SAFE HOSPITALS INITIATIVE

Second Edition

HOSPITAL SAFETY INDEX

GUIDE
for EVALUATORS

World Health Organization

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Contents

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Introduction 1

The Hospital Safety Index occupies a central place in local, national and global efforts to improve the functioning of hospitals in emergencies and disasters. This is an area that the World Health Organization (WHO) has promoted and supported for more than 25 years. After the Pan American Health Organization (PAHO) and WHO released the first version of the Hospital Safety Index in 2008, ministries of health and other health entities, other government ministries and agencies, and public and private hospitals across the six regions of WHO have joined their counterparts in the Americas in applying and adapting the Hospital Safety Index. The growing interest in safe hospitals led to calls from countries and other stakeholders for the revision of Hospital Safety Index to make it a truly global assessment tool that can be used in all contexts across the world.

In emergencies, disasters and other crises, a community must be able to protect the lives and well-being of the affected population, particularly in the minutes and hours immediately following impact or exposure. The ability of health services to function without interruption in these situations is a matter of life and death. The continued functioning of health services relies on a number of key factors, namely: that health services are housed in structures (such as hospitals or other facilities) that can resist exposures and forces from all types of hazards; medical equipment is in good working order and is protected from damage; community infrastructure and critical services (such as water, electricity etc.) are available to support the health services; and health personnel are able to provide medical assistance in safe and secure settings when they are most needed.

In 2005, at the 2nd World Conference for Disaster Reduction in Kobe, Japan, 168 countries approved the Hyogo Framework for Action and in so doing agreed to:

> **"promote the goal of 'hospitals safe from disasters' by ensuring that all new hospitals are built to a level of safety that will allow them to function in disaster situations and implement mitigation measures to reinforce existing health facilities, particularly those providing primary health care."**[1]

Defining the term "safe hospital" will help to guide the approach to assessing the safety of hospitals. A safe hospital is a facility whose services remain accessible and functioning at maximum capacity, and with the same infrastructure, before, during and immediately after the impact of emergencies and disasters. The continuing functionality of the hospital depends on a range of factors, including the safety of its buildings, critical systems and equipment, the availability of supplies, and the emergency and disaster management capacities of the hospital, particularly for response to and recovery from hazards or events which may occur.

A key element of progress towards safe hospitals has been the development and application of the Hospital Safety Index – a rapid and low-cost diagnostic tool for assessing the probability that a hospital

1 Hyogo Framework for Action 2005-2015: building the resilience of nations and communities for disasters. Geneva: United Nations International Strategy for Disaster Reduction, 2007 (http://www.unisdr.org/2005/wcdr/intergover/official-doc/L-docs/Hyogo-framework-for-action-english.pdf, accessed 4 November 2014.

will remain operational in emergencies and disasters. The evaluation yields useful information about a hospital's strengths and weaknesses and will point to the actions required to improve the safety and emergency and disaster management-capacities of the hospital.

The rapid diagnostic application of the Hospital Safety Index provides, as a comparison, an out-of-focus snapshot of a hospital: it shows enough of the basic features to allow evaluators to confirm or disprove the presence of genuine risks to the safety of the hospital, and the hospital's level of preparedness for the emergencies and disasters to which it will be expected to provide health services in the emergency response. The Hospital Safety Index also takes into account the hospital's environment and the health services network to which it belongs.

This *Guide for evaluators* for the Hospital Safety Index provides a step-by-step explanation of how to use the Safe Hospitals Checklist, and how the evaluation can be used to obtain a rating of the structural and nonstructural safety, and the emergency and disaster management capacity, of the hospital. The results of the evaluation enable hospital's own safety index to be calculated.

The Hospital Safety Index tool may be applied to individual hospitals or to many hospitals in a public or private hospital network, or in an administrative or geographical area. In some countries, such as Moldova, all government hospitals have been evaluated using the Hospital Safety Index. In this respect, the Hospital Safety Index provides a useful method of comparing the relative safety of hospitals across a country or region, showing which hospitals need investment of resources to improve the functioning of the health system.

Once the evaluation is complete, the evaluation team presents its findings to the hospital's senior management and staff. The reports from individual hospitals are usually integrated into a report of a group of hospitals to policy-makers in the health, finance or other ministries. In the private sector, results may be reported to the respective board of directors. Within the scope and scale of available resources, hospital management and staff will have responsibility for making the changes needed to improve the hospital's safety level, especially with regard to addressing nonstructural measures and strengthening emergency and disaster management capacities. However, large-scale changes, such as retrofitting of the hospital's structure to ensure its safety may require substantial investment from sources outside the hospital. (e.g. ministries of health, finance, education or social security, or the governing boards of public, private or nongovernmental institutions).

Revision of the Hospital Safety Index and this guide for evaluators

The original Hospital Safety Index was developed by PAHO and WHO with contributions from national experts in a variety of fields and was released in 2008. Subsequently, the Hospital Safety Index tool has been used to assess the safety of more than 3500 facilities and has been adopted and implemented by many countries. However, some countries considered that the original Hospital Safety Index needed some adaptation to meet the specific considerations of their region. For instance, sections on assessing the availability and training of the health workforce and the security of health facilities, staff and patients were proposed. This experience from across the world led to calls for revision of the Index in order to make the tool applicable to all hazards and all country contexts. Following intensive discussions and an extensive period of consultations, the revision of the Hospital Safety Index has been achieved with the consensus of many professionals from different disciplines with expertise and experience in hospital safety and in the application of the Index in countries around the world.

The revised Hospital Safety Index Checklist now requires that 151 items in structural, nonstructural and emergency and disaster management modules are evaluated by trained and experienced independent experts. The integrity of original checklist has been maintained in the revision. Nevertheless, some changes have been made, such as the following:

- Items have been added to give greater emphasis to security, staff availability, fire protection and suppression systems for internal fires, maintenance of critical systems, and the system for coordination of emergency operations in the hospital.
- The items have been modified to address all types of hazards which may affect the safety of the hospital or lead to an emergency or disaster to which the hospital will need to be prepared to respond.
- Some items have been moved between modules (e.g. the structural safety module has been bolstered by some elements from the nonstructural module).
- A section on infrastructure protection and access has been added.
- Details of supplies and equipment have been placed together into the same submodule.
- The explanations and references for each item have been expanded.

In addition, further guidance has been provided to give the evaluation team and decision-makers more options for the presentation of results and the calculation of a hospital's safety index in order to reflect the different political, risk and resource contexts around the world.

It is important to note that Hospital Safety Index involves an element of subjectivity on the part of the specialists using it, thus reinforcing the importance of the guidance and references in the Guide for evaluators and the value of training the evaluation team in the use of the Hospital Safe Index before any evaluations are conducted. As experience in applying this version of the tool widens, it is probable that it will need to be revised to reflect continuous improvement, broader applications and new and specific challenges such as security threats and climate change.

Importantly, the Hospital Safety Index has proved to be a most valuable tool for improving the safety and functionality of hospitals, such that life-saving and other health services can be provided in emergencies and disasters. The Index is expected to continue to play a vital role in action on safe hospitals at local and national levels, and through international commitments to support national safe hospitals programmes and the next global framework for disaster risk reduction that is expected to be agreed by Member States of the United Nations at the Third World Conference on Disaster Risk Reduction in Sendai in March 2015.

