GOOD PRACTICE NOTE

IFC Life and Fire Safety: Hospitals

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WORLD BANK GROUP

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This Good Practice Note (GPN) was prepared by the consulting firm FPC Risk and peer reviewed by John Graham, Luis Cestari, and Elena Chuzhakova (all IFC).

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List of Abbreviations

dBA	decibel (A-weighting)
FACP	Fire Alarm Control Panel
GPN	Good Practice Note
IFC	International Finance Corporation
LFS	Life and Fire Safety
m	meter
$m.s^{-1}$	meter per second
MAC	Manual Alarm Callpoint
min	minutes
N	Newton
Pa	Pascal
SHEVS	Smoke and Heat Exhaust Ventilation System
WBG	World Bank Group


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se the elevator

Introduction

The Life and Fire Safety (LFS) Good Practice Notes (GPNs) are technical reference documents developed for two main purposes:[1]

- To support IFC's investment decisions when evaluating if life and fire safety objectives have been achieved
- As a general guideline for the project team to develop a life and fire concept for the specific occupancy

This GPN is a guideline for investment projects in both new and existing occupancies.

The GPN provides further guidance to section 3.3 of the World Bank Group (WBG) General Environmental, Health, and Safety (EHS) Guidelines, which are the core of IFC's requirements on life and fire safety.

DOCUMENT STRUCTURE

This GPN consists of two main parts:

- A description of fire safety approach, specific requirements and components of fire protection
- Four annexes:
    - Annex A. Guideline Key Life and Fire Safety Design Principles
    - Annex B. Key Life and Fire Safety Audit Aspects
    - Annex C. Inspection and Maintenance Schedule
    - Annex D. Life and Fire Safety Documentation and Approval Flow

LIFE AND FIRE SAFETY OBJECTIVES

The following objectives should be demonstrated by the project team when designing a building:

- Initially use a defend in place strategy followed by safe evacuation of patients
- Limit fire and smoke spread to the room of fire origin
- Safe intervention for fire brigade

These life and fire safety objectives can only be achieved through implementation of technical and operational measures.

[1] This document is not a legal reference.

1. Health Care Occupancies-Specific Fire Risks

Patients in health care occupancies are one of the most vulnerable population groups in case of a fire. Unlike most other buildings and occupancies, the least desirable emergency action in a health care occupancy is the wholesale relocation or evacuation of patients who are often incapable of self-preservation due to age or physical or mental disabilities.

Besides this vulnerability of the population, a health care occupancy houses some considerable fire hazards:

- Considerable amounts of bed linen.
- Laboratories and / or operating rooms, where considerable amounts of flammable liquids and / or gases can be used. These areas often also contain very specific and expensive equipment.
- Presence of oxygen bottles and / or oxygen transport systems.

Without specific fire safety measures, a developing fire would spread faster than the required time to evacuate all patients.

2. Life and Fire Safety Components

APPROACH – "DEFEND-IN-PLACE"

A "defend-in-place" strategy is required to obtain an acceptable fire safety level in health care occupancies. This strategy includes nearly the entire gamut of systems available.

The defend-in-place strategy is implemented using a "total concept" approach. This approach provides an assortment of features that are deemed necessary to avoid the movement of patients to the outside during a fire. Of course, those patients or residents who might be perilously close to the effects of the fire are given a range of protection features, such as being moved to an adjacent safe refuge area on the same floor.

Requirements for allowable building construction types, sprinklers, alarm and detection systems, and staff training work in harmony to help ensure that a patient can be safely and adequately protected, regardless of where a fire starts.

Staff action is an integral part of the life safety features required in a health care facility. The proper response from staff in terms of availability, actions, and management of a fire can readily influence

Patients in hospitals are one of the most vulnerable population groups in case of a fire.

the outcome of a fire. Health care facility staff are charged with the responsibility of preserving the safety of their charges, whether that involves informing patients who are not in jeopardy from the fire or helping to relocate those who are.

Staff training, coupled with the traditional built-in systems and features (e.g., construction; compartmentation; interior finish; alarm, detection, and sprinkler systems; and control of contents and furnishings), combine to provide a safe environment for one of the most vulnerable population groups.

Hence, the required level of life and fire safety can be achieved by implementing a range of fire safety measures.

A summary table of the key LFS design criteria is included in Annex A of this document. In the following paragraphs, each of the key aspects is described in more detail.

STRUCTURAL FIRE RESISTANCE

GOALS

Since a 'defend-in-place' strategy is used, the building structure should be strong enough to withstand a fire in the room of fire origin.

REQUIREMENTS

As a first requirement, the building structure should be non-combustible.

Other requirements of the building structure depend on the height of the building. The following values are recommended:

- Single-story building: 60 minutes structural resistance
- All other buildings: 120 minutes structural resistance

These structural fire resistance requirements can be achieved by following materials:

- Columns and beams of reinforced concrete. Design of these elements should take into account static and dynamic forces, fire resistance, etc.
- Metal columns and beams. Since metal loses its strength at elevated temperatures, these elements should be protected by intumescent[2] coatings or material insulation such as gypsum casings, etc. Another option is to use concrete poured metal elements.

MAINTENANCE

Maintenance of fire resistant structures depends on the material used. Concrete elements don't require specific maintenance. Strength calculations need to be performed if higher loads are applied or if elements are altered.

Coatings are more vulnerable to damage and should be visually inspected regularly. Coatings need to be reapplied at regular intervals, in accordance with maintenance instructions. Fire resistant casings might also be vulnerable to damage and need to be visually inspected regularly.

[2] Materials that swell when exposed to heat, providing insulating or sealing properties.

FIRE COMPARTMENTATION

COMPARTMENTATION GOALS

Well-maintained fire compartmentation confines fire and smoke to a limited area in the building. It is the fundamental basis of passive fire protection. A fire compartment can contain single or multiple rooms. In health care occupancies however, the first intent is to limit the fire spread to the room of fire origin.

Fire compartmentation enables three goals of fire protection:

- Life safety
- Property protection
- Continuity of operations

The following good practices are recommended:

- Every floor forms a single fire compartment
- Every occupancy type / function area forms a single fire compartment
- High-risk areas are located in separate fire compartments
- Safe means of egress are enclosed by fire-rated walls and doors
- Vertical openings (stairs, elevators, utility shafts) are enclosed by fire-rated walls and doors
- Floors with patients contain the following barriers against fire and / or smoke movement:
    - Barriers between all patient rooms
    - Barriers between patient rooms and corridors
    - Barriers separating each floor into at least two compartments thus providing a safe refuge area

In the following sections, more guidance is given.

Well-maintained fire compartmentation confines fire and smoke to a limited area in the building

COMPARTMENTATION BETWEEN FLOORS

Fire compartmentation between floors prevents a fire from spreading quickly between floors. The fire compartmentation of the floor slab should have at least a fire resistance of:

- 1 hour for buildings not exceeding 25 m
- 2 hour for buildings exceeding 25 m

Attention should also be given to prevent possible flame spread through the openings on the outside of the building.

