Sri Lakshmi Narayana Institute of Medical Sciences

Date: 04.05.2020

From
Dr. Raji Sharma
Professor and Head,
Department of Anaesthesia
Sri Lakshmi Narayana Institute of Medical Sciences
Bharath Institute of Higher Education and Research
Puducherry

To
The Dean,
Sri Lakshmi Narayana Institute of Medical Sciences
Puducherry

Sub: Request for Permission to conduct value-added course: Fire hazards in hospital environment

Dear Sir,

With reference to the subject mentioned above, the department proposes to conduct a value-added course titled: Fire hazards in hospital environment for undergraduates from July 2020-Dec 2020. We solicit your kind permission for the same.

Kind Regards
DR. RAJI SHARMA

FOR THE USE OF DEANS OFFICE

Names of Committee members for evaluating the course:

The Dean: Dr RAJASEKAR

The HOD: DR. RAJI SHARMA

The Expert: Dr K SELVARAJU

The committee has discussed about the course and is approved.

Dean Subject Expert HOD

DEAN
LAKSHMI NARAYANA INSTITUTE OF MEDICAL SCIENCES
OSUDU, AGARAM VILLAGE,
KOODAPAKKAM POST
PUDUCHERRY - 605 502

OFFICE OF THE DEAN

Sri Lakshmi Narayana Institute of Medical Sciences

OSUDU, AGARAM VILLAGE, VILLIANUR COMMUNE, KUDAPAKKAM POST,
PUDUCHERRY - 605 502.
[Recognised by Medical Council of India, Ministry of Health letter No. U/12012/249/2005-ME (P -II) dt. 11/07/2011]
[Affliated to Bharath University, Chennai - TN]

Circular

05.06.2020

Sub: Organizing Value-added Courses: Fire Hazard In Hospital Environment - reg

With reference to the above mentioned subject, it is to bring to your notice that Sri Lakshmi Narayana Institute of Medical Sciences, **Bharath Institute of Higher Education and Research** is organizing **" FIRE HAZARD IN HOSPITAL ENVIRONMENT"** course in July-Dec 2020.

The course content is enclosed below."

The application must reach the institution along with all the necessary documents as mentioned. The hard copy of the application should be sent to the institution by registered/ speed post only so as to reach on or before 15/06/2020. Applications received after the mentioned date shall not be entertained under any circumstances.

Dean

DEAN
SRI LAKSHMI NARAYANA INSTITUTE OF MEDICAL SCIE
OSUDU, AGARAM VILLAGE,
KUDAPAKKAM
PUDUCHERRY - 605 502

Encl: Copy of Course content.

COURSE PROPOSAL

Course Title: **Fire hazards in Hospital Environment**

Course Objective:

1. To enable the students to learn about various risk factors pertaining to fire accidents in the hospital and identify and mange them accordingly

2. To be prepared for inadvertent events in hospital

Course Outcome:

On successful completion of the course, the students will have skill in identifying and managing fire hazards in hospital.

Course Audience: II year MBBS students

Course Coordinator: Dr. Raji Sharma

Course Faculties with Qualification and Designation:

1. Dr. Raji Sharma- Professor And HOD
2. Dr K Selvaraju- Associate Professor

Course Curriculum/Topics with schedule (Min of 30 hours)

S.No	Date	Topic	Time	Hours	Faculty
1	18.07.2020	Hospital- a risk zone for fire hazards	2-4PM	2	Dr. Raji Sharma
2	25.07.2020	Fire triad	2-4PM	2	Dr K Selvaraju
3	01.08.2020	Fire prevention	2-4PM	2	Dr. Raji Sharma
4	08.08.2020	Fire suppression	2-4PM	2	Dr K Selvaraju
5	22.08.2020	evacuation	2-4PM	2	Dr. Raji Sharma
6	29.08.2020	Infrastructure planning	2-4PM	2	Dr K Selvaraju
7	05.09.2020	Electrical system planning	2-4PM	2	Dr. Raji Sharma
8	12.09.2020	Equipment planning	2-4PM	2	Dr K Selvaraju
9	19.09.2020	Safety /security equipments	2-4PM	2	Dr. Raji Sharma
10	26.09.2020	Fire protection equipments	2-4PM	2	Dr K Selvaraju
11	03.10.2020	Fire protection systems	2-4PM	2	Dr. Raji Sharma
12	10.10.2020	Fire safety training and practices	2-4PM	2	Dr K Selvaraju
13	17.10.2020	NABH standard	2-4PM	2	Dr. Raji Sharma
14	24.10.2020	Gas supply installation	2-4PM	2	Dr K Selvaraju
15	31.10.2020	Assessment	2-4PM	2	Dr. Raji Sharma

References

1) Fire Hazard Categorization and Risk Assessment for Dhaka City using GIS, January 2004.

2) Fire Hazard Assessment During Construction of A Mixed-Use Development Project In Kuala Lumpur; International Journal of Engineering & Technology, July 2018.

3) Fire and Smoke: Understanding the Hazards; Chapter:4 Hazards Associated with Fires(1986)

VALUE ADDED COURSE

1. **Name of the program & Code**

   FIRE HAZARDS, ANAES 01

2. **Duration & Period**

   30 hrs: July 2020 – December 2020

3. **Information Brochure and Course Content of Value Added Courses**

   Enclosed as Annexure- I

4. **List of students enrolled:**

   Enclosed as Annexure- II

5. **Assessment procedures:**

   Multiple choice questions- *Enclosed as Annexure- III*

6. **Certificate of Participation:**

   Enclosed as Annexure- IV

7. **No. of times offered during the same year**:

   1 Time July 2020- December 2020

8. **Year of discontinuation: 2020**

9. **Summary report of each program year-wise**

Value Added Course- July 2020 – December 2020					
Sl. No	**Course Code**	**Course Name**	**Resource Persons**	**Target Students**	**Strength & Year**
1	ANAES 01	FIRE HAZARDS	DR. SELVARAJU K	II MBBS	20

10. **Course Feed Back**

    Enclosed as Annexure- V

RESOURCE PERSON

Dr K SELVARAJU

DEPARTMENT OF ANAESTHESIOLOGY
SRI LAKSHMI NARAYANA INSTITUTE
OF MEDICAL SCIENCES
OSUDU, KUDAPAKKAM, PUDUCHERRY-605 502

COORDINATOR

DR. RAJI SHARMA

Head of Dept. of Anaesthesiology
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Kudapakkam, Puducherry - 605 502

Annexure I

FIRE HAZARDS

Hospital- a risk zone for fire hazards
Fire triad
Fire prevention
Fire suppression
evacuation
Infrastructure planning
Electrical system planning
Equipment planning
Safety /security equipments
Fire protection equipments
Fire protection systems
Fire safety training and practices
NABH standard
Gas supply installation
Assessment

Hospital safety and its importance

Most fire-related hazards are caused due to carelessness and improper handling of goods. One of the places where it is difficult to evacuate people in case of a fire breakout is a hospital. Evacuating people from hospitals during a fire hazard is challenging because it involves moving patients who are immobile and are unable to help themselves.

The real challenge is evacuating high dependency people before the fire spreads in the vicinity. Therefore, it is important that hospitals and other health care centers have adequate fire prevention and safety measures in place. Prevention is the key in the case of fire-related accidents especially when places like hospitals are concerned. Every hospital must have well-planned exit ways and well-maintained firefighting equipment to ward off the casualties and damage to assets.

By ensuring fire safety in hospitals, we can prevent fire accidents. Hospitals stack a lot of combustible materials like chemicals, cylinders, surgical equipment, etc. And many hospitals also have an inbuilt kitchen or canteen. A fire accident may have a lot of casualties as the fire may become uncontrollable in minutes.

So, the hospital management should ensure that their buildings are fire safe all the times

Some of the worst fire accidents in Hospitals in India

1. AMRI Hospital, Kolkata

On December 2011, a major fire accident at AMRI hospital in Kolkata killed 95 people. The main cause of this mishap was an electrical short circuit and stocking of combustible substances in the basement. This was a case of negligence by the management of the hospital. During the incident, the hospital had around 160 patients and also many staff members. At least 50 patients were there in the intensive ward.

2. IMS & SUM Hospital in Bhubaneshwar

October 17, 2016, we saw one of the worst fire accidents in IMS & SUM Hospital, Bhubaneswar. 22 were killed and 120 were injured. In this case, the hospital staff tried to douse the fire with fire extinguishers and in this process, they lost almost 20 crucial minutes before they called the fire department. This shows the lack of preparedness of the hospital staff during emergencies.

3. Rohini Super specialty hospital in Hanamkonda

On October 17, 2017, an electrical short-circuit triggered a fire in Rohini super specialty hospital in Hanamkonda, Telangana. 199 patients were admitted to this hospital at the time of the

accident. Two patients died and four were injured. The hospital's fire safety system did not work during this crucial time. Everyone including the doctors and hospital staff was in a state of panic and did not know how to respond.