Aim, objectives and contents of this guide 2

The purpose of this *Guide for evaluators* is to provide guidance to evaluators on applying the checklist, rating a hospital's safety and calculating the hospital's safety index. The evaluation will facilitate the determination of the hospital's capacity to continue providing services following an adverse event, and will guide the actions necessary to increase the hospital's safety and preparedness for response and recovery in case of emergencies and disasters. Throughout this document, the terms "safe" or "safety" cover structural and nonstructural safety and the emergency and disaster management capacity of the hospital.

The Hospital Safety Index is a tool that is used to assess hospitals' safety and vulnerabilities, make recommendations on necessary actions, and promote low-cost/high-impact measures for improving safety and strengthening emergency preparedness. The evaluation provides direction on how to optimize the available resources to increase safety ensure the functioning of hospitals in emergencies and disasters. The results of the evaluation will assist hospital managers and staff, as well as health system managers and decision-makers in other relevant ministries or organizations in prioritizing and allocating limited resources to strengthen the safety of hospitals in a complex network of health services. It is a tool to guide national authorities and international cooperation partners in their planning and resource allocation to support improvement of hospital safety and delivery of health services after emergencies and disasters.

The objectives of this *Guide for evaluators* are:

- to give evaluators an objective and standardized approach to applying the Safe Hospitals Checklist, so that they can make an initial determination about whether or not the hospital will be able to function in the immediate aftermath of emergencies and disasters;
- to provide standard criteria for elements that will be evaluated in different contexts so that there is a common basis for reviewing the safety and needs of a number of hospitals;
- to simplify recording and classifying of information about the strengths and weaknesses found in a hospital, both individually and as part of a health-service network, and communities' capacity to manage emergencies and disasters;
- to recommend activities and measures to improve hospital safety and preparedness.

The *Guide to evaluators* also provides guidance to groups of experts from a variety of disciplines who are committed to reducing risks to hospital safety and strengthening preparedness, disaster response and recovery for hospitals.

The guide includes a section on methodology, two forms that should be completed, a section on the scoring systems and safety index, and a basic glossary of terminology, as follows.

- The methodology section provides the evaluator with an overview of the process and what to consider when using the checklist.
- Form 1 "General information about the hospital" (Annex 1) should be completed by the facility being evaluated.
- Form 2 "Safe Hospitals Checklist" (Annex 2) should be completed by the evaluation team.
- There is an explanation of to how to present the findings of the evaluation and how to calculate the hospital's safety index.
- The glossary provides standardized vocabulary for all those involved in the process.

While this document was developed for tertiary-level hospitals, it can be applied to the evaluation of other health facilities and can be used as a reference to evaluate other public services and facilities, subject to the corresponding technical adaptations being made and national and international standards being taken into account.

3 Conceptual aspects of emergency and disaster risk management

Nearly all communities are exposed to adverse phenomena, whether of natural origin or caused by technological or societal hazards. Among these are hurricanes, floods, earthquakes, wildfires, drought, volcanic eruptions, chemical incidents, terrorist attacks, violence against health workers, patients and facilities, and outbreaks of disease. All of these adverse events disrupt the routine life of a community and have a range of human and material consequences. Homes are destroyed, communities are isolated, and basic services are damaged. People lose their jobs and businesses, crops are destroyed and agricultural production is brought to a standstill. People go missing, are injured or killed, and experience a wide range of other health effects, including disease, disruption to treatment of chronic diseases, psychosocial effects and disability.

Disaster risk is defined as the likelihood that damages will overwhelm the ability of the affected community to respond. The hazard, which is a phenomenon with the potential to cause damage to elements and assets of communities (including people's health), interacts with vulnerability of those elements; this interaction determines if, and by how much, a community will be adversely affected by that hazard. Vulnerability is an expression of the exposure and susceptibility of society's elements. The main factors influencing disaster risk are: human vulnerability expressed primarily by levels of poverty and social inequality; health status of populations at risk; rapid population growth, mainly among the poor who settle in areas that present a variety of natural hazards (e.g. river beds, riverbanks, steep slopes); increasing environmental degradation, particularly because of poor land-use practices and their impact on climate change; poor planning; poor construction and the lack of early warning systems.

Communities have more or less resilience to the emergencies and disasters that occur at their location or affect them. The extent and severity of the damage caused by an adverse event is inversely proportional to the level of resilience of a community: the more resilient, the less damage. Finally, the capacity to respond determines whether an adverse event will be an emergency or will develop into a disaster.

Consequently, hazard events, emergencies and disasters affect people in different ways according to their health, social, economic and environmental conditions. Disasters cause proportionally more damage to developing countries and the poorest communities. Cyclones or hurricanes can hit two countries or two communities with the same wind speed and amount of rain, but the extent of damage to lives, infrastructure and health services will be very widely divergent because of different levels of vulnerability and capacities in the two communities.

Safe hospitals 4

Health facilities are vital to saving lives, providing care during emergencies, and aiding community recovery. In many countries, hospitals are the last shelter for disaster victims seeking refuge and the care they desperately need. Hospital systems also represent a major investment – up to 70% of the ministry of health budget – and are an icon of social well-being. Losing a hospital may result in a loss of security, connectivity and trust in local authorities. Yet the record shows that health facilities and health workers are among the major casualties of emergencies, disasters and other crises.

Government agencies (including ministries of health and national disaster management organizations), public and private hospitals and their partners have taken action to ensure the safety and preparedness of hospitals, so that they are able to continue to deliver essential services in emergencies and disasters. In this respect, WHO has been promoting safe hospitals programmes for more than 25 years, resulting in global, regional and national policy commitments, technical guidance and support provided to countries and partner organizations across WHO's six regions. Seventy-seven countries across the world have reported to WHO that they are implementing Safe Hospital activities.

The Hospital Safety Index tool has been used to assess the safety and preparedness of more than 3500 health facilities, and action has been taken to implement the assessment's recommendations for making hospitals safer and better prepared for emergencies. Many training programmes have been conducted by various organizations to increase the capacity of hospital staff to prepare for and respond to internal and external emergencies. In recent years, increasing attention has been given to the security of health workers and facilities, and to the sustainability and energy efficiency of "smart" or "green" hospitals.

Many hospitals are situated in areas of natural hazard or are exposed to hazards that may affect their safety and functioning.[1] It is estimated that a hospital that is out of service leaves some 200 000 people without health care. The loss of emergency services during emergencies and disasters severely lessens the possibility of saving lives and reducing other health consequences. Billions of dollars of damage to infrastructure has been caused by disasters around the world.[2] When we factor in the health costs for the millions who went without health services during an extended period, indirect losses are much higher.

The breakdown of the hospital's functional capacity to respond to emergencies and disasters is the main cause of service interruption in hospitals in such events; only a small proportion of hospitals are put out of service because of structural damage. The measures to prevent disruption of a hospital's functionality, including critical systems, supplies, and emergency and disaster management capacities, require much less of an investment than preventing a building's collapse. However, the technology, policy and management of hospital building performance in disasters continue to be major challenges.