Atria are required to be separated from all patient rooms with at least a 1 hour fire separation. Evacuation of patients through the atrium is not allowed.

COMPARTMENTATION BETWEEN OCCUPANCIES / FUNCTION AREAS

The following occupancies / function areas should form separate fire compartments, with a fire rating of at least 60 minutes:

- Patient room areas
- Kitchen and restaurant
- Laundry
- Surgery areas
- Laboratory areas
- Parking areas
- Soiled linens storage
- Electrical/mechanical areas

SAFE MEANS OF EGRESS

In order to protect people against toxic effects and heat impact of smoke resulting from a fire, only a limited evacuation distance is allowed through which one can be exposed. After this evacuation distance, people should be able to evacuate through safe means of egress to the outside. These means of egress are separated from the rest of the building by walls and doors with sufficient fire rating.

On floors containing patient rooms, another level of protection is required: each floor should be subdivided into at least two compartments. If a fire occurs, another compartment on the floor can act as a safe refuge for the patients who were located in the compartment of fire origin.

VERTICAL OPENINGS

Vertical openings in floors are particularly hazardous because they enable rapid fire and smoke spread through the building if they are not protected. As a general guideline, vertical openings should have a fire rating of at least 2 hours.

ADDITIONAL BARRIERS IN PATIENT ROOM AREAS

Since it is the intent to limit the fire to the room of fire origin, the following additional fire compartmentation is good practice:

- Between patient rooms: compartmentation at least smoke tight, preferably ½ hour flame tight
- Between patient rooms and corridors: compartmentation preferably ½ hour flame tight
- Safe refuge separations in patient room compartments: fire rating of at least 1 hour

COMPARTMENT CONSTRUCTION

A well-constructed fire compartment consists of walls that are strong enough to provide the required fire rating. Openings in these walls can only be made if they are sealed by certified components. An overview of the most important components is given in the following sections.

FIRE RATED DOORS

Fire rated doors should be always certified to have a defined fire rating. As a general guideline, the fire doors should have the same fire rating as the fire walls. Exceptions are possible if national legislation accepts doors with a lower fire rating than the walls (e.g., U.S. standards accept that doors have a fire rating which is approximately 2/3 of the wall's fire rating).

The installer of the fire rated doors should follow the manufacturer's published instructions, and should provide for every door a certificate that the door is installed in accordance with these requirements.

FIRE RATED WINDOWS

Windows are possible in fire rated walls if they have a certified fire rating. The fire rating of the window should be equal to the wall fire rating.

FIRE RATED DUCTWORK

When ducts are installed through fire walls, one of following options should be installed to protect the opening against fire spread:

- The duct should be encased in a fire rated enclosure that has the same fire rating as the fire rated wall.
- A fire rated damper should be installed in the duct where it penetrates the fire rated wall. This fire rated damper should have a certificate for the same fire rating as the fire rated wall. The opening between wall and duct should be sealed with material having the same fire rating as the wall.

SEALING OF OPENINGS

All other openings (cables and cable trays, plastic or metal pipes) should be sealed with material that provides a fire rating equal to the fire rating of the wall. If plastic pipes protrude through a fire rated wall, specific fire rated collars should be installed in the penetration through the wall. It is recommended that a certificate is provided for every specific penetration through a fire rated wall.

MAINTENANCE

Compartmentation as such doesn't require much maintenance, since most of the protection measures are passive. However the following items should be inspected annually:

- Fire doors:
    - If doors are self-closing, check if they still latch correctly and check for damage to the door
    - If doors should close upon fire detection: test the mechanism by activating a fire detector
- Fire dampers: inspect the closing mechanism
- Smoke dampers: test if the damper closes upon fire detection

The effectiveness of fire compartmentation to confine fire and smoke relies heavily on the protection of openings through the fire rated wall/floors. A well-implemented 'management of change' program is necessary to identify alterations that can have an impact on a fire compartment. It is often noticed that fire wall penetrations are not properly sealed after modifications (e.g., additional penetration for cables), which can have an immense impact on the performance of the fire rated wall.

INTERIOR FINISH

GOALS OF INTERIOR FINISH

The fire spread in a room is highly dependent on the flammability of wall, floor and ceiling materials. Flash-over can be expected within minutes if the interior finish materials will contribute easily to the fire. Apart from the flammability of the materials, other factors can also influence the hazard to the people close to the fire:

- Flame spread characteristics
- Amount of smoke produced by the burning material
- Toxicity of the smoke
- Tendency to create droplets when burning

The choice of interior finish materials will strongly influence life safety.

CHOICE OF INTERIOR FINISH MATERIALS

Since patients are particularly vulnerable to a fire, it is important to maximize the selection of materials that are non-combustible or difficult to ignite.

Since standards of reaction to fire are hard to compare, it is difficult to define in this section requirements on class of materials.

The following guidelines, however, can be given:

- Always permitted: concrete elements, gypsum finishes, ceramic materials, metal ceiling elements, rockwool elements for false ceilings.
- Further investigation required: all common plastic materials, since these materials present a large variation on flammability, smoke production and toxicity.
- Never allowed: low density fibreboard, wood-based panels, plastic based insulation products.

The requirements for interior finish can be reduced by the installation of a sprinkler system. As a general rule, however, the 'never allowed' materials cannot even be permitted when sprinkler systems are installed.

MAINTENANCE

No specific requirements on maintenance exist.

A well implemented 'management of change' program is however necessary to identify which materials are to be used during modification projects in the building.

FURNISHINGS, MATTRESSES, DECORATION

GOALS

Just as with interior finish materials, the room furnishing has a big impact on the potential spread of a fire. By selecting proper materials, the hazard to people close to the fire can be significantly reduced. The choice of furnishing, mattress type and decoration has most impact on life safety.

CHOICE OF FURNISHINGS, MATTRESSES AND DECORATION

Foam materials can contribute significantly to the strength of a fire. For this reason, it is recommended to avoid as much as possible upholstered furniture in patient rooms. Specific standardized tests on performance of this type of furniture in fires exist. If such furniture is selected, it is highly recommended to select certified items that have a better performance in a fire.

Mattresses may also contain combustible foaming materials. As a minimum, these mattresses should pass tests on their resistance against smouldering cigarettes or other small objects.

Curtains can also have a large impact on the fire spread, due to their vertical orientation. Attention should be paid to the selection of fire retardant curtains that have a good reaction to fire.

MAINTENANCE

Also for this topic, a well-implemented 'management of change' program is necessary to identify which materials are to be used during modification projects in the building.

FIRE DETECTION

GOALS OF FIRE DETECTION

Automatic fire detection systems provide a fast and reliable means to detect a fire in its incipient stage. As such, they enable following goals of fire protection:

- Life safety
- Property protection
- Continuity of operations

In order to react as quickly as possible, the installation of an automatic smoke detection system is extremely important in health care occupancies.

