Introducing the Good Practice Notes on Life and Fire Safety for Hotels and Hospitals

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Our presenters

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**Luis Cestari** is a Consultant with IFC’s Environment, Social and Governance Department, based in Washington, D.C. Luis has a Master’s of Science in Fire Protection Engineering from the University of Maryland and over 25 years of experience as a life and fire safety engineer. In addition, Luis is a member of the National Fire Protection Association and is a professional member and technical instructor for the Society of Fire Protection Engineers.

**Ralf Bruyninckx** is the CEO of FPC Risk, responsible for the overall management of FPC Risk and Global Business Development. He began his career as a fire risk engineer in 1998 and combines an engineering degree with a business background. His primary expertise is in fire risk analysis and performance-based design.
IFC’s approach - framework

• In 2001: The Life and Fire Safety (L&FS) Guidelines

• Since 2006: PS4: “Infrastructure and Equipment Safety”

• General EHS Guidelines, section 3.3 (Life and Fire Safety)
Applicability - all new buildings and buildings programmed for renovation accessible to the public

- Hospitals
- Hotels
- Retail facilities
- Education centers
- Cinema and other leisure facilities
- Airports and other passenger terminals

Building should be compliant with:
- Local codes and regulations;
- and internationally accepted L&FS standard (e.g. US-NFPA 101, standards from Australia, Canada, South Africa, and United Kingdom)

Occupants are often unfamiliar with the building layout or unable to evacuate on their own.
Fire Safety in Emerging Markets

- Emerging markets record 10 times fire deaths per year compared to developed countries.

Fire Safety in Emerging Markets
Fire Safety in Emerging Markets

- Clients are highly compliance driven (and, in fact, do invest in fire safety);
- However, there are gaps in local codes and regulations; and
- Discrepancy between design stage/operation
  - Lack of awareness and safety culture
  - Lack of technical knowledge
  - Minimum budget spent on maintenance
  - Security vs. Safety

- Consequences of fire in EM are generally much more severe due to the lack (or improper performance) of protective L&FS systems and low emergency readiness
IFC’s approach - design/construction vs operation

- Verification of building compliance should always be done by a suitably qualified professional:
  - concept design (Master Plan)
  - engineering design
  - post-construction

- Any “Change of use” during operational stage shall also obtain professional verification

- For existing buildings with high risk: A qualified professional should conduct a life and fire safety audit (risk-based analysis)

- Clients need to establish a systematic approach towards L&FS matters on operational stage – to ensure continuous and sound L&FS management
IFC’s L&FS Good Practice Notes

• GPNs are intended to help project teams early in the process to understand key design and operational requirements for specific occupancy, and associated additional costs

• GPNs also contain useful practical documents like checklists, maintenance schedule and other

• GPNs have universal applicability

Documents are available at:

www.ifc.org/LFSHotels
www.ifc.org/LFSHospitals
Basis for GPNs

• International Codes / Standards / Guidelines
• Experience (technical / operational / organizational)
• Statistical data
• New technologies
• Risk analysis techniques
The following objectives should be demonstrated by the project team when designing a building:

- Safe evacuation of occupants
- 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.
GPN Document Structure

DOCUMENT STRUCTURE

This GPN consist 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
Specific Fire Safety Risks

- Multi – occupancy
- Large atrium
- Back of the house
- People are unfamiliar / sleeping

- Mobility
- Bed linen
- Surgery rooms
- Presence of Oxygen Transportation
L&FS Components

- Fire Prevention
- Extinguishment
- Emergency Response
- Detection and Alarm
- Escape
- Compartmentation
IFC’s L&FS Good Practice Notes - What?

GUIDELINE KEY LFS DESIGN PRINCIPLES

**STRUCTURAL RESISTANCE**

- **Recommended**
  - Single-storey: 60 min
  - > 1 storey: 120 min

**COMPARTMENTATION**

- **Required**
  - Between building floors
    - Vertical openings: 25 m², 60 min
  - Between function areas
    - Safe means of egress: 60 min, self-closing doors
  - Corridors in patient room areas: 30 min flame thigh, self-closing doors
  - “Safe refuge” on patient floors: 60 min, self-closing doors

**INTERIOR FINISH / FURNISHING, MATTRESSES, CURTAINS**

- **Required**
  - As a minimum, all materials should comply with local regulations
  - 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