1 In Member States of the WHO Region of the Americas alone, 67% of the region's estimated 18 000 hospitals are located in areas where there are hazards that could cause disaster.

2 According to a report prepared by the United Nations Economic Commission for Latin America and the Caribbean (ECLAC), damage to health infrastructure caused by disasters in the Region of the Americas amounted to more than US$ 7.82 billion over the period 1972–2011.

Many hospitals are built without taking the occurrence of hazards into account. In addition, when maintenance is neglected, systems that are critical for the functioning of the hospital deteriorate over time. However, the vulnerability of health facilities can be reversed through sustained political and financial support, as has been shown in a variety of projects in many countries.

In designing new safe hospitals or taking measures to improve the safety of existing hospitals, there are four objectives:

I) enable hospitals to continue to function and provide appropriate and sustained levels of healthcare during and following emergencies and disasters;

II) protect health workers, patients and families;

III) protect the physical integrity of hospital buildings, equipment and critical hospital systems; and

IV) make hospitals safe and resilient to future risks, including climate change.

The aim of Safe Hospitals programmes is to ensure that health facilities will not only remain standing in case of emergencies and disasters, but that they will function effectively and without interruption. Emergencies and disasters require an increase in treatment capacity, and the hospital must be ready for optimal use of its existing resources. The hospital must also ensure that trained personnel are available to provide high quality, compassionate and equitable treatment for casualties and survivors of emergencies, disasters and other crises.

The Hospital Safety Index 5

While Safe Hospitals programmes aim to reinforce the safety and ensure the functionality of all health facilities for emergencies and disasters, the Hospital Safety Index is a tool designed for the assessment of the safety of tertiary, university or major referral hospitals since they play a most critical role in the response to emergencies and disasters. They also represent the highest level of care for cities or regions of the country, and often represent a significant investment by public, private and nongovernmental sectors in health care. A specific tool has been developed by PAHO for small to medium size health facilities.

Ensuring the functionality of hospitals and making them safe in the event of disasters poses a major challenge, not only because of the high number of hospitals and their high cost but because there is limited information about current levels of safety and emergency and disaster management in hospitals.

Hospitals represent more than 70% of public spending on health in countries. Most of this spending is for specialized health personnel and sophisticated and costly equipment. It is critical that hospitals continue to work during emergencies and disasters since people immediately go to the nearest hospital for medical assistance when emergencies occur, without considering whether the facilities might not be functional. Consequently it is vital to identify the level of safety and functionality a hospital will have if an emergency or disaster occurs. Hospital evaluations aim to identify elements that need improvement in a specific hospital or network of hospitals, and to prioritize interventions in hospitals that, because of their type or location, are essential for reducing the mortality, morbidity, disability and other social and economic costs associated with emergencies and disasters.

Detailed vulnerability studies typically include in-depth analysis of hazards and of structural, nonstructural, health-system and hospital vulnerability. Each of these aspects requires the input of specialists who have experience in disaster reduction. Vulnerability studies generally take several months to complete and may cost the hospital tens of thousands of dollars.

For that reason, the Hospital Safety Index is a very important tool for moving closer to the goal of hospitals that are less vulnerable but safer and better prepared for emergencies and disasters. The Hospital Safety Index was devised and revised by national experts to provide health authorities and other hospital stakeholders with a method for conducting rapid and inexpensive evaluations of hospitals. A checklist helps to assess different items and safety ratings for a hospital. A scoring system assigns the relative importance of each item which, when calculated, gives a numeric value to the probability that a hospital can survive and continue to function in an emergency or disaster.

The Hospital Safety Index not only estimates the operational capacity of a hospital during and after an emergency, but it provides ranges that help authorities determine which hospitals most urgently need actions to improve their safety and functionality. Priority might be given to a hospital which has a poor level of safety which would put the lives of occupants at risk during an emergency or disaster.

1 Índice de seguridad hospitalaria: Guía para la evaluación de establecimientos de salud de mediana y baja complejidad. Washington (DC): Organización Panamericana de la Salud (Pan American Health Organization); 2010.

2 Report of the Caribbean Commission on Health and Development. Washington (DC): Pan American Health Organization; 2006.

The Hospital Safety Index is not only a tool for making technical assessments, but also provides a critical approach to emergency and disaster risk management for the health sector, with a focus on prevention, mitigation and preparedness for emergency response and recovery. It is not an "all or nothing" approach to hospital safety, but allows for improvement in a hospital over time. The index does not replace an in-depth vulnerability assessment or other studies, but it helps authorities to determine quickly what actions and measures can improve safety and what capacity the hospital has to respond to emergencies and disasters.

Procedures and recommendations for evaluating hospitals and applying the Hospital Safety Index

6

General coordination

The group responsible for general coordination (the authorizing entity) and oversight of the hospital evaluation(s) is made up of managers and professionals at the decision-making level from relevant organizations (e.g. ministry of health, social security or finance, national disaster management committee, private hospital network). The authorizing entity should include organizations and people who are responsible for strategic decision-making, development of policies, programmes, and plans, and resource allocation for the safety and functioning of the health service network in case of emergencies and disasters. The evaluation of a hospital may also be authorized by the senior management of a specific hospital.

The authorizing entity will initiate the evaluation process in each hospital. It is also responsible for selecting and training evaluators, forming the evaluation teams, and facilitating the first contact between the evaluation team and representatives of the hospital being evaluated. It will collect and review the results of the evaluations, calculate the scores for each module and the hospital's safety index, and develop and maintain databases, among other duties. The authorizing entity has overall responsibility for reviewing recommendations from the evaluation team and carrying out the agreed actions for improving the safety and emergency and disaster management capacity of the hospital.

***Note**: The authorizing entity and the evaluation teams should treat the evaluation report as confidential. Under no circumstances should an evaluator discuss the results of the evaluation with outside parties.*

Membership and responsibilities of the evaluation team

Evaluators should be professionals who work in the areas of hospital construction, providing health services, administration, or hospital support activities (e.g. critical systems, maintenance). If possible, evaluators should have at least five years of experience in structural design, construction, critical systems, and hospital emergency and disaster management. When people with these backgrounds are not available, professionals with less experience or students at an advanced level in equivalent fields of study may be selected. Evaluators with less experience should be supervised by national and/or international experts in the subject. In either case, the aim is for expert observation in evaluating elements of the hospital.

The evaluation is conducted by a multidisciplinary team, preferably including:

- engineers with training in structural engineering;
- architects with training in hospital design;
- specialists in hospital critical systems, biomedical engineering and equipment, and/or electrical and mechanical maintenance;
- health-care professionals (doctors, nurses etc.);

- specialists in emergency and disaster management, including planning and/or administration and logistics; and
- others (security specialists, municipal inspectors etc.).

It is important to consider the needs of the hospital and its position in the hospital network when forming the evaluation team. For example, geotechnical engineers or engineers specializing in seismic resistance should be part of the team evaluating health facilities located in earthquake zones.

The size and number of teams can vary according to the complexity of the hospital. The team should request the advice of national and international specialists when necessary.