INSTALLATION OF FIRE DETECTION SYSTEMS

An automatic fire detection system consists of following components:

- A fire alarm control panel (FACP) that manages the complete system
- Fire detectors
- Manual alarm callpoints (MACs)
- Input / output modules (I/O modules) that integrate specific signals from / to equipment managed by the FACP

It is strongly recommended to only install fire detection systems that are accepted by national standards or approved by accredited bodies. The design of the system should be performed by a company that is certified for the installation of such systems.

A 'cause and effect matrix' should be developed during the design. This matrix should summarize all actions that need to be activated by the FACP upon fire detection in one of the detection zones.

The FACP or one of its repeater panels should be located in a continuously staffed location.

It is recommended to automatically transmit a confirmed fire alarm signal to the fire department or to a dedicated command post in order to initiate fire fighting intervention as soon as possible. Procedures in which the alarm is verified by personnel before the alarm is transmitted are permitted.

MAINTENANCE

Since a fire detection system is composed of often sensitive electronic equipment, proper maintenance of the system is vital: the system should be maintained annually by a certified company.

Automatic fire detection systems provide a fast and reliable means to detect a fire in its incipient stage.

Besides this yearly maintenance, the system owner is responsible for the daily follow-up of technical alarms. Equally important is a 'management of change' procedure: with every change of layout or function of any area, a verification should be performed that the detection system in the area is still capable to detect a fire swiftly.

Alarm sounders should be strategically installed in the building to obtain a distinctive alarm signal throughout.

FIRE ALARM

GOALS OF FIRE ALARM

The main goal of a fire alarm system is to start the evacuation of a compartment or complete building in a timely and orderly manner.

In order to meet this goal, the alarm signal should be:

- Clearly distinct from any other sound in the building
- Loud enough in all areas

Fire alarm signals can be roughly divided into following categories:

- Audible alarms (e.g., siren, bell)
- Voice evacuation systems
- Visible notification signals

A siren system can be installed in all health care areas that are not accessible to patients: health care personnel should know the fire alarm signal and should know what to do in case of fire alarm.

In patient areas, a voice evacuation system is preferred: this system combines a general alert system with pre-recorded messages. With this system, specific directives can also be given for one alarm zone or for the complete building.

Visible notification are permitted to be used in lieu of audible devices in critical care areas. Visible devices should be considered particularly in those areas where the risk of interference with medical equipment monitoring alarms is highest.

INSTALLATION OF FIRE ALARM SYSTEMS

Alarm sounders should be strategically installed in the building to obtain a distinctive alarm signal throughout. The following sound levels should be obtained:

- Surgery areas and other critical care areas: visible notification instead of audible signals.
- Other areas: at least 65 dBA or 15 dBA above the average ambient sound level, measured 1.5 m above floor level.
- Voice messages are not required to meet the sound levels indicated above. The message should however be intelligible within specific spaces in the building. These areas should be predetermined during the design and should include minimally:
    - All large public areas as reception, waiting rooms, etc.
    - Patient room areas (common areas and corridors).


FIRE

The maximum sound level in any location should not exceed 110 dBA. Visible notification means can be provided in areas with potential high noise levels (e.g., generator rooms).

The fire alarm system should be divided into alarm zones in order to allow for a phased evacuation of the building. Several fire compartments can be combined into one alarm zone, but it is not allowed to subdivide a fire compartment into different alarm zones.

The fire alarm system is an installation that needs to remain in service during fire conditions: care should be taken to install fire rated cabling and to supervise the correct working of all electronic equipment.

MAINTENANCE

The alarm system should be maintained annually by a certified company. The alarm should be tested at least annually to check if sound levels comply.

During change projects, it should always be verified that the sound levels are still attained in every area.

MEANS OF EGRESS

EGRESS GOALS

The means of egress allow people to evacuate safely from the health care facility or remain safely inside temporarily (defend-in-place). In order to achieve this goal, the following requirements should be met:

- The path on which people can be exposed to fire and smoke should be limited in distance.
- The means of egress should have sufficient width to allow all occupants to evacuate in due time.
- Enough independent evacuation ways should be available to allow a safe evacuation if one of the routes is blocked by a fire.
- People are not impeded on the evacuation route by blocked or locked doors, low ceiling heights, too narrow routes, steep stairs, low illumination levels, storage of materials, etc.
- People should be able to locate the exits easily.
- In patient room areas, people are often not capable to evacuate without any assistance. Every floor should therefore be divided into at least two safe refuge areas with enough capacity to locate all beds safely. Every safe refuge area on the floor should be directly accessible by a fire service access elevator that can be used to evacuate the beds from the building if necessary.

In order to protect people against toxic effects and heat impact of smoke resulting from a fire, only a limited evacuation distance is allowed.

DESIGN OF MEANS OF EGRESS

MAXIMUM EVACUATION LENGTHS

The evacuation route consists of a number of components for which definitions are given below:

- **Common path:** The portion of a route that must be traversed before separate and distinct paths of travel to at least two exits are available.
- **Exit:** That portion of a means of egress that is separated from all other spaces of the building or structure by construction, location, or equipment as required to provide a protected way of travel to the exit discharge. Staircases or direct accesses to the outside are typical examples of exits. The entrance to a safe refuge area in patient room areas is not considered to be an exit.
- **Exit discharge:** That portion of a means of egress between the termination of an exit and a public way.
- **Dead-end corridor:** That portion of an exit access corridor in which the travel to an exit is in one direction only.

Recommended maximal evacuation lengths can be found in Annex A.

The following other guidelines should be taken into account:

- Maximum 50 percent of the exit capacity is allowed to discharge through a lobby or reception area. All other exit capacity should discharge directly to the outside.
- Main entrance requirements for areas with occupant loads that are higher than 50 persons (reception area, waiting rooms, etc.)
    - The main entrance should be of a width that accommodates one-half of the total occupant load.
    - In any case, additional exits shall be provided for at least one-half of the occupant load.

ARRANGEMENT OF MEANS OF EGRESS

Enough means of egress should be available to allow people to evacuate safely if one of the exits cannot be reached due to the fire. In general, it is recommended to organize evacuation routes in such a way that at least two independent exits can be reached from every area in the building. A part of these exit routes can be 'common path,' see Annex A for recommendations on maximum lengths.

The larger the maximum occupant load of an area, the more independent evacuation routes should be provided.

The means of egress should be organized in such a way that maximum one route can be blocked in case of a single fire: exits, exit accesses and exit discharges shall be remotely located from each other. As a general guideline, exits are considered to be remote from each other if the distance between the two exits is not less than one-half of the length of the maximum overall diagonal dimension of the building or the area to be served. Moreover, it is highly recommended that every safe refuge area in patient room areas gives access to at least two exits without returning to the area of fire origin.