**FIRE ALARM**

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

**SMOKE CONTROL**

- **Required**
  - Stairwell pressurization system in buildings > 25 m
- **Required**
  - SH/EVS in atria
- **Recommended**
  - Smoke removal system in guest room corridors, as per local code

**EVAUATION**

<table>
<thead>
<tr>
<th>Occupancy</th>
<th>Common path</th>
<th>Dead-end corridor</th>
<th>Distance to exit</th>
<th>Distance in patient room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient room areas</td>
<td>10 m</td>
<td>10 m</td>
<td>60 m</td>
<td>15 m</td>
</tr>
<tr>
<td>Restaurant</td>
<td>5 m</td>
<td>5 m</td>
<td>75 m</td>
<td></td>
</tr>
<tr>
<td>Commercial Waiting area</td>
<td>30 m</td>
<td>15 m</td>
<td>90 m</td>
<td></td>
</tr>
</tbody>
</table>

**FIRE EXTINGUISHERS**

- **Required**
  - Hazardous areas of sprinklered buildings
- **Recommended**
  - Throughout the building (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. fryers) in open kitchens
- **Recommended**
  - Sprinkler systems throughout the building, except in low-rise hospitals that only contain outpatient rooms.
  - Kitchen hood systems in kitchen areas that are separated from restaurants

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

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### IFC’s L&FS Good Practice Notes - What?

#### GUIDELINE KEY LFS DESIGN PRINCIPLES

<table>
<thead>
<tr>
<th>Structural Assistance</th>
<th>Required</th>
<th>Recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single storey max.</td>
<td>2 storey</td>
<td>2 storey max.</td>
</tr>
</tbody>
</table>

#### AUTOMATIC SUPPRESSION SYSTEMS

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required</td>
<td>Kitchen hood systems protecting hazardous cooking equipment (e.g., fat fryers) in open kitchens</td>
</tr>
<tr>
<td>Required</td>
<td>Sprinkler systems throughout the building, except in low-rise hospitals that only contain outpatient rooms.</td>
</tr>
<tr>
<td>Indicative price range</td>
<td>New: $40 - $65 USD/m²  &lt;br&gt; Existing: $55 - $80 USD/m²</td>
</tr>
<tr>
<td>Recommended</td>
<td>Kitchen hood systems in kitchen areas that are separated from restaurants</td>
</tr>
<tr>
<td>Recommended</td>
<td>Gas extinguishing systems in areas where a fire can lead to large business interruption (e.g., computer rooms, large archives)</td>
</tr>
</tbody>
</table>

#### SMOKE CONTROL

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required</td>
<td>Smoke detection system in buildings - yes.</td>
</tr>
<tr>
<td>Required</td>
<td>Smoke detection system in areas and patient rooms</td>
</tr>
<tr>
<td>Recommended</td>
<td>Dust removal system in areas and patient rooms</td>
</tr>
<tr>
<td>Required</td>
<td>Smoke detection in surgery and other critical care areas</td>
</tr>
<tr>
<td>Recommended</td>
<td>Smoke detection in areas and patient rooms</td>
</tr>
</tbody>
</table>

**IFC International Finance Corporation**

World Bank Group
# Documentation approval flow

## Annex D. Life and Fire Safety Documentation and Approval Flow

<table>
<thead>
<tr>
<th>PHASE</th>
<th>IFC REQUIREMENTS</th>
<th>DOCUMENTATION</th>
<th>IFC APPROVAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CONCEPT DESIGN</strong></td>
<td>LFS Cornerstones</td>
<td></td>
<td>IFS Masterplan in accordance with FC Guidelines?</td>
</tr>
<tr>
<td></td>
<td>Prescriptive vs performance based</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Definition of design and installation codes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>WBIG General EHS Guidelines</td>
<td>Local Legislation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LFS Good Practice Note</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DETAILED DESIGN</strong></td>
<td>Detailed design</td>
<td>Int. Accepted LFS Codes</td>
<td>LFS Masterplan and Detailed design certified by LFS specialist?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Local LFS Codes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Detailed Design Documents</td>
<td></td>
</tr>
<tr>
<td><strong>INSTALLATION</strong></td>
<td>Construction</td>
<td>Int. Accepted LFS Codes</td>
<td>Installation according to LFS Masterplan?</td>
</tr>
<tr>
<td></td>
<td>Testing &amp; Commissioning</td>
<td>LFS Good Practice Note</td>
<td>System test results in accordance with codes?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Construction Documents</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Certificates of installation</td>
<td></td>
</tr>
<tr>
<td><strong>OPERATION</strong></td>
<td>Maintenance</td>
<td>LFS Good Practice Note</td>
<td>&quot;Due diligence&quot; : Design in accordance with codes of good practice?</td>
</tr>
<tr>
<td></td>
<td>Management of change</td>
<td>Int. Accepted Codes</td>
<td>Inspection and tests of existing systems?</td>
</tr>
<tr>
<td></td>
<td>Housekeeping</td>
<td>Maintenance manuals</td>
<td>Issues identified during supervision by E&amp;S specialist?</td>
</tr>
<tr>
<td></td>
<td>Emergency preparedness</td>
<td>Maintenance records</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fire prevention program</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Incident reporting documents</td>
<td></td>
</tr>
</tbody>
</table>