All professionals involved in the process should receive training in the objectives and methodology of the safe hospitals evaluation, filling out the Safe Hospitals Checklist, interpretation of results, and preparation of a final evaluation report. However, calculation of a hospital's safety index is not necessarily part of the evaluation team's responsibility; rather the calculations are usually the responsibility of the authorizing entity.

Organization of the evaluation team

Once the hospital is chosen, the evaluation team is formed by the authorizing entity, taking into account features of the hospital and its surroundings. Each team must have a coordinator. Besides their own official identification, all evaluators must have a form of identification that accredits them as part of the evaluation team – e.g. the certification that they have completed the training course for the Hospital Safety Index tool, or that they have fulfilled other requirements established by the general coordination group or authorizing entity.

The team coordinator is designated by the appropriate authority or chosen by the evaluation team. Ideally, the team coordinator will have prior experience in emergency and disaster management as well as experience in assessing hospitals for safety in emergencies and disasters, preferably using the methodology of the Hospital Safety Index tool.

The team coordinator's responsibilities include the following:

- to arrange pre-evaluation interviews with hospital personnel in order to finalize evaluation arrangements;
- if necessary, to arrange the team's transport, lodging and security, and procure the materials and tools needed for the evaluation;
- to provide documentation from other hospitals that is pertinent to the evaluation, to organize interviews with staff from different divisions of the hospital, and to organize subgroups, as necessary, for the evaluation;
- to provide evaluation team members with copies of the Safe Hospitals Checklist and collect these when comments and recommendations have been made;
- to manage the process until the formal presentations of the evaluation are made to the authorizing entity; and
- to make contact with national and/or international experts should the team require assistance.

The evaluators' responsibilities are:

- to evaluate the hospital's safety in accordance with the four modules of the Hospital Safety Index checklist;
- to collect and analyse relevant documentation and collaborate in filling out and signing the forms; and
- to provide technical input to the final recommendations.

Each evaluator is responsible for completing an evaluation form. Where a subgroup makes an assessment, evaluators in that subgroup will complete only the section of the form that corresponds to their assignment. Evaluators are responsible for consolidating the information and modifying it in accordance with the results of the first meetings following the evaluation.

A high level of ethical and cordial behaviour is expected from team members.

***Note**: The results of the evaluation report are to be treated as confidential. Under no circumstances will an evaluator discuss the results of the evaluation with outside parties*

Evaluators must not interfere in the daily operations of the hospital. They must not handle equipment or give advice to staff on matters concerning hospital operations. Evaluators should take safety measures during the evaluation and should wear personal protective equipment when appropriate.

It is expected that all evaluators will dedicate themselves to the evaluation for the time required. Depending on the complexity of the hospital and the experience of the evaluators, an on-site evaluation should not take longer than 8 hours, but in the case of a highly complex and large hospital up to three days may be needed for the evaluation.

Equipment and materials

The following equipment and materials will be needed during the evaluation:

- the *Guide for evaluators* of the Hospital Safety Index (i.e. this document);
- a map of the area surrounding the hospital;
- local and regional hazard maps and other hazard-related information;
- a plan of the hospital site showing buildings and distribution of services;
- forms (Form 1: General information; Form 2: Safe Hospitals Checklist);
- notebooks, pencils, pens;
- two-way radio or cell phone;
- directory of key personnel involved in the evaluation;
- flashlights with charged batteries;
- still camera, video camera, tape recorder (optional);
- light tools (measuring tapes, chisels etc.) (optional);

- calculator (optional); and
- other tools considered necessary for the technical assessment.

Evaluation team members should carry with them:

- personal identification;
- evaluation team accreditation;
- comfortable and appropriate work clothing; and
- necessary protective items (helmet, protective glasses etc.).

Role of the Hospital Emergency/Disaster Committee in the evaluation

The members of the Hospital Emergency/Disaster Committee should be present throughout the evaluation process, as should hospital authorities and personnel who are involved in decision-making or who have vital information about the elements being evaluated.

In terms of the evaluation, the main responsibilities of the Hospital Emergency/Disaster Committee are:

- to provide all documentation needed to carry out the evaluation;
- to cooperate in the inspection of the structure by demonstrating or explaining the actual situation in order to facilitate an accurate diagnosis;
- to support the diagnosis process with comments and evidence; and
- to facilitate the participation of key hospital personnel in interviews and or meetings about the evaluation. Everyone should keep in mind that the objectives of the evaluation process are to take the necessary steps to reduce risk, mitigate damage from disasters, create awareness about disaster prevention, and increase preparedness for the hospital's response to emergencies and disasters.

The Hospital Emergency/Disaster Committee (also known as Emergency Risk Management Committee) is the hospital entity responsible for articulating, directing, assessing and coordinating hospital activities for the periods before, during and after an emergency/disaster, ensuring the participation of all hospital workers. The structure of this committee should reflect that of the particular facility, but in general should have the following membership:

- hospital director;
- director of administration;
- chief of emergency unit (coordinator);
- chief of nursing;

- medical director;
- chief of surgery;
- chief of laboratory services;
- chief of maintenance ;
- chief of transportation;
- chief of security;
- chief of support services;

and, for the purposes of evaluation:

- labour union representative;
- community representative;
- other hospital personnel as deemed necessary.

This committee's main task is to guide the development and execution of policies, programmes and plans that integrate risk management, hospital safety, and emergency and disaster response and recovery. Among other responsibilities, the committee determines the hospital's internal disaster response standards and functions, oversees permanent training and education of staff, and promotes cooperation and integration with the health system and community it serves. The terms of reference for the evaluation and the policies pertaining to the role of the Hospital Emergency/Disaster Committee should be formalized before the evaluation process begins.

Initial inspection of surroundings

First, the evaluators make a preliminary inspection of the city or area where the hospital is located. This provides an overview of the architectural and construction features of the city, the type of damage that hazards could cause, and the areas of the city and of the hospital that would probably be most affected. The evaluators will become familiar with primary and alternate routes used to access the hospital.

During the initial inspection, the team gathers pertinent documentation from different sources, including fire services, police, suppliers of water, electricity and telecommunications, and other community services. All this information is included in the final report.

Next there is an inspection of the exterior of the hospital. This involves filling out the forms that describe the building and type of structure, construction quality, irregularities and general condition, including the condition of facings, balconies, ledges etc. The condition of neighbouring structures is documented, and evaluators determine whether outside evacuation areas are safe.

The team identifies hazardous facilities near the hospital and irregularities in the terrain (e.g. whether there are steep slopes nearby), and any large bodies of water (ocean, rivers, lakes) that could elevate the level of groundwater.

Using the checklist

When the process of using the Safe Hospitals Checklist begins, it is important to consider the time required to complete the evaluation, the availability of all interested parties (evaluation team, members of the Hospital Emergency/Disaster Committee, others), and any hospital requirements (shifts, treatment hours, patients etc.). The evaluation should be interactive and dynamic and should have input from the members of the Hospital Emergency/Disaster Committee, members of the evaluation team, and outside parties (municipal and health authorities) as deemed necessary.