MEANS OF EGRESS COMPONENTS

People should be able to move quickly on means of egress: all components should be designed to enable a fluent evacuation. The following recommendations are given:

- As a general recommendation, evacuation doors should never be provided with locks. People should always be able to evacuate through emergency doors if necessary. All doors should be able to be opened without

excessive force. If locks are necessary due to the patient's conditions, enough staff should be available at all times to unlock the doors and direct patients to safe areas, or must utilize special locking arrangements (delay locks, exit push buttons, etc.).

- Exits and exit accesses should be well illuminated: people should be able to see all possible obstructions and dangerous components such as turns in corridors, junctions, stair treads, ramps, etc.

In patient room areas, enough space should be provided in every safe refuge area to locate the beds from a compartment where a fire starts. If this space is located in corridors, these should be wide enough to enable further evacuation to elevators, etc.

SIGNAGE

All exits should be well marked: signage should be provided above the exit doors and directional signs should be installed judiciously throughout the building. The signs should be illuminated by dedicated emergency lighting.

MAINTENANCE

Regular inspection rounds are needed to check that all means of egress are free and unobstructed. These inspections can be performed by the security teams or during so-called 'self-inspection' rounds on which this and other fire safety aspects are checked. Formalized records should be kept on the findings of the rounds and the actions that were taken as a result of the inspections.

The emergency lighting requires at least yearly maintenance by a certified company. During these maintenance rounds, the performance of system batteries should be checked. Other failures like broken bulbs should be corrected as soon as possible.

FIRE CONTROL AND SUPPRESSION

GOALS OF FIRE SUPPRESSION

The objective of a fire suppression system is to control or extinguish the fire in its early stage. These means of suppression can be manual (fire extinguishers, hose reels) or automatic (sprinkler systems, gas extinguishing systems, etc.). The primary goal of these suppression means is to limit property damage and to control the fire before it becomes hazardous to people not close to the fire or to intervention teams. Due to the vulnerability of the patients, the system should be part of a strategy to keep the fire in the room of fire origin.

FIRE EXTINGUISHERS

Fire extinguishers are active fire protection devices used to extinguish or control small fires. They are intended to be used by the hospital's first intervention team or by visitors that have the expertise to use them. They are not intended for use on an out-of-control fire that can endanger the user.

Many types of fire extinguishers are available: water, foam, dry chemical, carbon dioxide, etc. All of them have specific advantages and disadvantages and should be selected by experienced persons.

At a minimum, fire extinguishers are required in hazardous areas of unsprinklered buildings, but are recommended to be installed throughout the hospital building. In any case, the position of fire extinguishers should comply with local code requirements.

STANDPIPE SYSTEM

A standpipe systems is a type of rigid water piping that is built in multi-story buildings to which fire hoses can be connected. The presence of standpipe systems saves time for firefighters: laying a firehose up a stairwell takes considerable time.

Two types of standpipe systems are available:

- Wet standpipe systems, that are filled with water and are pressurized at all times. Often, hoses are already connected to the system, which allows the fire department to quickly attack the fire. Wet standpipe systems can be combined with sprinkler systems by connecting them to the same piping network.
- Dry standpipe systems, that are empty at normal conditions and need to be connected to a fire hydrant (or other water source) in case of an intervention.

Wet standpipe systems are recommended in both sprinklered and unsprinklered buildings, because they provide a means of suppression that is readily available and less restricted than fire extinguishers.

Dry standpipe systems are particularly recommended in buildings higher than 4 floors without a wet standpipe system. Both systems are best installed in staircases, since these form a relatively safe location for the fire department to prepare an attack of the fire.

Apart from the two standpipe systems described above, hose reel cabinets can be installed throughout the building and connected to the sprinkler system or directly to the water distribution system. These hoses work on a lower pressure which allows them to be used by first intervention teams or occupants. Hose reel cabinets are only suitable for smaller fires, since water flows are considerably lower than the systems described above.

AUTOMATIC SUPPRESSION

If well-designed and maintained, automatic sprinkler systems are considered to be the most effective and reliable fire suppression system available. Statistical information shows that approximately 95% of fires are confined to the room of origin when a sprinkler system is installed. For this reason, sprinkler systems are required in all hospital buildings, except low-rise buildings that only contain outpatient rooms.

Sprinkler systems should be designed in accordance with approved standards. Sprinkler installation design is based on minimum spray densities over a maximum area of operation. The higher the risk classification of the rooms, the higher the requirements will be for the spray densities and the area of operation. The water supply should be reliable: it is recommended to install a dedicated fire water tank and a fire pump certified by an accredited body. The fire pump should have a reliable power source: an electric driven pump should be connected to an emergency generator, or an engine driven fire pump should be installed instead. Furthermore, the installation of valves in the system should be limited to the strict minimum to operate the system: statistics show that most sprinkler systems fail due to a closed valve.

In hospitals, discussions often arise on sprinkler protection of surgery rooms and rooms with expensive medical equipment. The following arguments are in favor the use of sprinklers:

- Sprinkler systems are highly reliable. Should unwanted activation be a concern, a pre-action system can further decrease the potential of unwanted activation of a sprinkler head.
- Sprinklers only activate at a temperature of minimum 68°C. One can expect that, if the room is occupied when the fire ignites, the personnel has suppressed the fire before the sprinklers activate. The sprinkler system can be seen as a system that will control larger fires.
- Most fires are normally controlled by two sprinklers, not all sprinklers in the room / compartment will be activated at once. Water damage will therefore only occur near the fire origin.

If there are further objections or even legal restraints against the installation of sprinkler systems in these rooms, the area should be well separated from the remainder of the hospital. Besides the systems mentioned above, other systems are available to protect specific rooms:

- Automatic gas extinguishing systems are suitable to protect vulnerable spaces that are susceptible to water damage. These systems are commonly used in server rooms or in electrical rooms. It is advised to install such a system if a fire in the room can lead to a large business interruption or a high value loss. The systems are however less suitable for the protection of areas that are normally occupied by patients or hospital personnel.
- Kitchen hood systems are designed to extinguish cooking fires caused by grease or grease-laden vapors. The suppression agent consists of a wet chemical or a water mist.

MAINTENANCE

Proper maintenance of fire extinguishers, fire hoses and all mechanical parts of automatic suppression system is needed to ensure proper performance. Maintenance should be performed at least annually by a certified company.

Besides this yearly maintenance, the system owner is responsible for some general maintenance tasks and regular checks. Equally important is a 'management of change' procedure: every change of layout or function of any area, requires verification that the suppression system in the area is still capable to control or suppress a fire effectively.

SMOKE CONTROL

GOALS OF SMOKE CONTROL

Smoke control systems are designed to control the area affected by smoke, to limit the smoke temperature or to provide smoke-free zones in egress routes. As such, they enable following goals of fire protection:

- Life safety
- Property protection

Smoke control can be performed by passive means (smoke barriers or smoke curtains) and / or active systems. Active systems consist of natural ventilation, mechanical smoke extraction, or smoke pressurization systems.