4. MY Hospital Indore

The lives of 47 newborn babies were in danger when a fire broke on November 4, 2017, at MY Hospital, Indore. Fortunately, there was no loss of life. But, it is alleged that the hospital has been flouting fire safety laws.*

In all the cases, the fire safety laws have been violated.

What are the best ways to prevent fire accidents in hospitals?

Preventive measures to reduce fire risks in hospitals are different from the fire safety measures adopted in other places such as schools, office, and industries. A hospital has many combustible substances, chemicals, and gases, heat dissipating equipment, and electrical wiring, which can lead to a serious fire accident if appropriate safety measures are not observed.

Adequate fire prevention methods must be designed and developed including the fixed evacuation points, fire equipment and regular maintenance of electrical equipment to prevent a fire hazard.

Here is a list of preventive measures to reduce fire risks in hospitals:

1. Architecture and layout

The design and architecture can prove as a turning point in case of a fire breakout. A hospital's architecture planner must make sure that there is ample of open space in the building to minimize the possibilities of spreading fire in the entire building. Pressurized exclusion of smoke must be a priority while planning the architecture of a hospital.

2. Fire safety plan

Every member of the hospital must be aware of a well-charted and detailed action plan which everyone needs to follow in case of a fire breakout. Fire drills must be carried out on a regular basis to make sure that hospital staff including doctors must know how to respond during emergency situations.

3. Fire detection equipment

Fire detection is the first step towards preventing fire hazards. Hospitals must have fire detection equipment such as heat detector, smoke detector, fire gas detector, flame detector, etc installed at important locations. Not only the installation of fire detection equipment is essential, it must also be ensured that these devices are working properly by checking them on a timely basis.

4. Prohibiting smoking to reduce chances of fire

Hospital authorities must ban smoking inside the premises of the hospital, especially near oxygen cylinders. This will significantly reduce the chances of fire outbreak.

5. Fire audit survey

Hospitals can seek help from professional bodies for conducting fire safety audits to make sure that the adequate fire prevention measures are observed in the hospital. If the authority recommends any changes, it should be implemented diligently.

6. Maintenance of electrical wiring and equipment

Faulty wiring systems can be a cause of fire outbreak. To prevent fires from electrical equipment, maintenance must be carried out at least once in a month and other electrical equipment that can lead to fire hazard must also be properly maintained.

In 1929, a Cleveland clinic fire killed 120 people when they ignored NFPA recommendations for storing their x-ray film (made of nitrocellulose). Several tons were stored in the basement, a few feet away from a heat source. When nitrocellulose reaches 300 degrees, it turns into an explosive gas. The heat source caught the film on fire and toxic, explosive gas spread through the floorboards, causing explosions throughout the hospital.

Since 1929, fire and building code has changed a lot in hospitals. In 1980-1984, data shows that an average of 7,100 hospital fire happened annually with 5 deaths per year. In the study for 2006-2010, fires in hospitals went down to 1,400 with an average of 1 death per year.

The main reason fires reduced in hospitals so much during this time was smoking being banned from hospitals. When that ban took effect, fires caused by smoking materials in hospitals went from 35% to 7%.

Currently, the top causes of fires in hospitals are

- **Electrical Equipment**

Hospitals have a lot of electrical equipment, and often have overworked sockets and cables. They sometimes use extension cords and daisy chain them together, which is a violation.

- **Kitchen Facilities**

Fires in kitchen facilities are common because of cooking fats, electrical ovens, toasters and open flames.

- **Cigarette Smoke**

While cigarettes are banned in healthcare facilities now, people still sneak them or, while smoking outdoors, don't properly dispose of them.

- **Specialized Medical Equipment**

Lasers and electrosurgical tools are an ignition hazard, especially near oxygen tanks, surgical clothing, and flammable sterilizing liquids.
A study done on fire code violations in hospitals showed that the top fire safety violations were

- **Extension Cord Daisy Chains**

Because of the need to have equipment plugged in, hospitals will use extension cords and daisy chain them together, which is a violation and can cause them to become overheated, sparking a fire.

- **Fire Door Compliance**

The Fire Marshal who collected data of the most violations in hospitals said that many fire doors were not closing or latching correctly. They also had holes in them, which would cause them to no longer be fire proof.

- **Fire Exit Obstructions**

Carts, wheel chairs, and medical equipment were found blocking fire exit doors.

- **Hand Sanitizers**

Alcohol based hand rubs are all over hospitals. However, they are flammable and need to have a 6-foot breadth between the sanitation station and any ignition sources.

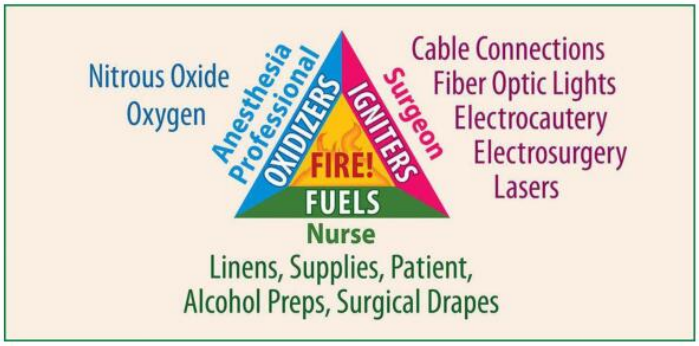
- **Gas Cylinders and Medical Oxygen Compliance**

Gas cylinders and medical oxygen need to be properly stored and secured.

- **Portable Fire Extinguishers**

Portable fire extinguishers were missing, obstructed, improperly mounted, previously discharged, past due inspection, improperly signed, or not enough were in the hospital.
From 2009-2013, only 4% of fires went beyond the point of origin thanks to the increase in fire sprinklers. Today, 79% of hospitals are protected by fire sprinklers and it has greatly reduced the spread of fires and fire-related death in hospitals.

Fire triad



Before we undertake fire prevention, we first need to understand the three main ingredients that constitute a fire: heat, fuel, and oxygen. The paradigm below, referred to as the “fire triangle,” shows how these three components interact to create a fire

Fuel is any combustible material that can be used as the source of ignition of the fire, as well as to keep it burning.
Oxygen is an oxidizing agent that reacts with the fuel to start and continue the fire. Lower concentrations of oxygen result in slower fuel combustion.
Heat: Fires require oxygen and fuel reacting with each other at a temperature exceeding a threshold tem- perature, referred to as the “flash point.” Different materials and chemicals have different flash points, some at low temperatures and some high. The lower the flash point temperature of a compound, the more easily the compound ignites.

There are five classes of fires that are categorized based on the types of contributing fuel/combustion materials. These classes are as follows

Class A: Fires that involve ordinary combustible materials such as wood, cloth, paper, rubber, and many plas- tics.
Class B: Fires that involve flammable liquids, combustible liquids, petroleum greases, tars, oils, oil-based paints, solvents, lacquers, alcohols, and flammable gases.
Class C: Fires that involve energized electrical equipment, such as power tools, wiring, fuse boxes, appliances, TVs, computers, and electrical motors.
Class D: Fires that involve combustible metals such as magnesium, potassium, titanium, zirconium, lithium, and sodium.
Class K: Fires that involve combustible cooking oils and fats used in commercial cooking equipment

Fire prevention

This guide was created to address the vulnerability of hospitals to fires. All possible steps should be taken to mini- mize the hazard of fires in hospitals and to stress the need for evacuation. Hospitals Don’t Burn! Hospital Fire Prevention and Evacuation Guide is applicable to existing hospitals that can be retrofitted to improve safety against fires as well as proposed or newly built facilities. The document is formatted into four main sections, namely:
Prevention
Suppression
Evacuation
Evacuation Training Drills

The primary aim of a hospital facility is to not evacuate patients unless absolutely necessary. Hence, special attention should be focused on proper prevention and suppression techniques to avoid this worst-case scenario. That being said, evacuation training and preparedness is of paramount importance to avoid and/or minimize loss of life.

Section 3 provides a guide on hospital evacuation. It is not a fixed plan that completely details the tasks and respon- sibilities of each member of the evacuation team. Indeed, the components and personnel suggested in this guide may vary depending on the particular hospital for which the evacuation plan is being developed.

Fire suppression

The eight leading causes of hospital fires in the United States of America are shown in the chart below (these figures are based on data from the National Fire Protection Association)

Main Causes of Hospital Fires

Data on selected hospital fires in the Latin American and Caribbean region and around the world are presented

SUPPRESSION

Fire suppression is critical in order to circumvent/minimize damage or the loss of property and life. The ability to quickly detect and extinguish fires is a key factor in avoiding the worst-case scenario, which is evacuation of the hospital.

Fire Alarm System

There are several ways in which fires can be detected. The traditional and obvious method of detection is a person seeing the fire and/or smelling smoke, at which point a fire alarm should be activated or a notification issued. In some cases, a designated “runner” relays the notification to others through word of mouth. In other instances, manual fire alarm pulls or manually activated alarm-initiating devices are used to sound the fire alarm.