Items to be evaluated are grouped into modules. Each item and module is weighted differently according to its importance to the overall safety of the hospital. Modules can be evaluated individually (to generate a module-specific safety index) or together (to obtain an overall hospital safety index in which the scores from each module are integrated to give a single measurement). (Refer to Chapter 8: Calculating the module scores and the hospital's safety index; and to Chapter 9: Presenting the results for the hospital's safety index)

The organization of the evaluation should take into account the complexity, role and other aspects of the evaluated facility and its surroundings, so that evaluation teams can be put together, including the number of groups and the specialization of the experts needed.

The evaluation team is divided into subgroups, each having a different focus such as structural or non-structural safety or emergency and disaster management. The composition of subgroups is determined by the features of the hospital and its surroundings. Each subgroup should have at least two people, with each having expertise in certain areas of the evaluation.

Time must be scheduled for organizational meetings prior to the evaluation in addition to the time required for the on-site evaluation of the facility. These organizational meetings should be arranged to include members of the evaluation team, representatives from the authorizing entity and the organization which is responsible for the hospital (e.g. ministry or health or social security, private sector entity, nongovernmental organization), the management staff of the hospital, and members of the community.

It is advisable to take photographs to obtain as much documentation during the evaluation as possible and, with authorization from the hospital administration, to use recording cameras and voice recorders. However, this equipment should not be used if it intimidates interviewees in any way or lessens the level of confidence between evaluators and hospital staff.

Each item in the checklist must be answered unless there is an indication that an answer can be left blank. Sampling questions is not allowed. If there is doubt about rating an item, it is preferable to give a lower safety rating than a higher one. Any item classified as having a low level of safety will be recommended for priority attention.

During the process of completing the checklist, evaluators should not make comments about operations in the hospital unless these are specifically addressed in the evaluation. Value judgments expressed by individual evaluators or by the group are not considered part of the evaluation.

Evaluators should make notes about their observations in the column reserved for comments in the checklist, in the row pertaining to a specific item. These comments are helpful when compiling the evaluation report. While they do not form part of the numerical calculations of the module or the safety index, comments are included in the recommendations made by the evaluators. In the comments sec-

tion an evaluator may justify a positive or negative rating, include questions raised by the hospital about a response in the checklist, or emphasize urgent measures that should be taken to improve the hospital's safety. The comments section can also include general references to the facility that are not included in the evaluation modules or that might warrant another opinion.

The evaluation and comments must be made in the local language. Any translations of the material must be faithful to the meaning of the original content.

Once the evaluation team has completed the evaluation, the hospital being evaluated has the opportunity to add general comments regarding the process and the evaluation team. This feedback is essential for improving the evaluation process.

Finalizing the evaluation

Once the on-site evaluation is completed, the members of the evaluation team meet to share, consolidate and discuss their findings. Following this, a meeting is organized which includes all interested parties from the hospital and partners, whether or not they were directly involved in the evaluation. Members of team subgroups will make general observations about the data collected at this meeting. Subsequent discussion and suggestions will be used to make changes to the evaluation documents, or comments can be noted.

If there is disagreement between the evaluation team and the Hospital Emergency/Disaster Committee or administration of the hospital, this should be noted as an observation on the evaluation.

The corrected document is signed and dated by members of the evaluation team, and a copy is delivered to the hospital director. The evaluation report with any additional documentation (photographs, documents, recordings etc.) is also delivered to the authorizing entity or general coordination group.

The authorizing entity is responsible for filing all documentation, updating the database of the tabulated results of hospital assessments, and calculating the scores for each module and the safety index. The group prepares the final report which includes recommendations made by the evaluation team.

The final report should be presented at the final meeting with interested parties, including the Hospital Emergency/Disaster Committee. At that meeting feedback is expected from the evaluated institution regarding the general evaluation process, so that improvements can be made to future evaluations.

Following the presentation of the final report to the hospital, the next tasks and responsibilities will emerge for both groups. The authorizing entity or general coordination group must diligently follow up by organizing inspections (and more detailed studies) of the measures deemed necessary to improve the hospital's safety and emergency and disaster management. The immediate improvements which fall under the responsibility of the hospital must be carried out within the times recommended. The hospital must then inform the authorizing entity or general coordination group and proceed to final inspections, if this step has been agreed upon.

A copy of the final report will be filed by the authorizing entity or coordination group along with supporting documentation in a file identified with the name of the hospital and subdivided into dates of evaluations. The database will be updated and dates will be agreed on for the follow-up process.

Brief description of the evaluation forms 7

Form 1. General information about the hospital

This form includes general information about the hospital being evaluated and its treatment and operating capacity:

- General information: name and address of the hospital; contact details; names of senior management and emergency/disaster management staff; number of beds; hospital bed occupancy rate; number of personnel; diagram of the facility and its surroundings; role in the health services network etc.
- Hospital treatment and operating capacity: number of beds by services (e.g. medicine, surgery, intensive care); medical, surgical and nonclinical staff; operating theatres; emergency and disaster operations; expansion capacity in case of emergencies and disasters.

This form should be completed by the hospital's emergency or disaster committee before the evaluation. If possible, it should be accompanied by a diagrams and maps of the hospital, its local setting and the distribution of services within the hospital, with a legend describing them.

Form 2. Safe Hospitals Checklist

The checklist is used to make a preliminary diagnosis of the hospital's safety and capacity to provide services in the event of emergencies and disasters. It contains 151 items, each of which has three safety rating levels: low, average and high.

The checklist is divided into four sections or modules:

I. Module 1: Hazards affecting the safety of the hospital and the role of the hospital in emergency and disaster management

II. Module 2: Structural safety
Module 3: Nonstructural safety
Module 4: Emergency and disaster management

Issues to keep in mind while using the checklist are as follows:

- The contents of the checklist and the elements being evaluated are formulated for application in large complex hospitals. They may also be described as general hospitals, university hospitals, tertiary referral hospitals or specialized hospitals.

- Module 1 is used to determine the hazards that may directly affect the safety of the hospital and those for which the hospital may be expected to provide health services in response to emergencies and disasters. Module 1 and the hazards identified are not included in the calculation of a hospital's safety index.
- The evaluation team should evaluate the hospital against the items in modules 2, 3 and 4, with reference to both the hazards identified in Module 1 and the maximum capacity of the hospital for emergencies and disasters identified in Form 1 (General Information about the Hospital).
- Each item in modules 2, 3 and 4 has a value that reflects its importance in relation to other items in the same module. Items with the most relevance are shaded or highlighted and are weighted more heavily than other items. The evaluation results in a score for each module.
- The values assigned to each item are in accordance with established standards (e.g. WHO manuals, regional or national standards, local construction codes, and institutional standards and rules).
- Evaluation of items is applied most strictly in the critical areas of the hospital where the demand for treatment is greatest in emergencies and disasters.
- The calculation of each hospital's safety index is based on the weighting of the respective modules. Two models are recommended for calculating the index. In order to facilitate comparison between hospitals, it is essential that the same model is applied to all hospitals covered by the evaluation.
  - Model 1: The values for structural components represent 50% of total values in the index, nonstructural components represent 30%, and functional capacity represents 20%. This model is proposed for countries or regions where there is a higher risk of structural and nonstructural failure, as in high earthquake-prone or high-wind areas.
  - Model 2: All three modules are weighted equally: i.e. each module contributes 33.3% to the calculation of the safety index. This model is proposed for countries or regions where earthquakes and high winds are not considered to be likely hazards.
- For the evaluation process to be considered complete, all items must be analysed. Where indicated in each module, it is possible to leave an item blank if it is not considered relevant to the hospital concerned. However, a comment should always be provided to show that the item was considered.
- The checklist includes instructions for filling out each of the items. Only one box for each item being evaluated should be marked with an "X" (low, average, or high).