In hospitals, the following systems are regularly used:

- Smoke and Heat Exhaust Ventilation Systems (SHEVS) in atria or large compartments
- Corridor smoke removal systems in guestroom corridors
- Pressurization systems in stairwells and / or elevator shafts or lobbies

SMOKE AND HEAT EXHAUST VENTILATION SYSTEMS (SHEVS)

SHEVS are designed to limit the smoke spread to a certain area ('smoke control zone'), to obtain a smoke-free height in the smoke control zone and to limit the smoke temperature.

SHEVS are typically installed in atria: the open connections between floors are extremely vulnerable to rapid smoke spread. This creates very hazardous situations and occupants can be surprised by toxic fumes.

A SHEVS' design is based on a design fire that can be obtained from specific standards. Based on the design fire and the required smoke-free height, calculations can be performed to estimate the required mechanical extraction rate or the required amount of ventilation openings.

Equally important to the extraction rate is to provide enough supply air to the area: without this fresh supply air, the system will not be able to extract smoke from the smoke control area.

Since SHEVS extract hot air from the smoke control area, the system can delay sprinkler activation. Attention should be paid to this interaction if both systems are combined in the same area. In general, it is good practice to activate the SHEVS by a sprinkler flow alarm.

CORRIDOR SMOKE REMOVAL SYSTEM

Corridor smoke removal systems are fairly basic systems in which a fixed number of air changes is imposed in corridors. A corridor smoke removal system creates safer egress routes, due to the constant supply of fresh air which dilutes smoke that enters the corridor. Corridor smoke removal systems are often required by local codes.

STAIRWELL AND ELEVATOR SHAFT PRESSURIZATION SYSTEMS

Pressurization systems impede smoke spread to certain areas of the building by creating an overpressure. They are commonly used and highly recommended in staircases in high-rise buildings, since they provide an extra grade of protection that allows for longer evacuation times.

Pressurization systems in staircases should be carefully designed: they should create a pressure difference of at least 50 Pa (all doors closed) and an airflow of at least 0.75 $m.s^{-1}$ through an open door. On the other hand, it should still be possible to open the staircase doors easily (most codes prescribe a maximum opening force of 100 N). Pressurization systems can also be installed to protect elevator shafts against vertical smoke spread.

MAINTENANCE

Proper maintenance of all mechanical parts of the system is needed to ensure proper performance of the system. Maintenance should be performed at least yearly by a certified company (preferably the installer of the system).

PROTECTION FROM FIRE HAZARDS

GOAL

Certain areas in health care buildings typically contain a higher fire risk than most of the other areas. Typical examples of these areas are:

- Areas used for storage of combustibles or flammables:
  - Flammable liquid rooms (storage of solvents, etc.)
  - Large archives
  - Trash collection rooms
  - Linen rooms
  - Oxygen storage and generation facilities
  - Medical gases

- Areas housing heat-producing appliances:
    - Boiler rooms
    - Generator rooms
    - Kitchens
    - Laundries
    - Incinerator rooms
    - Autoclave rooms
- Areas used for maintenance purposes:
    - Workshops
- Areas containing a higher fire load:
    - Employee locker rooms
    - Laboratories
    - Gift shops (larger than 50 m^2)
    - Car parking areas

Due to the higher risk, these areas should be well segregated from the other hospital areas and / or protected by dedicated fire suppression systems. Examples of such fire suppression systems are wet chemical systems in kitchen hoods, powder extinguishing systems protecting gasoline burners in boiler rooms, gas extinguishing systems on power generators, etc.

A proper separation of the fire hazards enables following goals of fire protection:

- Property protection
- Business continuity

DESIGN OF FIRE HAZARD PROTECTION

Protection from fire hazards can be done by separating the area from the remainder of the hospital with fire rated walls, by active fire suppression systems or a combination of both. The required fire rating depends on the fire load and/or potential ignition sources in the area, but following ratings can be used as a guideline:

- 2 hour fire rating: flammable liquid rooms, laboratories involving considerable amounts of flammable liquids, boiler and generator rooms, transformer rooms with oil-filled transformers.
- 1 hour fire rating: large archives, trash collection rooms, laundries, linen rooms, kitchens, workshops, employee locker rooms and gift shops, high-tension areas and transformer rooms.

The installation of active suppression systems can lead to a reduction of the recommended values above.

MAINTENANCE

As for other active and passive systems, regular maintenance is needed. We refer to the chapters above for the recommendations.


BRE 2
BAINS
BALCON
W.C
TOIL
CHAMBRE 1
ENTREE
CUISINE
PL
SE JOUR
BALC
BAINS
W.C.
ENTREE
PL
SE JOUR

3. Documentation

This section describes documentation that should be developed during the design, construction and exploitation of the hospital.

FIRE SAFETY MASTER PLAN

The fire safety master plan describes on a conceptual basis all the life and fire safety aspects that are integrated in the building.

The document should include all major fire risks, applicable codes, standards and regulations, and mitigation measures. The master plan will be prepared by a suitably qualified professional acceptable to IFC.

It should cover following aspects:

- Fire prevention
- Means of egress
- Detection and alarm systems
- Compartmentation
- Fire suppression and control
- Emergency response plan
- Operation and maintenance

The fire safety master plan should be updated during the building's lifetime: after every significant modification, alterations should be checked against the plan and additional life and fire safety measures should be taken if necessary.

FIRE SAFETY DESIGN DOCUMENTATION

The fire safety design documentation provides more detailed information on the systems installed in the building: it typically contains following information:

- As-built plans of the systems
- Verification calculations if required
- Data sheets of all components
- List of necessary spare parts
- Supplier list
- System certificates
- Fire safety design documentation

FIRE PREVENTION PROGRAM

The fire prevention program typically describes the staff responsibilities to prevent a fire. It should also include a training program for staff.

MANAGEMENT OF CHANGE PROGRAM

An effective Management of Change Program consists of procedures that consider:

- The basis for the proposed change
- The impact of the change on safety and health of employees and guests
- Necessary modifications on operating and emergency procedures
- Required authorization of the proposed changes

Each of these aspects should be formalized in a plan that demonstrates that the LFS level of the hospital is at least maintained throughout the change.

EMERGENCY RESPONSE PLANS

The emergency response plan describes the staff responsibilities in case of a fire or other type of emergency.

Health care occupants have, in large part, varied degrees of physical disability, and their removal to the outside is impractical in many cases, except as a last resort.

Since patients are very vulnerable to the consequences of a fire, the emergency response plan should first focus on the evacuation of patients away from the fire origin. After this first evacuation, evaluations should be performed to determine the need to further evacuate the other compartments of the hospital.

The emergency response plan should at least contain following topics (see additional information in WBG EHS Guidelines):

- Use of alarms
- Transmission of alarms to fire department
- Emergency phone call to fire department
- Response to alarms
- Isolation of fire
- Evacuation of immediate area
- Evacuation of safe refuge area
- Preparation of floors and building for evacuation
- Extinguishment of fire

MAINTENANCE PLAN AND CONTRACT FOR ALL FIRE PROTECTION SYSTEMS

Fire protection systems require maintenance by qualified persons. A maintenance plan should be available, that shows what systems are maintained with a certain frequency.