According to the National Fire Protection Association in the United States, suggested requirements for installing and locating manual fire alarm–initiating devices are as follows:

-Manual pull boxes should be securely mounted on a background of contrasting color.

-The operable part of the fire alarm box should not be more than 1.07 m (42 inches) to 1.22 m (48 inches) abovefloor level.

- Manual pull boxes should be located so that they are conspicuous, unobstructed, and accessible.

- Manual pull boxes should be located so that the horizontal travel distance between boxes on any floor is not more than 61 m (200 feet).

- Additionally, manual pull boxes should be located within 1.52 m (5 feet) of either side of a grouped opening (e.g., a bank of elevators and staircases located together) that is over 12.2 m (40 feet) in width.

Smoke and Heat Detector

A variety of smoke and heat sensors can be installed as part of a fire alarm system to detect fires that begin in low-traffic areas away from personnel/staff. These sensors should ideally trigger an automatic alert system with visible (flashing lights/strobe lights) and audible bells or voice alerts to indicate that a fire was detected. The sensors should also be able to pinpoint the location at which the fire was detected, through a remote annunciator panel that lights up to indicate the area where the fire detection device was triggered.

Smoke detectors will generally detect a fire faster than heat detectors. However, personnel responsible for the specific siting of smoke and heat detectors should consider the possibility of any false or unwanted alarms. For instance, smoke detectors should likely not be used in the facility's kitchen. Instead, opt for fixed-temperature heat detectors in cases where a sudden rise in temperature is expected in a fire.

Smoke and heat from fires will tend to accumulate in the highest parts of the enclosed spaces of the building. This is where the detectors should be located.

REMEMBER: A fire alarm system is established to (i) enhance the safety of building occupants and (ii) to minimize damage to the property.

SUPPRESSION

The location of smoke and heat detectors depends on the type of detector being used and the geometry and occupancy of the space. Typically, the maximum coverage areas for smoke and heat detectors are 100 square meters (1,076.4 square feet) and 50 square meters (538.2 square feet), respectively.

There are three types of smoke detectors: ionized, photoelectric, and combined ionized/photoelectric. Ionized smoke detectors are relatively inexpensive, while photoelectric detectors tend to cost more.

Fire Suppression

Once a fire has been detected, a suppression system to extinguish the fire is required to minimize damage and avoid evacuation. A variety of firefighting equipment can be installed in different locations in the hospital to combat specif- ic types of fires, with special consideration to the patients occupying each area and the medical equipment housed in those areas.

Fire Extinguishers

Fire extinguishers are labeled with standard symbols and letters representing the classes of fires that they areABC Dry Chemical

These extinguishers, rated for Class A, B, and C fires, contain 2.3 to 9.1 kg (5 to 20 pounds) of monoammonium phosphate. Monoammonium phosphate is a finely ground extinguishing agent similar in appearance to yellow talcum powder. Nitrogen gas is used for the propellant. Dry chemical extinguishers, which have a range of about 4.6 m (15 feet), are easy to use but extremely messy. They are typically found in hallways and occasionally in labs.

Carbon Dioxide (CO2)

These high-pressure vessels are filled with either 2.3 or 4.5 kg (5 or 10 pounds) of liquid CO2. They are to be used only on flammable liquid or electrical fires. Because the CO2 is expelled as a gas, the extinguisher has a very limited operation range of about 1.2 m to 1.8 m (4 to 6 feet). These extinguishers, easily identifiable because they do not have a pressure gauge, are found mostly in labs or mechanical rooms.

Halon

Halon fire extinguishers, which have a range of about 4.6 m (15 feet), are rated for Class B and Class C fires but are also effective in fighting Class A fires. They use bromochlorodifluoromethane (halon 1211) as their extinguishing agent. Halon is an extremely clean agent that leaves no residue, making it effective for use around computers and other sensitive equipment. However, halon 1211 was deemed environmentally unsafe in 1995, and its use is being phased out in many countries.

Dry Powder

These extinguishers are intended for Class D (metal) fires. The fire is extinguished by isolating and smothering it with either a copper-based or sodium chloride–based powder. Dry powder extinguishers are mounted on two- wheel carts and have a range of 0.9 m to 1.8 m (3 to 6 feet).

HOSPITALS DON'T BURN! Hospital Fire Prevention and Evacuation Guide

How to Use Fire Extinguishers

The following are important considerations before you attempt to fight a fire:
-Make sure that everyone else is leaving the area, someone has sounded the alarm, and someone has called the fire department.
-Ensure that you have an unobstructed escape route at your back.
-Verify that the fire is small, confined, and not spreading.
- Make sure that you know what is burning and that you have the appropriate type of extinguisher to fight the fire.
-You are knowledgeable regarding the use of the extinguisher.
-Make sure that you keep your back to a clear exit and stand 2 to 3 meters (6 to 8 feet) away from the fire.

-Your safety is paramount; if the fire is out of control, leave the area immediately.
Fire wardens (or health and safety officers) and hospital staff should be trained on how to use fire suppression devic- es. Regular training sessions should be undertaken as part of the medical facility's scheduled safety and evacuation simulations

The four steps in using a fire extinguisher can be remembered through a simple acronym: **PASS.**

These extinguishers are rated to combat Class K (grease) fires. In recent years, many commercial kitchens have be- gun to use more efficient cooking appliances and unsaturated cooking oils that operate at much higher tempera- tures than the previous oils and appliances. The Class K extinguisher was developed to combat this new hazard. This extinguisher uses a wet-potassium-acetate-based, low-pH agent that has a greater firefighting and cooling effect for this type of hazard. Most of these extinguishers can safely be used to fight Class A, B, or C fires as well (although the label should be checked first). Their range is 3 m to 3.6 m (10 to 12 feet). Class K extinguishers can be found in kitchens where deep-fat fryers are in use.

P – Pull the pin
This unlocks the operating lever.

A – Aim low
Point the extinguisher nozzle or hose at the base of the fire.

S – Squeeze

Squeeze the lever above the handle to discharge the extinguishing agent. Re- lease the lever to stop.

S – Sweep

Sweep the nozzle or hose from side to side. If the fire is going out, move toward the flames; keep the extinguisher aimed at the base of the fire and sweep back and forth. Watch the fire area once the fire is extinguished and be prepared to repeat

e suppression system with fire extinguishers. There are other fire suppression devices that can be installed in a hospital to improve the facility's resilience to fire hazards. These include water sprinkler and mist sprin- kler systems, water hose reels, and smoke extractors.

Water Sprinkler Systems

-These systems have a water droplet diameter greater than 1 mm, and the cumulative surface area coverage for 1 liter of water is approximately 3 square meters.

-Typically, in fire sprinkler systems, the full network of pipes is constantly charged with water.

-The sprinkler head is a heat-sensitive valve that releases water once the temperature exceeds a fixed temperature, generally 30oC above the ambient temperature.

- Each sprinkler head operates independently and will activate only once sufficient heat reaches the valve. Therefore, only the sprinklers closest to the fire will operate, maximizing the available water pressure to the location of the fire.

-Sprinkler systems cause less water damage than the hoses used by the fire service to combat a fire.

-Sprinkler systems do not automatically discharge water upon activation of the fire alarm but, rather, act independently.

Mist Sprinkler Systems

- Mist sprinkler systems function similarly to traditional water sprinkler systems.
- Their water droplet diameter is less than 1 mm, and their cumulative surface area coverage for 1 liter of water

is approximately 60 square meters.

- Once the system is activated, a pump drives water through a special nozzle to form a dense water mist or fog.
- This mist suppresses and extinguishes the fire through the removal of heat and displacement of oxygen from the fire zone.
- These systems require only a low volume of water, making them safer than some other systems for use around medical and electrical equipment, especially in the ICU.

Some of the key advantages of well-maintained sprinkler systems are:

- They allow for a more open-plan layout in a facility—in other words, longer distances between firecompart- ments—while still meeting fire safety requirements.
- They allow greater flexibility in the design and future adaptability of the space in the facility.

- Structures with sprinklers can reduce fire rating requirements for structural elements by as much as 30 min- utes, depending on building code specifications and a country's regulations with respect to health care facili- ties.

A key disadvantage of sprinkler systems is that they may be quite expensive to incorporate into existing health care facilities. A fire safety specialist should investigate the building's structural and architectural layouts to determine the

HOSPITALS DON'T BURN!

Hospital Fire Prevention and Evacuation Guidefeasibility of installing a sprinkler system. If it is not feasible to install a system for the entire facility, installation should be considered at least for critical areas of the hospital with higher vulnerability to fires.

Water Hose Reels

- Water hose reels should be located on every floor of the hospital, to provide a realistically accessible and con- trolled supply of water to fight a fire.
- Fire hoses are connected to the main water supply or an independent water storage system.
- Fire hoses are typically 18 m to 36 m (59 to 118 feet) in length and have an internal diameter of 13 to 19 mm (0.5 to 0.7 inches). The size of the hose reel used is dependent on the size of the medical facility, as there needs to be sufficient length to overlap adjacent hoses.
- Fire hose reels are all similar in their operation. The general procedure for their use is as follows: n
- Ensure that the nozzle/jet is in the closed position.n Turn on the main valve. Pull the hose off the drum, toward the fire.
- Open the nozzle/valve and direct the stream of water toward the fire.

