have responsible for the entire incident.

The fire, which gutted the top two floors of the building, turned into a blaze at around 11 am and was brought under control only in the late evening. "There was lot of smoke emanating from the top floors where the fire broke out. This caused panic among the people working there, which made the evacuation process a little difficult. But the fire brigade managed to evacuate everyone," a municipal official said.

The fire and rescue effort caused huge traffic snarls in the city, especially on the perennially busy Link Road.

Rescue efforts

A coast guard chopper evacuated one of the men. The other fire fighters climbed down to safety after the fire was doused again. About 30 firemen had gone to the site of the fire. The fire completely destroyed

the first two floors before the personnel brought it under control.

People had been evacuated from the building. The fire personnel used the "top-down approach" as they went from floor to floor, fighting the blaze and rescuing people. A dozen firemen were left on the rooftop when the dying fire suddenly became stronger due to the winds.

A chopper was sent to rescue the personnel. The dramatic rescue of one firefighter was watched by a huge crowd below.

The building, located near the Lokhandwala Link Road, has many high-profile offices, including those of film stars like Hrithik Roshan and Ajay Devgn, as well as the corporate offices of Adlabs Imagica. "The fire caused panic among the people working at the building. This made the evacuation process a little difficult. But everyone was evacuated in time," an officer said.

Fireman Nitin Ivalekar, however, was not so lucky – instead of being one of the survivors of the incident, he became its first casualty. He died of asphyxiation and burns. His death left behind a young widow and two young daughters.

As many as 33 firefighters were trapped in the 22-storey building while battling the blaze.

Most office-goers had not arrived when the fire broke out and initially it seemed that the flames were under control. However, when the fire-fighters reached the terrace, the flames suddenly flared up again, trapping them on the 20th and 21st floors.

"The fire flared up on the 13th floor and damaged our hose. We had to break the windows to release the heavy smoke," said fire-fighter Jitendra Ozhare. In a panic, he said, Ivalekar ran to the top floor and could not escape the fire.

An eyewitness from the neighbouring tower, Indira Singh, said the blaze was so intense that glass windows on the building melted. Reportedly, shards of glass fell on the street below, further adding to the confusion below. Incidentally, the building is one of several glass-clad office buildings in the city.

Implications

The 22-storey tower did not have functional fire-fighting apparatus, officials said. Besides, the glass fronted building presented complications for the rescue effort – several people reported that shards of glass melted and flew off to the ground below.

Several onlookers helped the firefighters on the ground with water and refreshments, while some also helped them with ice packs for their blistered feet and arms.

MAJOR FIRES IN INDIA SINCE 1990

- April 16, 1990: 70 killed as shuttle train is gutted by fire in Patna district.
- December 23, 1995: 442 persons, mostly children, killed in a fire at the annual function of a school in Dabwali (Haryana). The pandal had caught fire due to short circuit.
- August 6, 2001: 28 people were killed at a private mental asylum in Erwadi in Tamil Nadu.
- January 23, 2004: 49 killed and 40 injured in fire at a marriage hall in Srirangam in Tamil Nadu.
- July 16, 2004: 91 school children were killed in a fire accident at Kumbakonam in Tamil Nadu.
- September 15, 2005: 35 dead and 50 injured in fire in three firecracker units in Bihar.
- April 10, 2006: 64 killed and 80 injured after a fire engulfed the tent at a crowded consumer trade fair in Meerut.
- March 23, 2010: Around 25 killed in an old mansion in Kolkata.
- November 20, 2011: 15 died and more than 30 injured when a fire broke out at a community function of eunuchs in East Delhi.
- December 9, 2011: At least 73 dead in fire at AMRI Hospital in Kolkata.
- Feb 8, 2012: 11 workers were killed after fire broke out in an electronic factory in Haridwar.
- July 30, 2012: 32 killed in fire in Tamil Nadu Express bound for Chennai.
- February 27, 2013: Kolkata Market fire, 19 labourers killed.
- October 29, 2013: Hyderabad Mahabubnagar bus fire, 40 passengers killed.

FIR registered against builder, office owners in Andheri fire incident

A First Information Report or FIR was today registered against the builder, office owners, occupants and others in connection with the July 18 fire incident at an upscale commercial high-rise building in Andheri, police said.

The FIR registered was at Amboli police station against owners, developers, occupiers, secretary, chairman, manager and others of the Lotus Business Park building following a complaint from fire officer YR Jadhav, Deputy Police Commissioner (spokesperson) Mahesh Patil, said.