The plan should include checklists with the tasks done in-house (e.g., a fire pump needs to run +/- 15 min per week) and the tasks done by maintenance contractors.

Maintenance contracts should be available for all tasks done by external parties.

TEST PLANS FOR ALL FIRE PROTECTION SYSTEMS

Apart from the maintenance, the systems should be tested on a regular basis. Typically, these tasks can be performed in-house without the support of a maintenance contractor.

Test plans should include checklists with the tasks performed and their frequency. All test activities should be logged.

INCIDENT REPORTING DOCUMENTS

Incident reporting documents enable an organization to analyse incidents and remediate.

They should contain at least:

- Event details: time, location, consequences
- Event analysis:
    - Was the event caused by an unsafe act or unsafe condition?
    - Could the incident be avoided?
    - Are additional safety measures necessary to avoid similar incidents?

4. Fire Safety Project Approaches

There are different approaches to demonstrate compliance with the requirements of the LFS section (section 3.3) of the WBG EHS General Guidelines. Complying with local life and fire safety regulations is a minimum requirement to be eligible for IFC investment.

Compliance with local regulations and with an internationally accepted level of life and fire safety should be demonstrated by one of following approaches:

- Compliance with prescriptive codes in line with the WBG General EHS Guidelines.
- Performance based design: this alternative approach sets clear performance objectives by all stakeholders with regard to life and fire safety. It uses specific methods and techniques often supported by computer modelling to demonstrate that a health care building with certain defined fire safety measures is safe to operate.

5. Project Approval

For new developments, IFC will require an audit during following project phases:

- Finalization of Fire Safety Masterplan
- Finalization of Fire Protection Design
- Final testing and commissioning of fire protection systems
- Final Delivery Life and Fire Safety Documents

For existing properties, approval of the fire protection measures will be based on a technical due diligence:

- Verification of all available fire safety documentation
- Review of the hospital fire safety aspects, based on IFC GPN, WBG EHS Guidelines and codes of good practice


CAVE

Annex A. Guideline Key Life and Fire Safety Design Principles

STRUCTURAL RESISTANCE		
Recommended	Single-story: 60 min	> 1 story: 120 min

COMPARTMENTATION		
Required	Between building floors Vertical openings	< 25 m: 60 min > 25 m: 120 min self-closing doors
Required	Between function areas Safe means of egress	60 min, self-closing doors
Required	Corridors in patient room areas	30 min flame tight, self-closing doors
Required	“Safe refuge” on patient floors	60 min, self-closing doors
Required	High-risk areas	Rating dependent on hazardous area and active protection, self-closing doors

INTERIOR FINISH / FURNISHING, MATTRESSES, CURTAINS	
Required	As a minimum, all materials should comply with local regulations
Required	Non-combustible interior finish materials, use of items that are tested on their performance in a fire.

FIRE DETECTION	
Required	Patient rooms: addressable fire detectors Indication of the location of the fire in the nurse department on the floor
Required	Throughout the building Indicative price range[1]: New: 25 – 45 USD/m^2 Existing: 30 – 50 USD/m^2

FIRE ALARM	
Required	Alarm throughout buildings
Required	Flashing lights in areas with high noise levels
Recommended	Voice evacuation system in public areas and patient room areas
Recommended	Flashing lights in surgery and other critical care areas

MEANS OF EGRESS				
Required	maximum evacuation lengths in sprinklered occupancies			
Occupancy	Common path	Dead-end corridor	Distance to exit	Distance in patient room
Patient room areas	30 m	10 m	60 m	15 m
Restaurant Commercial Waiting area	5 m	5 m	75 m	
Offices	30 m	15 m	90 m	

MEANS OF EGRESS				
Required	maximum evacuation lengths in unsprinklered occupancies			
Occupancy	Common path	Dead-end corridor	Distance to exit	Distance in patient room
Patient room areas	10 m	10 m	45 m	15 m
Restaurant Commercial Waiting area	5 m	5 m	60 m	
Offices	25 m	5 m	60 m	
Required	Minimum 2 separate and independent exits per area(2) Minimum 3 exits if 500 < # persons ≤ 1000 Minimum 4 exits if 1000 < # persons			
Required	Each safe refuge area in patient room areas has direct access to a fire access elevator Every safe refuge area leads to two independent exits without returning to the area of fire origin.			
Required	Evacuation widths as per local codes.			
Required	Minimum 50% of exit capacity to discharge through safe means of egress, not leading through the reception area.			

FIRE EXTINGUISHERS	
Required	Hazardous areas of unsprinklered buildings
Recommended	Throughout the buildings (as per local codes)

STANDPIPES	
Recommended	Wet standpipes and/or standpipes as per local codes Hose reels throughout the building

AUTOMATIC SUPPRESSION SYSTEMS	
Required	Kitchen hood systems protecting hazardous cooking equipment (e.g., fat fryers) in open kitchens
Required	Sprinkler systems throughout the building, except in low-rise hospitals that only contain outpatient rooms. Indicative price range(1): New: 40 – 65 USD/m^2 Existing: 55 – 80 USD/m^2
Recommended	Kitchen hood systems in kitchen areas that are separated from restaurants
Recommended	Gas extinguishing systems in area where a fire can lead to large business interruption (eg computer rooms, large archives)

SMOKE CONTROL	
Required	Stairwell pressurization system in buildings > 25 m
Required	SHEVS in atria
Recommended	Smoke removal system in guest room corridors, as per local code

(1): The indicative price ranges are general estimates that are considered to be representative for typical hospital buildings. Further variance might occur, due to complexity of the building and regional price differences.

(2): Separate exits so that if one exit is blocked during an emergency the other is available for evacuation (a good practice is a distance of minimum 30 m between exits or exits separated more than 1/2 maximum overall diagonal dimension of the building or area).

Annex B. Key Life and Fire Safety Audit Aspects

OVERALL FIRE SAFETY

Is a LFS master plan available?

Is the building accepted by local authorities? Are acceptance documents available?

FIRE COMPARTMENTATION

Are as-built compartmentation plans, showing all fire separations, available?

Are certificates for all components of fire separations available?

- Fire doors
- Fire dampers
- Cable, pipe and duct sealing materials

Is the actual fire compartmentation in line with what is indicated on the plans?

- Are certified fire doors installed in fire separation walls?
    - Are any fire doors blocked open?
    - Do door closers work properly?
- Are any unprotected openings visible?

INTERIOR FINISH / FURNISHING, MATTRESSES, CURTAINS

Are certificates available on the reaction of these materials to a fire?

EVACUATION

Are evacuation plans available?

- In the as-built file of the hospital
- On strategic locations in the building

Are all evacuation routes clearly marked?