- Use fire hose reels only to fight Class A fires.Canvas fire hose reels are typically located close to fire hydrant points and are intended for use only by the fire service's emergency response team. It is important to ensure that the hose's nozzle/valve fittings correspond to those used by the local fire service.

Smoke Extractors

The rapid spread and accumulation of smoke usually poses one of the highest risks to human life in the event of a fire. One of the means of minimizing this danger is by incorporating special smoke extraction systems, usually in the initial design of heat, ventilation, and air-conditioning (HVAC) systems.

- Smoke extraction systems are mechanical systems that can be manually or automatically activated once the alarm is triggered.
- These systems are designed to remove hazardous smoke from the area of the fire and prevent the spread of smoke to other areas of the building through the closing of specific

vents and the high-pressure pumping of air to designated areas to to prevent the ingress of smoke.

- Smoke extractor systems tend to be quite costly to incorporate in existing facilities.

Evacuation

Types of Evacuation

Time frames for evacuation may differ depending on the nature of the threat and the amount of time that can be taken to prepare for moving patients. Specific types of evacuations are as follows:

"Emergency move"—evacuate immediately or patients and staff may die; no time to prepare.
Evacuate as quickly and safely as possible; limited time to prepare (1 to 2 hours); follow procedures.
No immediate danger; sufficient time for systematic evacuation procedures (many hours to several days).
Do not move patients, but begin to prepare for evacuation.

EVACUATION

Fire and bomb threats, for example, may necessitate immediate or rapid evacuation depending on the level of danger. Natural disasters with adequate warning periods, such as hurricanes and floods, may require only a gradual evacuation of the health care facility.

The following actions may be needed when the "prepare only" instruction is issued:

- If you hear the fire alarm or see flashing lights, close all fire doors in your area.
- Ensure that egress corridors are clear to allow movement of patients and equipment. Ü Locate and secure patients 'medical records and medical supplies.
- Ready evacuation transport equipment such as wheelchairs, blankets, and gurneys. Ü Set in motion a system to move people to designated assembly points.13
- Await further instructions; do not evacuate unless given the authorization to do so.

Movement

The hospital's incident commander determines, based on reports from the persons who detected and/or reported the fire situation, what type of evacuation is required:
Horizontal: The primary mode of evacuation, this involves moving patients in immediate danger away from the threat but keeping them on their current floor.
Vertical: This usually involves the complete evacuation of a specific floor in the hospital. Patients and staff will be evacuated out of the hospital only if necessary.
Shelter in Place: The staff may be instructed to "shelter in place," that is, remain in their units and await further instructions.

The type of movement is dependent on the type of hazard; for instance, the fire may be on the floor below or the threat may be a tsunami, in which case the evacuation sequence will be to move upward.

Evacuation Routes

Evacuation routes should be clearly established, as detailed earlier in Section 1.2.4. All hospital staff should have working knowledge of the evacuation routes and which one to take, based on the type of evacuation and as instruct- ed by the hospital's incident commander.

Specifically assigned staff members, sometimes referred to as "wardens" or "health and safety officers," should then direct patients and visitors to orderly and calmly evacuate.
Evacuation planning must take into consideration all spaces around the hospital compound. This will help in the development of emergency transit routes, assembly areas, holding areas, and so forth.

Level of Evacuation

The level of evacuation can be one of the following:
Complete evacuation
Partial evacuation
In most emergencies, a full evacuation will not be required. Due to the complex needs and unstable condition of many hospital patients, evacuation is generally considered as a last resort. Evacuation should be ordered only when absolutely necessary and when there is an imminent or potential unmitigated threat to patient/staff safety.

The following situations may warrant evacuation:
-Fire, smoke, and/or toxic fumes
- Structural damage to the facility

HOSPITALS DON'T BURN!

Hospital Fire Prevention and Evacuation Guide
- Potential exposure to hazardous materials Ü
- Terrorism or violent, armed visitors
- Credible bomb threat
-

When more time is needed and is available to assess the danger posed by the situation, hospitals should consider issuing a prepare only order.

Estimating Needed Personnel Resources

Effective evacuation of a health care facility depends on the number of staff and trained personnel available, at any given point in time, to perform the necessary evacuation duties. Understanding the scope of the evacuation and knowing the minimum number of people required to undertake these procedures in the event of an emergency is paramount in saving lives.

1.Number of staff is a crucial component of the aim to save lives in emergency situations in hospitals. A comprehensive evacua- tion plan needs to be in place that all staff members are aware of and are experienced in carrying out.

This section presents the basic steps involved in the evacuation of a medical facility. It is important to note that there is no fixed methodology for evacuations; the procedure will vary for each individual health care facility.

Recall that evacuation procedures are undertaken only as a final resort action for the hospital. In the case of a fire, evacuation is performed once the preventative and suppression measures described earlier have failed to contain the fire and lives are under immediate threat.

The following assumptions were made in the development of this document:
1. The hospital's Incident Command System (ICS) will be used throughout the duration of the evacuation response.
2. This guide does not replace or alter the hospital's fundamental ICS structure but is intended to contribute to additional operations that may be activated during an evacuation.

Evacuation of a health care facility may be required in a range of disasters, not only in the event of fires. The following table lists some of these disasters

Standard acceptable ratios of number of medical staff to number of patients have been established. These ratios are dependent on the level of care required for each patient.

function equally well in all hospitals and all circumstances. Listed below are some general potential evacuation priorities in selected scenarios. Hospital leaders, including the chief executive officer, administrators, and the hospital board, should use these scenarios to discuss patient prioritization as part of their planning efforts.
In an immediate evacuation that is severely time sensitive and involves immediate and broad threats to life safety, the priority must be to get as many patients out as possible. Therefore, the acuity model16 (wherein the patients needing the most assistance are the last to be moved) may be adopted in these situations. Default priorities in such situations are indicated

If time is critical and the acuity model is employed, ICU patients may be moved after all of the general care units have been evacuated. In addition, to maximize the number of patients evacuated in the least amount of time, this model ensures that critical care patients have access to medical gases, suction, and monitoring for as long as possible.

If a resource model evacuation is possible, ICU patients should be evacuated as transport resources become avail- able. Although ICU patients may be the last to leave the hospital, they should be the first to leave the assembly point, as they are the highest priority for transfer to other hospitals.

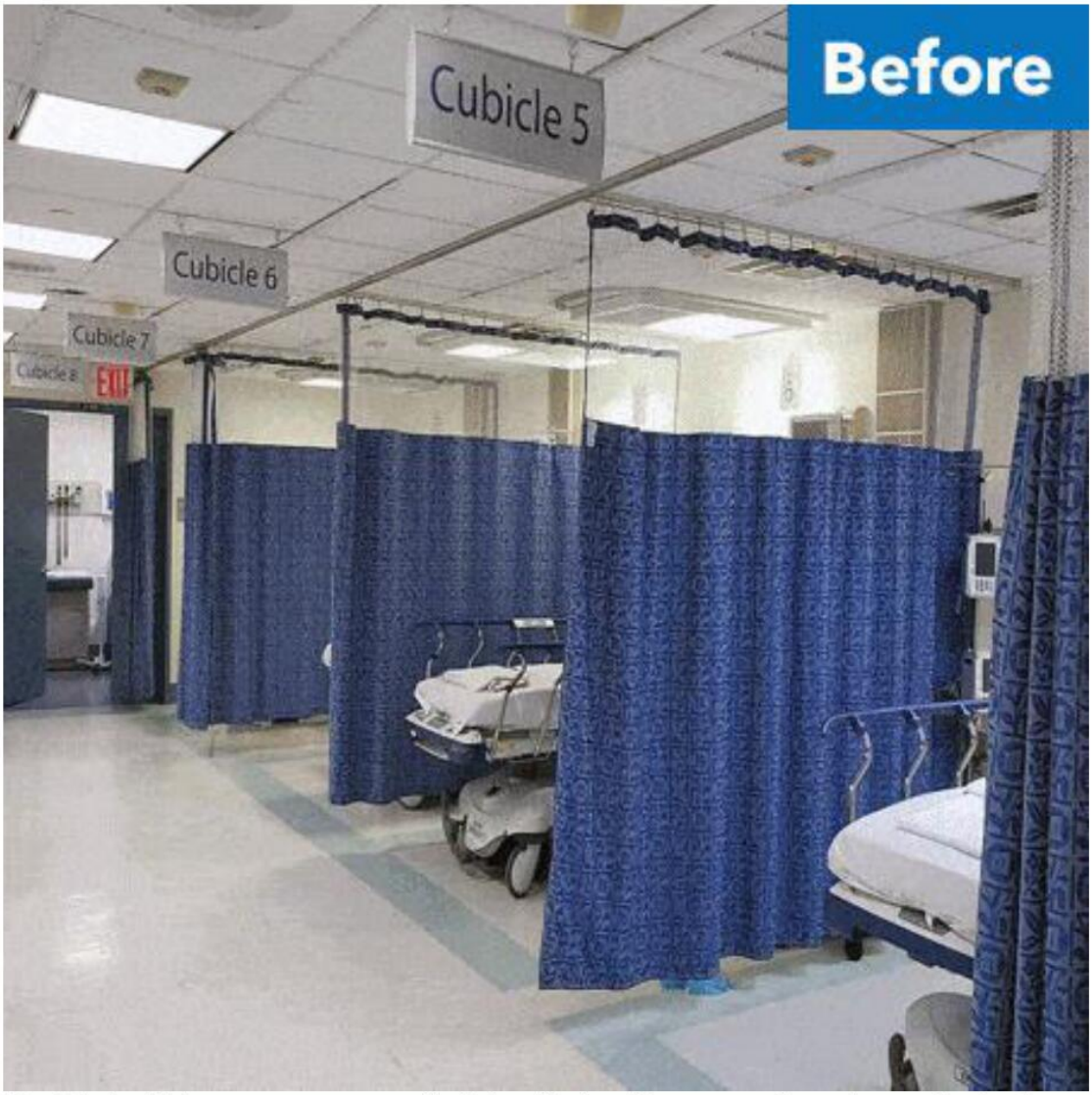
In a rapid evacuation, the default transport plan should be based on an orderly, rapid process in which entire patient care units are moved sequentially. Simultaneous evacuation may also take place; that is, a general medical/surgical unit and an ICU may be evacuated in parallel when possible to avoid uneven demand on EMS resources.