The four modules of the checklist

Module 1. Hazards affecting the safety of the hospital and the role of the hospital in emergency and disaster management

The first module allows for a rapid description of external and internal hazards or dangers and geotechnical properties of soils at the site of the hospital that may affect the safety or functioning of the hospital. The module also identifies those hazards which could lead to emergencies and disasters for which the hospital would be expected to provide health services in emergency response. These events may not directly affect the safety of the hospital; however the hospital should be prepared for such events.

Module 2. Structural safety

2.1 Prior events and hazards affecting structural safety

2.2 Building integrity

Evaluating structural safety of the hospital involves assessment of the type of structure and materials, and previous exposure to natural and other hazards. The objective is to determine if the structure meets standards for providing services to the population even in cases of major emergency or disaster, or whether it could be affected in a way that would compromise structural integrity and functional capacity.

Safety in terms of prior events involves two elements. The first is whether the facility has been exposed to hazards in the past, and its relative vulnerability to hazards. The second is whether the facility was affected or damaged in the past and how the damage was repaired.

The evaluators attempt to identify potential risks in terms of the type of design, structure, construction materials, critical components of the structure and structural risk reduction measures.

Structural systems and the quality and quantity of construction materials provide the stability and resistance of a building against natural forces. Making adjustments in a structure for the range of hazards which may affect the hospital is essential, since a structural solution can be valid for one hazard but not for another (e.g. for earthquakes but not for cyclones or floods).

Module 3. Nonstructural safety

3.1 Architectural safety

3.2 Infrastructural protection, access and physical security

3.3 Critical systems

3.4 Equipment and supplies

Nonstructural elements are critical to the functioning of the hospital. Architectural elements are distinct from structural elements as they do not form part of the load-bearing system of the hospital buildings. They also include emergency access and exit routes to and from the hospital, critical systems (e.g. electricity, water supply, waste management, fire protection), medical, laboratory and office equipment (whether fixed or mobile), supplies used for analysis and treatment, and so forth.

Module 4. Emergency and disaster management

4.1 Coordination of emergency and disaster management activities

4.2 Hospital emergency and disaster management response and recovery planning

4.3 Communication and information management

4.4 Human resources

4.5 Logistics and finance

4.6 Patient care and support services

4.7 Evacuation, decontamination and security

This module considers the level of preparedness of a hospital's organization, personnel and essential operations to provide patient services in response to an emergency or disaster.

How the hospital is prepared and organized to respond in emergency/disaster situations is central to evaluating a hospital's capacity to function during and after a disaster. In this module, evaluators check the level of organization for coordination of the hospital's response to emergencies and disasters, available plans and capacities for evacuation and response (including patient-care services, mass casualty management, triage and decontamination), human, finance and logistical resources for disaster preparedness and response, communication and information management, availability of staff, and safety and security of the staff.

The hospital administrators should provide evaluators with any documentation that is relevant to the hospital's emergency/disaster management capacities.

8 Calculating the module scores and the hospital's safety index

Module and safety index calculator

Before conducting the evaluation of the safety of a hospital or a network of hospitals, the coordination group or authorizing entity should determine what model will be used to calculate the safety index. The same model should be used for calculating the safety index of all hospitals in the region or country to enable a common standard for comparing the relative safety of all hospitals and the needs for safety improvements.

The first step in calculating a hospital's safety index is for the evaluation team to carry out the evaluation and complete the checklist process concerning the four modules.

The hazard levels assigned to the location of the hospital, including the level of hazard due to soil characteristics, are not counted when calculating a hospital's safety index.

The second step of the evaluation, which should be carried out by the authorizing entity or coordination group independently of the evaluation team, is to enter the results from the checklist into the hospital safety index calculator, which is a page that has a series of formulas that assign specific values to each item. The calculations are based on how the evaluators rated each item and the relative importance of that item in each module and to the overall safety of the hospital in case of emergencies or disasters.

Relative weight and standardization of items, sections, submodules and modules

The items are grouped into submodules, with a group of submodules constituting one module. In some, but not all, submodules there are several sections.

The value of each item is multiplied by its relative weight in a section and /or submodule. The sum of values of all the items of a submodule gives 100% of that submodule.

Each submodule is weighted in relation to the other submodules in the same module. The sum of the weighted values of the submodules gives 100% of the respective module.

Because it is possible to distinguish the results for sections, submodules and modules, it is easier to identify those areas of the hospital which rate low and thus require attention in order to improve the safety of the hospital.

As noted above, there are two models for the weighting of the modules to calculate the safety index:

Model 1: (where there is a higher risk of earthquake and/or cyclones)

- structural safety has a weighted value of 50% of the index;
- the nonstructural module has a weighted value of 30%; and
- emergency and disaster management is weighted at 20%.

Model 2: all the modules are given equal weight, so that

- structural safety has a weighted value of 33.3% of the index;
- the nonstructural module has a weighted value of 33.3%; and
- emergency and disaster management is weighted at 33.3%.

The sum of the weighted results of the three modules gives a hospital safety rating expressed as the probability (percentage) that a facility will be able to function in an emergency or disaster situation.

Given that each item has three levels of safety (high, average and low), and to avoid any distortion at the time of evaluation, a constant value is applied to each level of safety. Values are standardized to enable comparisons between hospitals for each module and for the overall hospital safety index. The safety index has a maximum value of 1 (one) and a minimum of 0 (zero).

Weighted values, standardization and calculations take into account that it is very difficult for a hospital to remain perfectly safe or operational, so it is rare for a facility to be given a safety index of 1.

Entering data into the safety index calculator

When formulas are applied to the data from the checklist, the calculator will assign weighted values to each item, section, submodule and module. The formulas calculate a specific value and index for each of the structural, nonstructural, and emergency and disaster management modules, and calculate an overall hospital safety index.

The checklist results are entered as number 1 in the corresponding cells and the calculation page automatically applies a series of formulas to carry out the following steps:

- automatically corrects input errors;
- accounts for the questions which are deliberately left blank by adjusting the denominator for the calculation;
- assigns weighted values for the safety of each item, section, submodule and module (structural, nonstructural, and emergency and disaster management);
- calculates and charts the relative safety and the module-specific safety index for each module;

- automatically classifies the module-specific index as "a", "b" or "c" ("c" corresponds to a score from 0 to 0.35, "b" to a score from 0.36 to 0.65, and "a" to a score from 0.66 to 1). (Note: the general recommendations in Table 1 also may apply to the module-specific indices);
- calculates and charts the overall hospital safety index (based on the weighting of the three modules together);
- automatically classifies the hospital as "A", "B" or "C" (see Table 1); and
- according to the hospital safety classification, provides general recommendations about how to correct deficiencies.