The accused, whose names were not specified in the FIR, were booked under the Indian Penal Code or IPC sections 304 A (causing death by negligence), 336 (act endangering life or personal safety of others), 337 (causing hurt by act endangering life or personal safety of others), 338 (causing grievous hurt by act endangering life or personal safety of others) and 34 (acts done by several persons in furtherance of common intention) and relevant sections of the Maharashtra Fire Prevention and Life Safety Measures Act 2006, Patil added.

The Police has so far recorded statements of over 20 people associated with the building, which had caught fire and claimed the life of a fireman Nitin Ivalekar (35).

A police team had also visited the site to understand the sequence of events that led to the blaze, said another officer.

"According to fire brigade officials, the building flouted safety norms as fire-fighting systems were not in place, open spaces were used as godowns and exit routes were cluttered etc," the officer said, adding, the lessees, the office owners and the building committee did not ensure all the safety norms were followed.

Quoting fire officials, police said, owners and occupants had also carried out alterations without prior permissions, which caused hurdles in fire fighting operations and led to the death of the fireman.

A major blaze had broken out on the 21st floor of Lotus Business Park a little before noon on Friday and 21 firemen got stranded on the rooftop for several hours even as all civilians were promptly evacuated.

The firemen were later rescued from the site with the help of Navy and Coast Guard helicopters and were rushed to Cooper Hospital for treatment. The fire was doused after more than six hours.

"THE BUILDING FLOUTED SAFETY NORMS AS FIRE-FIGHTING SYSTEMS WERE NOT IN PLACE, OPEN SPACES WERE USED AS GODOWNS AND EXIT ROUTES WERE CLUTTERED ETC," THE OFFICER SAID, ADDING, THE LESSEES, THE OFFICE OWNERS AND THE BUILDING COMMITTEE DID NOT ENSURE ALL THE SAFETY NORMS WERE FOLLOWED.

14 KILLED IN INDIA GAS PIPELINE BLAST AND FIRE

By Reuters

On June 27, 2014, 14 people were killed and 20 injured in a blast and fire at a gas pipeline in the southern Indian state of Andhra Pradesh, again raising safety concerns over the country's energy projects. The fire broke out on a stretch of pipeline running through the village of Nagaram, engulfing buildings and burning victims to death, according to TV news footage and eyewitness accounts.

Many such projects are opposed by villagers on safety grounds. "The situation is very bad...14 people were burnt alive and 20 have been admitted to hospital with injuries," Yanamala Ramakrishnudu, state finance minister of Andhra Pradesh, told Reuters. He added that the fire had been brought under control.

The incident was the most deadly in the Indian energy sector since August 2013, when 28 people were killed in a fire at Hindustan Petroleum Corp Ltd's refinery at Vizag in Andhra Pradesh. Prime Minister Narendra Modi said victims and relatives would receive compensation.

He said Rs 200,000 would be paid to relatives of the dead and Rs 50,000 for those injured, in addition to relief payments by the petroleum ministry and GAIL. The latest fire occurred in a pipeline operated by state-owned energy company GAIL (India) Ltd and disrupted supplies to a power station and closed two gas fields.

The 18-inch pipeline supplies 0.5 million standard cubic metres of gas a day to a power plant operated by Lanco Infratech Ltd., GAIL spokeswoman Vandana Chanana said. "We have made arrangements to supply gas to consumers through alternative pipelines," Chanana said. State-run explorer Oil and Natural Gas Corp has shut two of its gas fields that were supplying the fire-hit pipeline, its head of exploration N K Verma said. Oil minister Dharmendra Pradhan and state chief minister N. Chandrababu Naidu have ordered an inquiry into the blast and fire.

SHOCKING TWIST TO GR NOIDA E-WAY CAR FIRE

Wife, daughter of WagonR owner found murdered in their house

In a shocking twist to Saturday's car fire on the Noida-Greater Noida Expressway, in which a 30-year-old man was charred to death, the partially decomposed bodies of the wife and daughter of the owner of the Maruti WagonR were discovered from their residence in Sector-120 of Noida on Sunday. Prima facie, police suspect that the owner of the car had killed his wife and daughter four days ago.

According to the police, they were unable to identify the driver of the WagonR as the car was completely burnt. Later with the help of the registration number, the owner was traced and identified as Nitin Rohilla; an engineer working with Yamaha Motors.