Footnote: all projects are expected to meet local fire safety requirements
Financial Structure - Identified Cases

- New building (GF or BF) - Design agreed or not?
- New + Existing buildings to undergo major renovation
- New + Existing building(s) to remain intact
- Existing (renovation or not)
L&FS Systems - Operation and Maintenance (O&M)

Question: What is the main difference between L&FS systems and other building systems? See the following points of view:

- Design
- O&M
- Use
- Testing
L&FS Systems (Audit + O&M)

Annex B:

• Useful for Inspection or Supervision Stage
• Both by Client or IFC

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
Annex B: Key L&FS Audit Aspects

Hotel: Fire Alarm in ADA room (used by hearing impaired person) or smoking rooms

Hospital: Fire and smoke compartmentation
L&FS Systems (O&M)

Annex C:

- GPN’s assist to define L&FS systems O&M plans with methodology.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Fire detection and alarm</th>
<th>Occasional extinguishing system</th>
<th>Portable fire extinguishers</th>
<th>Fire doors</th>
<th>Fire dampers</th>
<th>Smoke control system</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUARTERLY</td>
<td>Visual inspection of system (circuit points not blocked, free space around detectors)</td>
<td>Visual inspection of accessibility</td>
<td>Visual inspection of positions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Verify that doors are not blocked open</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEMI-ANNUALLY</td>
<td>Visual inspection of system and containers</td>
<td>Functional test</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANNUALLY</td>
<td>Functional test of all detectors, call points and alarms</td>
<td>Visual inspection of hosing</td>
<td>Maintain and recharge as required by maintenance instruction</td>
<td>Check door for physical damage, no open toes left from replaced hardware</td>
<td>Visual inspection of hinges and other moving parts</td>
<td>Remove fusible link and operate damper</td>
</tr>
<tr>
<td>Battery test</td>
<td>Check closing of automatically closing doors upon fire detection</td>
<td>Lubrication as per manufacturer’s instructions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspection of log book</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EVERY 5 YEARS</td>
<td>Revision of all detectors (without self-check option)</td>
<td>Hydrostatic test of system</td>
<td>Complete visual inspection of gas containers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Certification inspection by third party</td>
<td>Every year</td>
<td>Every year</td>
<td>Every year</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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.

By building owner.

By maintenance contractor.

Certification by accredited body as per legal requirement, it should be done by third party.
GPN’s & Emergency Response Planning

- Tendency - Hospitals and Hotels
- Hazards
- Type of plan and Goals
- Evacuation? - Level of Evacuation
- Situations that merit evacuation
- Fire Extinguishing Activities and Control

**Hospitals**
- Patient Prioritization in Different Evacuation Scenarios
- Priority Ratings for Immediate Evacuation of Patients
- Hazards/ Evacuation transportation equipment

**Hotels:**
- Disable guests
- Phased Evacuation per floor
Conclusions

- There are multiple challenges in tackling Life and Fire Safety aspects in investment projects:
  - Gaps between local vs international requirements
  - Cultural behavior
  - Clients’ resistance to invest in safety beyond local compliance
  - Lack of lenders’ resources to supervise projects

- Designing for zero risk is not achievable, but investors should act to the best of their ability to minimize L&FS risks in its portfolio and to protect its reputation:
  - Awareness raising and knowledge transfer
  - Reliance on professional certification of buildings;
  - Strict enforcement of L&FS conditions in the legal agreements;
  - Regular supervision visits;
  - Contracts with third parties to review high-risk portfolio clients.
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• rbruyninckx@fpcrisk.com

Evaluation link:

www.surveymonkey.com/r/WebinarEvalLFS