There is controversy regarding the order of floor evacuations, but one recommended plan is to evacuate from the top of the building to the bottom if elevators are available or from the bottom of the building to the top if only stairs are available. It is important to note that, in situations such as fires and earthquakes, elevators should not be used.

1. Infra structure planning
2. Electrical system planning

INFRA STRUCTURE PLANNING

Mechanical and electrical systems act as vital organs to a hospital, providing power, water, fresh air and other important elements that keep the hospital running efficiently and safely.
Keeping those systems healthy is an essential part of being a health facilities manager. However, it can be challenging to stay up-to-date with the requirements and developments of hospital mechanical and electrical systems.



Health facilities managers can find detailed guidance on these issues in the latest editions of the *Mechanical Systems Handbook for Health Care Facilities* and the *Electrical Systems Handbook for Health Care Facilities*.

The key issues covered in depth in these American Society for Healthcare Engineering (ASHE) handbooks will give health facilities managers a solid foundation in these systems to meet the special needs and functions of their facilities.

Mechanical system issues

Proper construction and maintenance of mechanical systems, primarily heating, ventilation and air conditioning, are essential to the health of a hospital. Because of infection control, patient comfort, environmental concerns and other factors, mechanical systems in hospitals must be designed and maintained at a higher standard than those in a typical building. In recent years,

another essential mechanical systems issue has moved to the top of priority lists for facility managers: energy efficiency.

"I think the whole industry realizes that we need a paradigm shift in hospital systems design regarding energy use," says Ronald G. Holdaway, PE, a senior mechanical engineer with vast experience in health care facilities and the author of the latest edition of the *Mechanical Systems Handbook.*" Forty-two percent of energy used in hospitals is spent on reheating air. For years, the industry has made the excuse for high energy consumption that hospitals are unique and we can't save energy because it's a hospital, but all of a sudden the light bulb went off that we don't have to design the energy-consumption systems in a hospital the same way as we have in the past."

Some key mechanical systems issues health facilities managers should understand include:

Codes issues. Mechanical systems in health care facilities are regulated by standards established by a number of organizations, including the Facilities Guidelines Institute, ASHE, the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), the American National Standards Institute, the National Fire Protection Association (NFPA) and others. Chapter 7 of the *Mechanical Systems Handbook* provides a list of major codes to guide facility managers, and Appendix A-1 is a front-end project report that helps facility managers to prepare for inspections.

Energy efficiency. An entirely new chapter in the *Mechanical Systems Handbook,* called "High-Performance Design and Operation," spells out key design issues regarding efficiency.

"There are many low-cost things we can do from a design standpoint that can reduce energy use," Holdaway says. "We can also retrofit buildings at relatively low cost and still significantly reduce energy consumption in the facility."

A first step in creating an energy-efficient hospital is to benchmark energy use. One tool to use is ASHE's free Energy to Care benchmarking program that works with Energy Star Portfolio Manager and provides helpful data in graphic format and trend information. Energy to Care also includes an award program for ASHE members to recognize hospitals that have reduced energy consumption.

Other aspects of energy efficiency include measurement and verification. Metering can be added to such mechanical systems as cooling, heating and domestic hot water, and to electrical systems like HVAC loads, plug loads and lighting to direct efforts to reduce energy consumption.

Energy conservation specific to HVAC is highlighted in Chapter 8. Because patient comfort is a top priority in hospitals, energy conservation in HVAC sometimes takes a back seat. But Holdaway notes that properly scheduled maintenance does not need to interfere with patient comfort.

Powerhouse equipment. Powerhouse equipment is the primary heating and cooling equipment in a hospital. The equipment — boiler, chiller, etc. — likely was installed when the hospital was built, but facility managers should be aware of new system options, maintenance issues and code requirements.

An important powerhouse maintenance issue is proper chemical treatment of water in the cooling tower, which extends the life of the tower and maintains efficiency.

Another water treatment issue that facility managers must understand is minimizing the growth of *Legionella* in the cooling tower and the rest of a building's water system. The handbook references a new ASHRAE publication, 188P, which requires hospitals to establish a formal program to minimize *Legionella*

Heating, ventilation and air conditioning. HVAC, and air handling systems in general, play an important role in hospitals. Indoor air quality is essential to the comfort of patients, employees and visitors.
To properly understand HVAC principles, facility managers should have a basic understanding of the first two laws of thermodynamics, Holdaway says.
"In Chapter 5, I added a whole section on the basic laws of thermodynamics," he says. "Some would say that for the audience of maintenance engineers this is probably overkill, but I thought it was important. Quite honestly, I think the bar has been raised; they are better educated than in the past."
The next step in managing HVAC is understandingpsychrometrics, the dynamics of moist air. Appendix A-3 of the *Handbook* provides example psychrometric problems to help facility managers understand the use of a psychrometric chart.

A new section of this edition of the *Mechanical Systems Handbook* deals with chilled beams, a new way to maintain air temperature. "Chilled beams were not even an option when the previous editions were written," Holdaway says. "They have been introduced in just the last five to seven years."

Testing, balancing and adjusting the HVAC are other essential roles of facility managers. This work should be handled by certified contractors after a major construction project, but in-house staff can do the work after minor projects. Chapter 10 includes a guide for basic procedures in this regard.

Another important issue that facility managers should understand is commissioning, which is found in Appendix A-4. ASHE has several publications available on commissioning health facilities, including the *Health Facility Commissioning Guidelines* and the *Health Facility Commissioning Handbook*.

Electrical system factors

Electrical systems control nearly every aspect of a modern hospital, and a knowledgeable facility manager recognizes the interconnectedness of electrical systems and their energy sources. A hospital's electrical system must provide reliable, disturbance-free power around the clock.

Furthermore, it must be exceedingly safe, because patients are often in vulnerable states. All of this must be accomplished according to overlapping regulations from national and local authorities.

"Electrical systems in hospitals are more complex than those found in other buildings," says Hugh O. Nash Jr., PE, FIEEE, FASHE, author of the *Handbook of Electrical Systems* and a consulting electrical engineer."The complexity of the diagnostic and treatment equipment in hospitals makes [it] heavily reliant on electricity. Reliability is probably the No. 1 concern, but electrical safety is also a huge concern."

Basic issues and recent developments surrounding hospital electrical systems include:

Standards and codes. Anyone dealing with electrical systems in a hospital must have a basic understanding of the plethora of standards and codes affecting the field. Depending on the hospital, standards that must be followed include those adopted by state and local health departments, the Joint Commission and the Centers for Medicare & Medicaid Services. Typically, authorities reviewing the design and construction of health care facilities use codes established by the NFPA, including NFPA 70: National Electrical Code; NFPA 99: Health Care Facilities Code; NFPA 110: Standard for Emergency and Standby Power Systems; and NFPA 111: Standard on Stored Electrical Energy Emergency and Standby Power Systems.

Overcurrent protection. A facility manager must understand the basics of protecting against "faults," which are open circuits, unintended grounds and short circuits. The equipment that protects against faults includes circuit breakers, fuses and ground-fault protectors. Every hospital should undergo an evaluation to ensure that overcurrent protective devices can handle the highest possible faults.

Arc flash and selective coordination. Arc flash and selective coordination are related to overcurrent protection, and a new chapter of the *Electrical Systems Handbook* specifically addresses this topic.