Meanwhile, on Sunday morning, residents of Prateek Laurel Apartments in Noida complained of a foul smell emanating from Rohilla's flat on the fourth floor. A PCR call was made and a police team rushed to the spot.

The police broke open the door and found the body of Rohilla's wife Parul (29) on a chair in the drawing room while the body of his daughter Ayushi (4) was found lying near the kitchen. Police sources said circumstantial evidence suggested that Rohilla might have killed the duo, as mystery also shrouded the fire that broke out in his WagonR. Police said his wife and daughter were killed around four days ago since the bodies had already started decomposing. Blood stains were found all over the house. Circumstantial evidence was lifted from the spot and sent for further examination.

Investigations revealed that Rohilla last went to his office on July 16. On July 17, he sent a text message to his boss stating that he was unwell and would skip office. Parul's brother Neeraj claimed that on Saturday Rohilla called him and said that they had a fight and everything had finished. "He was in a state of panic and did not explain. He told me that Parul and Ayushi were at home," Neeraj added.

Soon after the call, Rohilla's car caught fire. Eyewitness said that there was a loud noise in the car after which it was engulfed in flames. "We have sent the body for autopsy and will also conduct a DNA test to ascertain the identity of the driver," said Preetinder Singh, Senior Superintendent of Police.

It appears that Rohilla killed his wife and daughter but the exact sequence of events is yet to be established. "We are scanning the CCTV footage in the building to check Rohilla's movement," he added. A case under appropriate Sections of the Indian Penal Code has been registered at Sector 58 police station.

NATIONAL ASSOCIATION OF FIRE OFFICERS

(REGISTRATION NO.: S-35438 OF 1999 UNDER SOCIETIES REGISTRATION ACT XXI OF 1860)

MEMBERSHIP FORM

NAME: _____

RANK: _____

ORGANISATION: _____

ADDRESS FOR CORRESPONDENCE: _____

..... CITY .....

(PO) ..... DIST. ..... STATE ..... PIN .....

TEL.NO ..... MOBILE ..... E-MAIL .....

AGE: **DATE OF BIRTH:** **BLOOD GROUP:**

QUALIFICATION (S) (ATTACH XEROX COPIES OF CERTIFICATES OF HIGHEST PROFESSIONAL/FIRE SERVICE QUALIFICATION)	EDUCATIONAL (HIGHEST)	
	PROF./TECH. (HIGHEST)	
FIRE SERVICE EMPLOYMENT PROFILE	NAME OF ORGANIZATION:	
	LENGTH OF TOTAL SERVICE:	
	PRESENT POSITION: (IF RETIRED SAY SO)	
	TEL: **FAX:** **E-MAIL :**	

APPLIED FOR :

SR. NO.	MEMBERSHIP TYPE	PROCESSING FEE	MEMBERSHIP FEE	TOTAL AMOUNT	PLEASE TICK MARK [✓]
1	**ANNUAL / ORDINARY MEMBERSHIP** (RENEWABLE EVERY YEAR)	**NIL**	**500/-**	**500/-**	
2	**ELITE MEMBERSHIP** (RENEWABLE AFTER EVERY 10 YEARS)	**NIL**	**3000/-**	**3000/-**	

MODE OF PAYMENT	DD/MO.NO	DATE	BANK NAME	AMOUNT

I hereby certify that the information given above is correct and also that I will abide by the Memorandum, Rules & Regulations of the Association.

Signature of the Applicant

Station :
Date :
N.B. Family members (Wife & Children) Names to be listed along with age.

C/o : Directorate of Maharashtra Fire Services, Maharashtra Fire Service Academy, Vidyanagari, Hans Bhugra Marg, Santacruz (East), Mumbai 400 098
Tel No. 2667 0439, Fax No. 2666 0287.

FOR OFFICE USE

The above application has been considered / not considered by the Sub – Committee on ..... and the above enrolment No. is .....

GENERAL SECRETARY

An amount of Rs. ..... as been received by DD/MO on ..... and Receipt No Date ..... is issued.

TREASURER

1. DD should be drawn in favor of **NATIONAL ASSOCIATION OF FIRE OFFICERS.** Payable at MUMBAI.
2. **The Membership Form along with relevant fee should be sent to Mr. Yazdi Malu Hon. Secretary, NAFO, C/o: Directorate of Maharashtra Fire Services, Maharashtra Fire Service Academy, Hans Burga Marg, Santacruz (E) Mumbai 400098 (Tel 022-26670438/39)**