- Are enough signs installed to show the evacuation routes?
- Is enough emergency light installed?
    - Are all evacuation pictograms illuminated?
    - Are evacuation routes well illuminated?
    - Is the emergency light system designed for a duration of 1 hour at least?
    - Is a meeting point clearly marked on a safe location outside the building?

Can the evacuation routes be used at all times?

- Are all evacuation doors free from locks?
- Are any evacuation doors blocked?
- Are all corridors, passages and stairs free from obstructions?
- Does at least 50% of the exit capacity discharge to the outside through safe means of egress, not leading through lobby or reception areas (ground floor)?

FIRE DETECTION AND ALARM

Is all fire detection and alarm system information available?

- Fire detection plans, single-line diagrams
- Datasheets of all components
- Calculations (voltage drop calculations, battery capacity)
- Cause and effect matrix
- Testing and commissioning documents
- System logbook

Is the fire detection and alarm system installation approved by an independent body?

Is the actual fire detection and alarm system in line with what is indicated in the system information?

- Are tests in conformity with what is shown on the cause and effect matrix?
- Is the fire alarm signal easily notifiable?
    - Is the alarm signal loud enough and distinct from other signals?
    - Are additional flashing lights foreseen in areas with high noise levels?
    - Are flashing lights foreseen in rooms where there is a risk of interference between the fire alarm signal and medical equipment monitoring signals?

Is the actual fire detection and alarm system fully operational?

- Is the fire alarm control panel free from technical faults?
- Are maintenance reports available and are all issues indicated on the reports resolved?

AUTOMATIC FIRE SUPPRESSION / SMOKE CONTROL

Is all information on automatic suppression / smoke control systems available?

- As-built installation plans
- Datasheets of all components
- Calculations (flow calculations, required capacity)
- Testing and commissioning documents

Is the automatic fire suppression / smoke control system approved by an independent body?

Is the actual system fully operational?

- Do any technical errors appear on the control panel?
- Are maintenance reports available and are all issues indicated on the reports resolved?

FIRE EXTINGUISHERS / HOSE REELS

Are plans available showing the location of all fire extinguishers and hose reels?

- In the as-built file of the hospital
- On the evacuation plans

Are all fire extinguishers and hose reels clearly marked?

- Are signs installed to show their location?
- Is emergency light installed to illuminate the signs?

Can the fire extinguishers / hose reels be used at all times?

- Is access free of locks?
- Are any fire extinguishers / hose reels blocked?

Are maintenance reports available and are all issues indicated on the reports resolved?

STANDPIPES

Are standpipes installed as indicated in the fire safety master plan and/or building permit?

Are the fire department connections at the base of the riser and in the building free from obstructions?

FIRE PREVENTION

Are good housekeeping rules applied and are they well followed?

Are formalized permit procedures applied for hot works and other activities that create a higher fire risk?

Is every employee aware of the fire risks related to his job and how to mitigate the consequences of a fire incident (e.g., are nurses aware of the importance of good housekeeping, unobstructed routes in corridors, use of fire resistant doors, etc.)?

Is a formal inspection procedure applied for life and fire safety aspects?

EMERGENCY RESPONSE

Is a formalized emergency response plan available?

Is the following information included in the emergency response plan:

- Use of alarms

- Transmission of alarms to fire department
- Emergency phone call to fire department
- Response to alarms
- Isolation of fire
- Evacuation of immediate area
- Evacuation of safe refuge area
- Preparation of floors and building for evacuation
- Extinguishment of fire

Is every employee informed on how to react in case of a fire alarm? Do the employees receive regularly an update of these procedures?

Are at all times enough employees available that are skilled in a first response to a fire alarm?

- Inspection of a fire alarm
- Activation of fire alarm
- Communication with local fire department

Are at all times enough employees available that are skilled in the use of fire extinguishers?

- Is the training of fire extinguishers repeated regularly?

Are at all times enough employees available that are skilled in the evacuation of patients?

- Is the evacuation training repeated regularly?

Are evacuation drills practiced at least once a year?

Annex C. Inspection and Maintenance Schedule

Frequency	Automatic sprinkler systems	Standpipes	Fire pump	Water tank	Kitchen hood suppression systems	Emergency standby power systems
WEEKLY	Record pressure	Visual inspection of dry standpipe control valves	Check pump house heating	Check heating system during freezing weather		Inspect the generator and its components
		Record pressure of wet standpipes	Fire pump operating test	Check water level		Check the house-keeping in the generator room
			Check packing gland tightness			Generator operation test
			Check suction and discharge pressure gauges			
			Check position of valves			
			Control alarms function properly			
MONTHLY	Visual inspection of section valves and alarm valves	Visual inspection of wet standpipe control valves	Remove battery corrosion, clean and dry battery case	Check water temperature	Visual inspection of system	Inspect and check the fan and alternator belts
			Check battery charger and charger rate			Inspect the battery charger and charger rate
			Equalize charge in battery system			Inspect and check the circuit breaker and fuses
			Exercise isolation switch and circuit breaker			Inspect and test the governor oil level and linkage
			Inspect, clean and test circuit breakers			Test each battery powered unit for 30 seconds
						Operate the transfer switch

By building owner.

By maintenance contractor.

Certification by accredited body as per legal requirements. Legal requirements prevail if they are more stringent. If certification is not legally required, it should be done by third party accepted by IFC.

Frequency	Automatic sprinkler systems	Standpipes	Fire pump	Water tank	Kitchen hood suppression systems	Emergency standby power systems
QUARTERLY	Test sprinkler flow and pressure alarms	Visual inspection of hoses and fire department connections	Check crankcase breather on diesel pump for proper operation	Visual inspection of tank		Inspect the crankcase breather
	Verify that fire department connections are visible and accessible	Visual inspection of pictograms	Clean water strainer in cooling system for diesel fire pump			Inspect the exhaust system insulation
		Test flow switches	Check exhaust system insulation for integrity and check exhaust system clearance to combustibles to prevent fire hazard.			
			Check battery terminals to ensure they are clean and thight.			
SEMI-ANNUALLY	Test quick-opening devices and accelerators of dry pipe systems.	Test tamper switches	Check operation of safety devices and alarms	Check water level alarms	Check all components	Test the antifreeze protection level
	Test fire detection system for preaction and deluge systems.				Verify that hazard has not changed	Test the operation of safeties and alarms
	Test tamper switches					Test emergency generators greater than 600 V under full load
ANNUALLY	Visual inspection of sprinklers, piping, hangers	Visual inspection of piping	Conduct fire pump performance test	Check accessibility and condition of fire department connection	Replace fusible links	Inspect and test tank vents and overflow piping for obstructions
	Check anti-freeze solution of glycol systems.	Check nozzles	Verify setting of relief valve			Inspect fuel piping

By building owner.

By maintenance contractor.

Certification by accredited body as per legal requirements. Legal requirements prevail if they are more stringent. If certification is not legally required, it should be done by third party accepted by IFC.