"Arc flash is a pretty hot topic in the industry right now, so it's timely," Nash says. "There's long been an understanding of the arc flash phenomenon and the risk it presents. But now the risk has been quantified, and it can be protected against with personal protective equipment (PPE)."

Arc flash and selective coordination are closely related. Selective coordination of overcurrent devices is generally desirable, because it ensures that the smallest area of a facility will have its power interrupted when a fault is cleared. But selective coordination means there is a time delay in tripping the circuit breaker, which increases the arc flash incident energy and the resulting risk.

To limit the risk of arc flash, managers should know the basics of reducing the incident energy of the arcs — by reducing the magnitude and time duration of the arc current — and understand the importance of distance and PPE in reducing the physiological effects of arc flash.

Essential electrical systems.

Naturally, the electricity supply in a hospital must be reliable, and NFPA codes specify a number of requirements, including the installation of automatic transfer switches and the presence of

multiple branches to separate loads by type. Facility managers should be aware of the different types of acceptable generators, how they are fueled, and the basic operational procedure.
An important and growing topic is the parallel operation of generators, and a new chapter was added to the *Electrical Systems Handbook* to deal with this topic. "More and more hospitals are using paralleling systems, so it's incumbent upon engineers to have a better understanding," Nash says. "Also, there are some new technologies that attempt to mimic paralleling systems at a reduced cost, but that are not true paralleling systems with dedicated synchronizers for each standby generator. Some of the newer systems are not totally adequate, and this has created some confusion in the industry."
A section about ground-fault interruption explains that such protection was prohibited for standby generators by previous editions of NFPA, but the larger sizes of health care generators, especially paralleled sets of generators, led the NFPA 70 committee to make ground-fault protection optional.

Patient safety. Keeping patients safe from electrical shock is generally accomplished by grounding metallic surfaces that are likely to become energized, and by protecting people from energized parts. Facility managers should be aware of NFPA requirements, such as the use of isolated power systems as alternatives to ground-fault interrupters in wet locations, and the specific requirements for operating rooms.
Lighting. Requirements for lighting in hospitals vary widely, because these facilities contain offices, public spaces, sleeping quarters, work areas and many other spaces. Lighting in patient care areas should be cleaned frequently and have minimal crevices or cracks, which can trap infectious material. Operating rooms have specific lighting needs; for example, computer monitor glare must be carefully controlled. The latest edition of the *Electrical Systems*

Maintenance and testing. Maintenance and testing are critical for hospital electrical systems, but they need to be tailored to each facility. NFPA codes applicable to testing and maintenance recently have changed to emphasize customized maintenance. Among the basic concepts that apply to all health care facilities are the recommendations to create a one-line diagram that shows the connectivity of the electrical system and an equipment-labeling protocol that indicates voltage, location and other information

A great resource

Hospital electrical and mechanical systems are complicated and ever-changing, and maintaining them requires constant attention. The ASHE handbooks provide a great resource for health facilities managers who are trying to wrap their arms around these systems.

3. Equipment planning

4. Safety , security equipments

5. Fire protection equipments

6. Fire protection systems

7. Fire safety training and practices

8. NAHB standards

NABH & FIRE SAFETY

Fires can be devastating, especially in a hospital where a large number of people who need to be evacuated may be vulnerable – immuno compromised, on life support, and incapable of moving on their own. There are special requirements that must be met with while evacuating such people in case of fire emergencies. But before that " –fires must be prevented".

The 'part 4 'of 'National Building Code of India – 2005 'on 'Fire & Life Safety 'covers the requirements for fire prevention & life safety in relation to fire and fire protection of buildings. The Code specifies construction, occupancy and protection features that are necessary to minimize danger to life and property from fire.
Buildings on the basis of occupancies have been divided into different groups in the chapter. Hospitals have been classified as sub-division C-1under Group C for Institutional Buildings with some specific requirements applicable for this category in addition to the general requirements common for all occupancies.

The NBC gives detailed guidelines for Construction Materials, General Requirements for all buildings, Life Safety, Fire Protection, Specific Occupancy wise Requirements and specific requirements for buildings above 15 meters.

NABH Survey:

During its survey process the NABH auditors look into the following to ensure that the organization is compliant with Fire Safety Regulations:
Fire Prevention and Control Infrastructure:
1. TheorganizationhasupdatedNOCfromstateFireDepartment.
2.Theorganizationhasamultidisciplinarysafetycommitteewithaseniorpersonasthechairmanofthesafety committee. The safety committee meetings are held at least once in 3 months. The minutes of the meeting are recorded and put up to the senior management.
3. TheorganizationhasaformallyappointedFireSafetyOfficerin-chargeofallconcernsrelatedtoFirePrevention& Safety. The Fire Safety Officer should be preferably from Security Staff and should be aware of all fire safety protocols.
4.TheorganizationhasawrittenplanforFirePreventionandSafetyandhasaFireSafetyManualapproved bythe safety committee.
5.TheorganizationhasanEmergencyCommandCentrethatbecomesfunctionalimmediatelywhenever thereisan emergency. There is a written protocol and written constitution of the committee and the Fire Command Centre is update with the name of the members. A designated person has the responsibility of informing all the Emergency Command members.
6. TheFireSafetyManualhasthefollowingcomponents:
• Plan for fire prevention & control.
• Systems for fire prevention & control.
• Maintenance Schedules/ SOPs for systems related to fire prevention & control
• Inspection protocols for fire safety installations.

• Codes for announcement of fire related emergency, procedures and communication protocols for the same.

• Responsibilities of different departments in case of fire.
• Procedures, frequency & protocols for mock drills.
• Constitution of Fire Fighting & Evacuation Teams.
• Evacuation Plan.
• Electrical Safety & System.
7.AmultidisciplinarycommitteeWhichhasFireSafetyOfficerasamember,holdsfacilityroundsatleast onceayear for non-clinical areas & twice a year for clinical areas. Fire Safety requirements are on the checklist of the said committee and the reports are submitted in writing to the safety committee.
8. Thesafetycommitteehasasystemwherebyallfiresafetyconcernsareaddressed.

9.Themockdrillsareconductedandthereportssubmittedtothesafetycommittee.Necessaryactionistak ento address any issues that crop up during mock drills.
10.The fire exits are well defined and end on the ground floor or refuge area or any safe place decided by the management.
11.The Fire Signages are appropriate and placed at the right locations.
12.Emergency fire signages are glow in dark signages.
13.The Fire Signages are visible and are bilingual, with one local language.
14.The egress routes are free from any materials that would cause hindrance in evacuation.
15.The Fire Doors have a proper fire rating and open outside.
16.The Fire Doors preferably have panic bars.
17.The Fire Doors remain open at all times.
18.The Fire cabinets are open all the time.
19.The Manual Call Points have means to break the glass.

20.The Fire Alarm syatems are properly tested and maintained and a record is kept for the same.
21.The Emergency Exit signs should be displayed prominently.
22.The stairwells used for evacuation are pressurized in case of fire emergency.
23.The lifts are not used in case of fire.
24.The HVAC system has appropriate fire dampers to prevent spread of fire that function properly in case of fire. The dampers are tested and have a regular preventive maintenance schedule.
25.All the equipments have an organized preventive maintenance schedule that is recorded and stickers put on the equipments showing the date of preventive maintenance check and the next date for maintenance.
26.Appropriate type & number of fire extinguishers have been installed according to the type of fire that could take place.
27.The Fire Extinguishers have a regular preventive maintenance schedule and stickers are put showing the date of checking and the next scheduled date for checking.
28.10% of Fire Extinguishers are used every year for checking the same.
29.The building has an approachable peripheral road around it for access by fire brigade.

30.The Fire Pump House is maintained properly and the pumps have pressure gauges that have been calibrated and appropriate pressures are maintained in the fire hydrant & sprinkler lines.

31.There is a proper training program for handling fire emergencies and training records are maintained. The entire staff is imparted fire safety training.
32.The staff is aware of the fire fighting systems, responsibilities during fire emergencies, evacuation routes & techniques, conversant with the type of fire extinguishers and their area of use, trained to operate fire extinguishers, code announcements and assembly points in case of fire.
33.The organization has policies & protocols for storing, dispensing & use of flammable materials. Appropriate warning signs for flammables are displayed.
34.Electrical safeties are in place. Preventive maintenance & testing is done at regular pre decided intervals and are recorded and stickers affixed.
35.All electrical panels have a rubber mat in front of them.
36.Theearthing system is tested regularly.
37.The UPS batteries are checked regularly by loading the same periodically to check any heating up etc.
38.There is proper ventilation in panel, UPS & equipment rooms to avoid overheating.
39.There is an approval from the Indian Explosives Department for bulk storage of Diesel & any other flammable material as per Indian Explosives Act, in case stored in bulk.
40.The pumps used for pumping fuel are of flame proof construction. 41.The Provisions are there to take care of fuel overflow.
42.Flues are properly insulated.