Table 1: General recommendations for intervention

Safety index	Classification	What should be done?
0 – 0.35	C	Urgent intervention measures are needed. The hospital is unlikely to function during and after emergencies and disasters, and the current levels of safety and emergency and disaster management are inadequate to protect the lives of patients and hospital staff during and after emergencies or disasters.
0.36 – 0.65	B	Intervention measures are needed in the short term. The hospital's current levels of safety and emergency and disaster management are such that the safety of patients and hospital staff, and the hospital's ability to function during and after emergencies and disasters, are potentially at risk.
0.66 – 1	A	It is likely that the hospital will function in emergencies and disasters. It is recommended, however, to continue measures to improve emergency and disaster management capacity and to carry out measures in the medium- and long-term to improve the safety level in case of emergencies and disasters.

The evaluator should interpret results in the context of other health facilities in the area's health service network, the location of the facility, and the demographics and health risk factors for the population it serves.

9 Presenting the results for the hospital's safety index

When all data have been entered into the calculator, the results available will include:

a) a module-specific safety index for each module (between 0 and 1) with an assigned classification: "a", "b" or "c";

b) an overall hospital safety index (between 0 and 1) with an assigned classification of "A", "B" or "C".

There are several of ways for the results of the evaluation to be presented in the final report depending on the requirements of the authorizing entity. The results may be presented as follows:

a) by the hospital's safety index classification (alpha): A, B or C. The advantage of the safety index is that it provides a classification for the hospital which is simple to communicate and can report aggregated results from a group of hospitals.

b) by the hospital's overall safety index (numerical): e.g. 0.73, 0.52, 0.27. The advantage of the number is that it shows the indexed score for the hospital and therefore can show whether it is in the middle of the classification range or closer to the extremes.

c) by the three letters corresponding to the classification for each module (alpha): e.g. bca, cbc, aab. The advantage of this presentation is that it can point directly to the modules which have higher or lower classifications and to their relative contributions to the overall index.

d) by a combination of the hospital safety index and the respective modules: e.g. A (abb), B (bca), C (cbc); or by alphanumeric: e.g. 0.73 (abb), 0.52 (bca), 0.27 (cbc). While this provides a more complex presentation, it combines the results for individual modules with the overall hospital classification or indexed score.

When a group of hospitals is being evaluated, the authorizing entity for the evaluation may be interested to review all hospitals either by the overall index or by each module. This may be useful for the prioritization and allocation of resources as there are often significant differences in the costs of improving structural safety, nonstructural safety and emergency/disaster management. As the evaluation using the Hospital Safety Index tool serves as a preliminary diagnosis, more targeted and detailed studies (e.g. hospital engineering studies) are recommended to obtain a more definitive assessment of the safety of the hospital and as the basis for planning major investments.

Completing the checklist 10

Before applying the checklist, make sure that the previous steps described in the proceedings and recommendations for the evaluation of the hospital have been completed. In this section each one of the 151 items to be evaluated is described and guidance is provided on how best to establish the corresponding degree of safety: High (H), Average (A) or Low (L). All the items need to be evaluated and assessed and the result of the evaluation should be noted down in the checklist.

The degree of safety will be evaluated in accordance with the ratings established for each item and the individual and collective experience of the group of evaluators. It is recommended that additional information or comments on items assessed should be noted in the observations column. Take into account that some items include a note in capital letters which indicates that it may not be possible to evaluate this item and, as a result, the space could be left blank with no answer. However, an explanation should always be provided to explain why it was left blank. Even in these cases, careful analysis is recommended to reconfirm that the condition described in capital letters is fulfilled before leaving the space blank and proceeding to the next item. The Safety Index Calculator will adjust the formula for calculation by taking account of any blank responses.

On completion of each module in the checklist, further comments or general observations should be noted together with the names and signatures of the evaluators.

The Safety Index Calculator has a special formula for calculating items that are not applicable to the hospital. When ratings from the checklist are entered, only the items that have been evaluated are calculated. In some cases a question may not apply to a particular hospital because the item is not relevant to the structure and function of the hospital. Only in such cases, and where there are instructions to leave boxes blank if the item does not apply, should the question not be answered.

As noted above, items that are highlighted in the checklist are particularly important for the evaluation and carry more value in the scoring of sections, submodules, modules and overall hospital safety.

Module 1: Hazards affecting the safety of the hospital and the role of the hospital in emergency and disaster management

Many hospitals are located in hazard-prone areas (e.g. floodplain areas, coastal areas subject to storm surge and tsunami, or near to seismic faults or hazardous facilities) which may affect the structural and nonstructural safety of the hospital. The emergency and disaster management role of the hospital may extend beyond those hazards which could directly affect the safety of the hospital (e.g. the hospital may need to be prepared to receive and treat patients in response to a flood although the hospital is not affected or damaged by the flood itself). Analysis of the geographical location of the hospital enables hazards to be assessed in relation to previous emergencies and disasters in the zone, hazards which may affect the hospital, and the location and type of land on which the hospital has been constructed. Emphasis should also be placed on internal hazards, such as hospital building fires, critical system failure (e.g. water, power) and security threats which can affect the safety of the building, patients, visitors and staff, and the functioning of the hospital. Evaluators should use their knowledge and expertise to assess how hazards and their proximity make the hospital less safe and less prepared to respond to emergencies or disasters.

This module is divided into two parts:

1.1 Hazards (comprising natural hazards, including geological, hydrometeorological and biological, and human-made hazards, including technological and societal hazards)

1.2 Geotechnical properties of soils

The Hospital Emergency/Disaster Committee should be requested to provide in advance the maps which show the hazards which could affect the hospital and the type of events to which the hospital will be expected to respond. Other entities which should be approached include the Ministry of Health, local government, multisectoral emergency or disaster risk management committees, disaster management organizations, civil protection agencies, and meteorological and geological agencies.

This information is fundamental to the evaluation of the safety of the hospital. The evaluation team and the hospital committee will use this information to set the context and boundaries of the evaluation in respect of the current and future hazards against which the hospital should be safe and the type of emergencies or disasters to which the hospital should be prepared to respond. The information collected will enable the evaluation team to ascertain the following:

- the frequency, magnitude and intensity of hazards from all sources that can cause damage or affect the safety of the hospital;
- risks of geological and hydrometeorological events to which the hospital should be prepared to respond;
- exposure to biological hazards and the risks of biological events, such as outbreaks and epidemics, to which the hospital should be prepared to respond;
- exposure to technological hazards (e.g. chemical and other industrial hazards, major transport crashes) and the risks of technological events to which the hospital should be prepared to respond;

- exposure to societal hazards such as violence, displacement and mass gatherings, and the risks of such events to which the hospital should be prepared to respond; and
- the geotechnical properties of the soil.

Consideration should be given to the changing nature of hazards, including sea-level rise and other longer-term factors which may be attributable to climate change. These hazards may affect the safety of a hospital at some point during its life cycle that may last for decades.