Frequency	Automatic sprinkler systems	Standpipes	Fire pump	Water tank	Kitchen hood suppression systems	Emergency standby power systems
	Maintenance of valves	Lubrication of swing-out racks	Lubrication of various parts			Inspect and test louver motor and controls
	Cleaning of strainers	Reracking of hoses	Replace oil and oil filters if needed			Inspect exhaust system hangers and supports and test for excessive back pressure
	Functional test of sprinkler system.		Calibrate pressure switch settings and check accuracy of pressure sensors			Inspect transfer switch main contacts and exercise the circuit breakers
			Inspect fuel piping			Check and test the ignition system of the engine and test injection pump and injectors
						Measure and record resistance readings with insulation tester
						Test each battery powered unit for its required autonomy
						Test the emergency generator under full load or under bank-load full test
						Replace oil and oil filters if needed
EVERY 5 YEARS	Internal inspection of check and alarm valves			Inspection of tank interior		
	Calibrate pressure gauges			Check all valves		
Certification inspection by third party	Every year		Every year		Every year	Every year
MONTHLY	Visual inspection of panels (no technical faults).	Verify that no alterations have been made to the room				
		Doors are self-closing or close automatically in case of suppression				

By building owner.

By maintenance contractor.

Certification by ACCREDITED body as per legal requirements. Legal requirements prevail if they are more stringent. If certification is not legally required, it should be done by third party accepted by IFC.

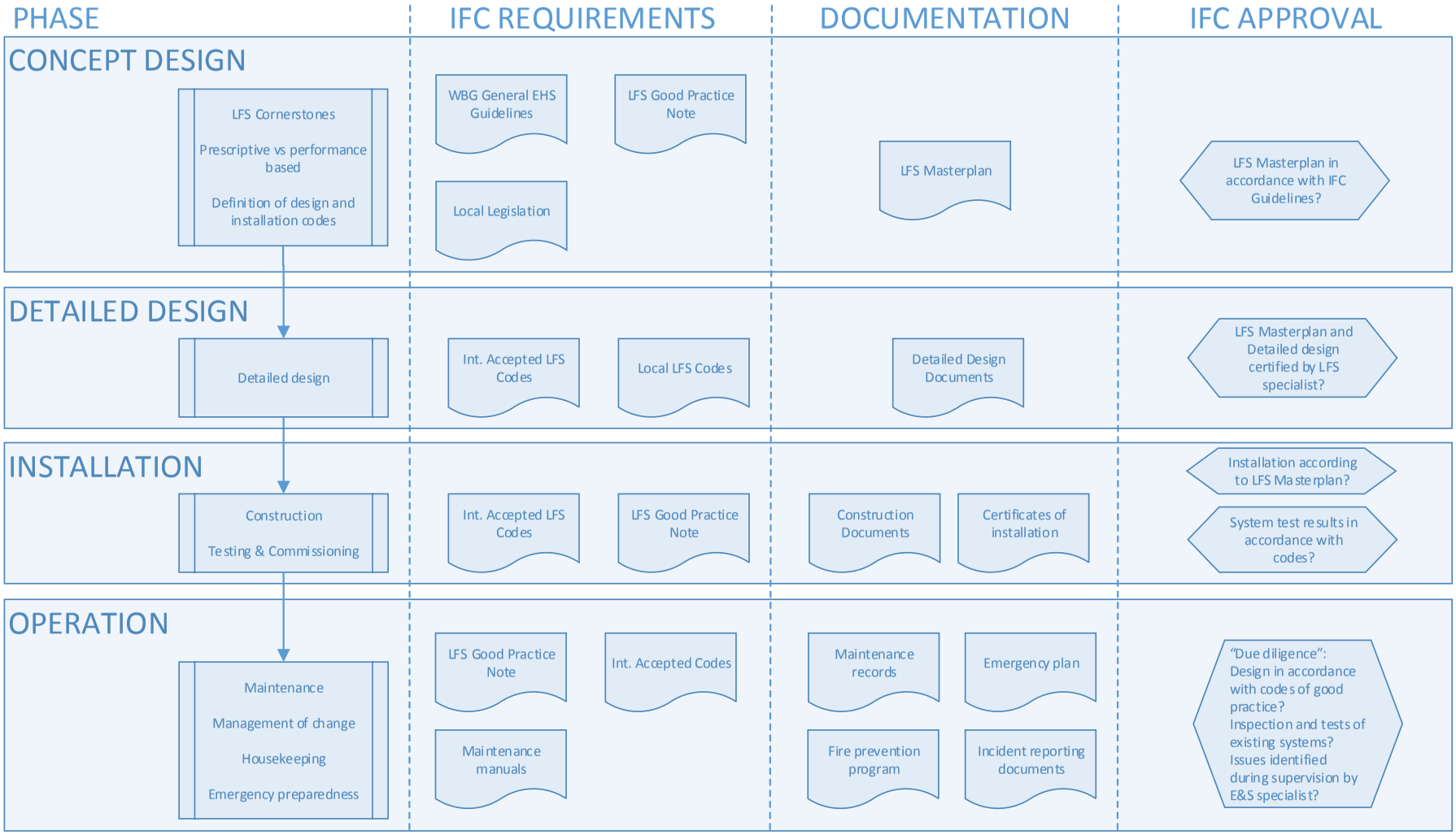
Frequency	Fire detection and alarm	Gaseous extinguishing system	Portable fire extinguishers	Fire doors	Fire dampers	Smoke control system
QUARTERLY	Visual inspection of system (callpoints not blocked, free space around detectors, …)		Visual inspection of accessibility	Visual inspection of doors		
				Verify that doors are not blocked open		
SEMI-ANNUALLY		Visual inspection of system and containers				Functional test
		Record container pressures and weights				
ANNUALLY	Functional test of all detectors, call points and alarms	Visual inspection of hoses	Maintain and recharge as required by maintenance instruction	Check door for physical damage, no open holes left from replaced hardware.	Visual inspection of hinges and other moving parts	
	Functional test of alarm transmission	Inspect enclosures or rooms for tightness		Check door closers on functionality and coordination of door leaves at double doors	Remove fusible link and operate damper	
	Battery test			Check closing of automatically closing doors upon fire detection	Lubrication as per manufacturer's instructions	
	Inspection of log book					
EVERY 5 YEARS	Revision of all detectors (without self-check option)	Hydrostatic test of system				
		Complete visual inspection of gas containers				
EVERY 8 YEARS	Revision of all smoke detectors with self-check option					
Certification inspection by third party	Every year	Every year				Every year

By building owner

By maintenance contractor

Certification by ACCREDITED body as per legal requirements. Legal requirements prevail if they are more stringent. If certification is not legally required, it should be done by third party accepted by IFC.

Annex D. Life and Fire Safety Documentation and Approval Flow



Footnote: all projects are expected to meet local fire safety requirements

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