Gas supply installation

Medical Gas Definition
Medical Gas is defined as: NITROGEN, OXYGEN, NITROUS OXIDE and MEDICAL AIR. In addition, Waste Anesthesia Gas Disposal (WAGD) and Medical Vacuum are also considered part of the Medical Gas system.

Location(s)

Medical Gas Medical and shut-off valves are located in patient care areas near nursing stations and procedure rooms. The shut-off valves are inside a 12” square cut-out in the wall, covered by a clear plastic door that can be removed by pulling on the metal ring attached to the center of the plastic door.
Medical gas shut-off valves are generally separated into zones (controlling a group of rooms/suites) or are dedicated to a single room/suite. The zone valves will identify by label and/or placard which rooms/suites they control. Pay attention and identify the right location (zone).

Authorized Personnel

There’s ’authorized personnel that are assigned to properly shut off the medical gas in case of an emergency. Medical gas shut-off authority is assigned to Respiratory Therapy, Health System Facilities and the Charge Nurse or Area Supervisor. The decision to shut off the medical gas should be made in consultation with the Charge Nurse or Nursing Supervisor.

Steps to consider to properly shut-off valves
Step #1: Identify if medical gases are actually an existing or continuing hazard to the incident/emergency.

Step #2: Staff can verbalize their understanding of whether they can wait for the Fire Alarm Response Team to respond to shut-off the gases.

Step #3: Identify all rooms/suites and/or patients that are being supplied gases and provide alternative sources (i.e. prepare for shut-off with medical gas cylinders and have additional cylinders delivered)

Step #4: Staff can identify which medical gas line shut-off valve controls which group of rooms/suites.

Step #5: Is the staff competent to perform bag mask ventilation in the event that the medical gases are shut off?

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FIRE PROTECTION

INTRODUCTION PURPOSE

It is the policy of Duke University to take all possible steps to minimize the potential for fires and to install and maintain equipment necessary to control fires if they occur.

RESPONSIBILITIES

Facilities Management Department Construction Services, the Medical Center Engineering and Operations Department, and the Office of the University Architect shall ensure that all new installations of fire alarm systems, fire suppression systems, extinguishers and fire alarm equipment to include standpipes, sprinklers, hydrants and fixed extinguishing systems meet all federal, state and local regulations.

Departments shall:

• Ensure that employees are adequately trained in portable fire extinguisher use and general fire evacuation procedures.
• Report any extinguisher out of place, or one which appears to have been used, to the OESO-Fire Safety Division at 684-5609.

Employees shall know the location(s) of fire equipment in their specific workplace, be able to utilize such equipment as necessary and be familiar with all exits and evacuation instructions.

OESO shall:

• Inspect work places on a periodic basis.
• Ensure that adequate fire extinguishers of the correct type and size are available.
• Ensure that extinguishers are tested monthly.
• Monitor the installation and maintenance of fire equipment and suppression systems.
• Conduct fire drills and extinguisher training.
• Coordinate inspections by the Durham Fire Marshal and other fire inspection officials.

PROCEDURES

FIRE EXTINGUISHERS

Extinguishers shall be located, labeled, and maintained so that they may be easily identified and in good operating condition.
All fire extinguishers shall be checked monthly to provide reasonable assurance that they operate properly.

EVACUATION AND GENERAL FIRE PROCEDURES HOSPITAL/MEDICAL CENTER

If a general evacuation is ordered, all persons (patients, visitors, and employees) must evacuate the building. Such circumstances would be an extreme emergency and ordered by Hospital Administration. General evacuation in Duke North and South Hospitals, the Eye Center, and the Clinical and Research Laboratory Building will be announced by the BAS Dispatcher over the building automated announcement system. In other Medical Center Buildings an audible alarm will sound. Persons should be evacuated to the outside of the building by using stairs designed as EXITS.

Medical Gas Shutoff

To assure that patient safety issues are adequately addressed prior to shutting off medical gases during an emergency situation (e.g., spread of a fire), the following procedure clarifies who is authorized to initiate a medical gas shut off. The procedure outlined below applies when there is a fire at or near the medical gas distribution valves in a patient's room. Note: Medical gases should NOT be shut off during fire drills.

- The primary responsibility for shutting off medical gas(es) in a true emergency/fire situation (when medical gases could contribute to he spread of a fire) is the Charge Nurse. On Intensive Care Units, the Charge Nurse must consult with the Respiratory Therapist, when available, to assure appropriate patient support after the medical gases are shut off.
- The Nurse Manager (during normal working hours) and the Administrative Nursing Supervisor (during 2nd and 3rd shifts, holidays, and weekends) will respond to all fire alarms on their assigned units as quickly as possible to support the Charge Nurse's decision and response.
- Respiratory Care personnel will respond to all fire alarms on inpatient units as quickly as possible to support the Nursing decision and response
- Occupational and Environmental Safety personnel will respond to all fire alarms on inpatient units as quickly as possible to support the Nursing decision and response.
- Directions on how to turn off medical gas valves will be posted on each valve. CAMPUS

Total evacuation is required from all sections of the building. The signal for evacuation is the sounding of the audible devices of the building fire alarm system

GENERAL EVACUATION PROCEDURES

R -REMOVE ALL PERSONS IN IMMEDIATE DANGER TO SAFETY to include patients, visitors, students and employees.

A -ACTIVATE MANUAL PULL ALARM/DIAL 911.
Give the following information:
The exact location of the fire (Building and Location-Area, Building Zone or Color or Zone Floor, Room Number) and the name of person calling and phone number.
C -CLOSE ALL DOORS AND WINDOWS to prevent the spread of fire and smoke. E - EXTINGUISH THE FIRE with a portable fire extinguisher or EVACUATE THE AREA. DO NOT USE THE ELEVATOR.
NOTE: Employees should review the Departmental Safety Procedures and Site Specific Fire Plan to familiarize themselves with all specific duties and responsibilities assigned to their job description.
FIRE DRILL PROCEDURES
Fire drills are required by law. They are held, not only to comply with this law, but also to protect patients, visitors and employees in the buildings. The drills may be conducted at any time. All Duke buildings are subject to fire drills. See Supplement U for hospital specific procedures.

EXITS IN OCCUPIED BUILDINGS

Doors, aisles, corridors or passageways leading directly to an exit must be kept clear of all obstructions at all times to include chairs, tables, merchandise, equipment or similar impediments.
No door, exit corridor, aisle, passageways leading to an exit or exit sign may be fully or partially covered, blocked, locked, or hidden by any decorations, objects (signs, banners, tables, chairs, etc.) or covering (sheets, banners, drapes, etc.).
Areas directly outside of an entrance or exit must be kept clear of all encumbrances for a minimum distance of 12 feet.

OPEN FIRES

No open fire, cooking fire, campfire or bonfire will be allowed on University property unless the individuals responsible have obtained written consent of the OESO-Fire Safety Division and a permit from the Durham Fire Marshal.
Open Fire Permits will be issued on a case by case basis only depending on weather conditions, acceptable location and general compliance as outlined in this policy and local ordinances.

ELECTRICAL EQUIPMENT

All electrical equipment utilized (lights, wires, plugs, connections, sockets, etc.) shall be UL approved and in good condition. The use of improvised wiring is prohibited.
All combustibles shall be kept at least 6 inches from any incandescent/fluorescent bulbs, electrical sockets, plugs, or other electrical appliance.
Portable space heaters are prohibited unless authorized by the Occupational and Environmental Safety Office, and either the Facilities Management Department (Campus) or Engineering & Operations (Hospital & Medical Center).

DECORATIONS

Electrical:
Holiday lights shall not be left energized more than 3- hours daily to reduce overheating.

Electrical lights (110 volt) and fiber optic lights (110 volt) shall not be used on artificial Christmas trees, wreathes and greenery. Only UL or FM approved, battery operated, 9 volt lights may be used.

Each living group or office area should have an appointed representative to ensure that the electrical decorations are de-energized at the end of the daily period.
Holiday/Theme Party Decorations:
All decorations must be noncombustible, inherently flame resistant or treated with an approved fire retardant in accordance with manufacturer's specifications that will pass NFPA 701 test. Decorative materials shall not exceed 10% of the aggregate areas of walls and ceilings.

Straw, hay, corn fodder, dried flowers, bamboo and other similar combustibles are prohibited as decorations inside facilities without written authorization from the OESO- Fire Safety Division. Exit doors and smoke doors may not be covered or blocked in any manner by decorations.

All combustible party decorations shall be removed from the area immediately following the event.
Exception: During the Christmas Holidays decorations should be removed no later than December 30th. Residence Halls should have all decorations removed no later than the closing of the residence halls by Housing Management.
Greenery, such as live Christmas trees and holly, are prohibited inside of Hospital and Medical Center buildings. In addition, live Christmas trees and holly are prohibited in Assembly areas, Schools, Day Care Centers, Stores, Hotels or Residence Halls unless the building is protected throughout by an automatic sprinkler system.

If a live Christmas tree is allowed in a facility, the following rules apply:
• Only one tree will be purchased for each department, group or living group and the tree located in a public area such as a commons area, reception area or lounge.
• All trees will be prepared by sawing off the trunk of the tree at an angle at least one-half inch or more above the original cut and spraying the tree with an approved fire retardant in accordance with manufacturer's specifications as required by NC State Building Code.
• The tree will be placed within a tree holder/stand capable of containing water to prevent drying. The stand will be checked daily to assure the water level is adequate. Remember: A tree will absorb large quantities of water while it is indoors.
• The tree will be placed in a location away from all heat sources.
• Smoking is not permitted near trees or other "live decorations".

Candles or other open flames are strictly forbidden for use inside University facilities except during religious ceremonies such as the observance of the Holiday of Chanukah. Those individuals wishing to utilize candles in observance of a religious holiday should contact OESO-Fire Safety Division to obtain information concerning fire prevention.
All personnel should know the location of building fire equipment to include fire extinguishers and manual fire alarm pull stations.

Keep all decorations (electrical and combustible) out of the reach of small children.

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All employees are required to attend a fire safety training session upon hire and annually thereafter. The training covers fire prevention, procedures to follow in a fire, evacuation, and extinguisher familiarization.

Value Added Course

Fire Hazards In Hospital Environment

Annexure II

STUDENT ENROLLMENT LIST (JULY-DEC 2020)

S.No.	University no	Name of the student	Year / CRRI	Signature
1.	U14MB281	NILA.R	II nd	
2.	U14MB282	NIMINESH.B.S	II nd	
3.	U14MB283	NIVETHA. B	II nd	
4.	U14MB284	NONG LEGO	II nd	
5.	U14MB285	OBED NEWMAI	II nd	
6.	U14MB286	PAVITHRA. S	II nd	
7.	U14MB287	PRADEEPA. A	II nd	
8.	U14MB288	PRASANNA.S	II nd	
9.	U14MB289	PRAVEENKUMAR.V	II nd	
10.	U14MB290	PREMKUMAR. P	II nd	
11.	U14MB291	PRIATHAM SWAMINATHAN.S	II nd	
12.	U14MB292	PRITHVIRAJAN. R	II nd	
13.	U14MB293	PRIYADHARSHINI.K	II nd	
14.	U14MB294	PRIYADHARSHINI.P	II nd	
15.	U14MB295	RAJALINGAM. N	II nd	
16.	U14MB296	RAJESWARI. J	II nd	
17.	U14MB297	RAMKATHIR	II nd	
18.	U14MB298	RANGARAJAN. R	II nd	
19.	U14MB299	RAVEENDHAREN.V	II nd	
20.	U14MB300	RENIL KUMAR. A	II nd	

RESOURCE PERSON

Dr K SELVARAJU

COORDINATOR

Dr RAJI SHARMA

ASSESSMENT

Annexure III

FIRE HAZARDS IN HOSPITAL ENVIRONMENT MCQ

1. PEEP stands for_____

    a. Personal evacuation exit point

    b. Prevention evaluation evacuation precaution

    c. Personal emergency evacuation plan

    d. Private evacuation exit point

2. How after fire alarm should be tested

    a. Once a week

    b. Once a year

    c. Once every 12hours

    d. Once a month

3. The available fire extinguisher can only use for a duration of

    a. 30-40sec

    b. 3-4min

    c. 15-20sec

    d. 1-2hours

4. In a case of fire we should rescue

    a. All patients

    b. All staffs

    c. Those at immediate danger

    d. All investors and contractors

5. When extinguishing a fire, you should

a. Turn your back always to north

b. Turn your back to fire exit

c. Turn your face to fire exit

d. Turn your face to south

6. When a fire breaks out, evacuate

a. Non ambulatory patients

b. Semi ambulatory patients

c. Ambulatory patients

d. None of the above

7. The ALERT step in RACE means

a. Code red

b. Break the alarm glass

c. Dial- 22

d. All the above

8. RACE stands for

a. Rescue alarm confine search

b. Release, accurate, contain, evacuate

c. Run away to the closer exit

d. Rescue, alarm, contain, evacuate

9. A lateral evacuation of patient care area involves

a. Closing all patients care area doors on the exit

b. Evacuating the patient through the smoke/ fire to a safe zone

c. Conducting a head count of the patient and staff

d. All the above

10. Steps of emergency management

    a. Mitigation

    b. Recovery

    c. Response

    d . All the above

Rangarajan-R

ASSESSMENT --Annexure III

FIRE HAZARDS IN HOSPITAL ENVIRONMENT MCQ

7/10

1. PEEP stands for_____

   a. Personal evacuation exit point

   b. Prevention evaluation evacuation precaution

   c. Personal emergency evacuation plan

   d. Private evacuation exit point

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b. Recovery

c. Response

d . All the above

Rajeshwari J.

8/10

ASSESSMENT --Annexure III

FIRE HAZARDS IN HOSPITAL ENVIRONMENT MCQ

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c. Conducting a head count of the patient and staff

d. All the above

10. Steps of emergency management

a. Mitigation

b. Recovery

c. Response

d. All the above

Annexure V

Student Feedback Form

Course Name: **FIRE HAZARDS**

Subject Code: **ANAES 01**

Name of Student: NILA. R Roll No.: U14HB281

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Sl. NO	Particulars	1	2	3	4	5
1	Objective of the course is clear			✓		
2	Course contents met with your expectations				✓	
3	Lecturer sequence was well planned					✓
4	Lectures were clear and easy to understand			✓		
5	Teaching aids were effective				✓	
6	Instructors encourage interaction and were helpful			✓		
7	The level of the course					✓
8	Overall rating of the course	1	2	3	4	5

** Rating: 5 – Outstanding; 4 - Excellent; 3 – Good; 2– Satisfactory; 1 - Not-Satisfactory*

Suggestions if any:

NIL

Annexure V

Student Feedback Form

Course Name: **FIRE HAZARDS**

Subject Code: **ANAES 01**

Name of Student: PRADEEPA. A Roll No.: 014MB287

We are constantly looking to improve our classes and deliver the best training to you. Your evaluations, comments and suggestions will help us to improve our performance

Sl. NO	Particulars	1	2	3	4	5
1	Objective of the course is clear			✓		
2	Course contents met with your expectations		✓			
3	Lecturer sequence was well planned				✓	
4	Lectures were clear and easy to understand					✓
5	Teaching aids were effective			✓		
6	Instructors encourage interaction and were helpful					✓
7	The level of the course					✓
8	Overall rating of the course	1	2	3	4	5

** Rating: 5 – Outstanding; 4 - Excellent; 3 – Good; 2– Satisfactory; 1 - Not-Satisfactory*

Suggestions if any:

NIL

Date: 22.12.2020

From
Dr. Raji Sharma
Professor and Head,
Department of Anaesthesia
Sri Lakshmi Narayana Institute of Medical Sciences
Puducherry

To
The Dean,
Sri Lakshmi Narayana Institute of Medical Sciences
Puducherry

Sub: Completion of value-added course: Fire hazards in hospital environment

Dear Sir,

With reference to the subject mentioned above, the department has conducted the value-added course titled: Fire hazards in hospital environment in July- Dec 2020 for 20 students. We solicit your kind action to send certificates for all the participants, whose name list is attached with this letter. Also, I am attaching the photographs captured during the conduct of the course.

Kind Regards,
Raji Sharma
Dr. RAJI SHARMA

Head of Dept. Anaesthesiology
Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Kirumpakkam, Puducherry - 605 502

Encl: Certificates

Photographs

Sri Lakshmi Narayana Institute of Medical Sciences

Affiliated to Bharath Institute of Higher Education & Research

(Deemed to be University under section 3 of the UGC Act 1956)

CERTIFICATE OF MERIT

This is to certify that _PRASANNA S_____ has actively participated in the Value Added Course on Fire hazards in Hospital Environment held during July - December 2020 Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

Dr.SELVARAJU K

RESOURCE PERSON

DEPARTMENT OF ANAESTHESIOLOGY
SRI LAKSHMI NARAYANA INSTITUTE
OF MEDICAL SCIENCES
OSUDU, KUDAPAKKAM, PUDUCHERRY-605 502

Dr. RAJI SHARMA

COORDINATOR

Sri Lakshmi Narayana Institute of Medical Sciences
Osudu, Kudapakkam, Puducherry 605 502

Sri Lakshmi Narayana Institute of Medical Sciences

Affiliated to Bharath Institute of Higher Education & Research

(Deemed to be University under section 3 of the UGC Act 1956)

CERTIFICATE OF MERIT

This is to certify that __NILA R _____ has actively participated in the Value Added Course on Fire hazards in Hospital Environment held during July - December 2020 Organized by Sri Lakshmi Narayana Institute of Medical Sciences, Pondicherry- 605 502, India.

Dr.SELVARAJU K

RESOURCE PERSON

DEPARTMENT OF ANAESTHESIOLOGY
SRI LAKSHMI NARAYANA INSTITUTE
OF MEDICAL SCIENCES
OSUDU, KUDAPAKKAM, PUDUCHERRY-605 502

Dr. RAJI SHARMA

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