Module 1 does not lend itself to measurement; nor does it form part of the calculation of the hospital's safety index. However, the assessment of each item in the checklist should refer to the hazards in the hospital's surroundings or the events to which the hospital should be prepared to respond This information will provide an indication of the anticipated number and type of patients for whom the hospital should be prepared to provide services in an emergency or disaster situation.

1.1 Hazards

The evaluation team should request the Hospital Emergency/ Disaster Committee to provide regional or site map(s) showing potential hazards for the hospital location and the catchment area of the hospital, i.e. the geographical area and population for whom the hospital would be expected to provide health care for emergencies and disasters. Depending on the hospital's role and capacity, the catchment area may be local, or it may be the entire country if it is the only hospital or if it provides specialized services.

Evaluation teams will benefit from the availability of hazard maps or other hazard information which will enable them to rate the level of the hazard readily. Should there be no hazard maps, evaluators should not stop the process; instead they should rely on the best available information on hazards from informed sources and use this information to estimate the level of the hazard.

The exposure of the hospital is measured (or estimated) by combining the probability of the occurrence and the magnitude of a particular hazard. In this way, hazards can be classified as high (indicating a high probability of hazards taking place or high-magnitude hazards, or both), medium (a high probability of moderate hazards) and low (a low probability or hazards of low magnitude).

It is helpful to take account of the history of hazards affecting the hospital when rating the hazard level. However, evaluators need to consider the potential threat of all hazards identified, including those that have not yet occurred but may do so in future.

Natural hazards

1.1.1 Geological hazards

- **Earthquakes**
  Refer to regional and local hazard maps or other hazard information, and rate the level of earthquake hazard for the hospital location (including catchment area) in terms of geotechnical soil analyses. Determine whether the hospital should be prepared to respond to an emergency or disaster due to earthquakes (based on exposure of the catchment population or the specialized role of the hospital for the treatment of injured patients).

- **Volcanic activity and eruption**
  Refer to regional and local hazard maps or other hazard information, and rate the level of volcanic hazard for the hospital's location. This should take into account proximity to volcanoes, volcanic activity, routes of lava flow, pyroclastic flow and ash fall. Determine whether the hospital should be prepared to respond to an emergency or disaster due to volcanic activity and eruption (based on exposure of the catchment population or the specialized role).
- **Dry mass movements – landslides**
  Refer to regional and local hazard maps or other hazard information for the region, and rate the level of landslide hazard for the hospital location. Note that landslides may be caused by unstable soils. Determine whether the hospital should be prepared to respond to an emergency or disaster due to landslides (based on exposure of the catchment population).
- **Tsunamis**
  Refer to regional hazard maps or other hazard information, and rate the level of tsunami hazard caused by submarine seismic or volcanic activity for the hospital location. Determine whether the hospital should be prepared to respond to an emergency or disaster due to tsunamis (based on exposure of the catchment population).
- **Other geological hazards (e.g. rockfalls, subsidence, debris and mudflows)**
  Refer to regional and local hazard maps or other hazard information to identify other geological phenomena. Specify the hazard and rate the corresponding hazard level for the hospital. Determine whether the hospital should be prepared to respond to an emergency or disaster due to the identified geological hazards (based on exposure of the catchment population).

1.1.2 Hydro-meteorological hazards

1.1.2.1 Meteorological hazards

- **Cyclones/ hurricanes/typhoons**
  Refer to regional hazard maps or other hazard information, and rate the hazard level for the hospital location in terms of cyclones, hurricanes and typhoons. Determine whether the hospital should be prepared to respond to an emergency or disaster due to cyclones, hurricanes or typhoons (based on exposure of the catchment population).
- **Tornadoes**
  Refer to regional hazard maps or other hazard information, and rate the tornado hazard level for the hospital location. Determine whether the hospital should be prepared to respond to an emergency or disaster due to tornadoes (based on exposure of the catchment population).
- **Local storms**
  Rate the hazard level for the hospital in relation to flooding and other damage due to intensive (or torrential) rainfall from local storms based on the history of such events. Determine whether the hospital should be prepared to respond to an emergency or disaster due to local storms (based on exposure of the catchment population).

- **Other meteorological hazards (e.g. sandstorms, wind gusts)**
  Rate the hazard level for the hospital in relation to risk of other meteorological hazards based on the history of such events. Determine whether the hospital should be prepared to respond to an emergency or disaster due to other meteorological hazards (based on exposure of the catchment population.

1.1.2.2 Hydrological hazards

- **River floods**
  Refer to regional and local hazard maps or other hazard information, and rate the river flood hazard level of the hospital location (including catchment area) in terms of river floods (and other watercourses, such as creeks). Determine whether the hospital should be prepared to respond to an emergency or disaster due to river floods (based on exposure of the catchment population).
- **Flash floods**
  Refer to regional and local hazard maps, other hazard information and past incidents, and rate the flash flood hazard level for the hospital location. Determine whether the hospital should be prepared to respond to an emergency or disaster due to flash floods (based on exposure of the catchment population).
- **Storm surge**
  Refer to regional hazard maps or other hazard information, and rate the storm surge hazard level associated with risks of cyclones, hurricanes, typhoons and other storms for the hospital location,. Determine whether the hospital should be prepared to respond to an emergency or disaster due to storm surge and related floods (based on exposure of the catchment population).
- **Wet mass movements – landslides**
  Refer to regional and local hazard maps or other hazard information, and rate the level of hazard due to landslides caused by saturated soils for the hospital location. Determine whether the hospital should be prepared to respond to an emergency or disaster due to landslides caused by saturated soils (based on exposure of the catchment population).
- **Other hydrological hazards (e.g. high tides, avalanches, coastal floods)**
  Refer to regional and local hazard maps or other hazard information to identify other hydro-meteorological hazards not listed above. Specify the hazard and rate the corresponding hazard level for the hospital location. Determine whether the hospital should be prepared to respond to an emergency or disaster due to other hydrological hazards (based on exposure of the catchment population).

1.1.2.3 Climatological hazards

- **Extreme temperature (e.g. heat wave, cold wave, extreme winter conditions – dzud)**
  Refer to regional and local hazard maps or other hazard information, and rate the level of hazard due to extreme temperature or weather condition. Specify the hazard and rate the corresponding hazard level for the hospital location. Determine whether the hospital should be prepared to respond to an emergency or disaster due to extreme temperatures (based on exposure of the catchment population).

- **Wildfires (e.g. forests, croplands, populated areas)**
  Refer to regional and local hazard maps or other hazard information, and rate the wildfire hazard level for the hospital location. Determine whether the hospital should be prepared to respond to an emergency or disaster due to wildfires (based on exposure of the catchment population or the specialized role of the hospital for the treatment of burns patients).
- **Drought**
  Refer to regional and local hazard maps or other hazard information, and rate the drought hazard level for the hospital location. Determine whether the hospital should be prepared to respond to an emergency or disaster due to drought (based on exposure of the catchment population or the specialized role of the hospital for the treatment of malnutrition).
- **Other climatological hazards, including those attributable to climate change (e.g. sea-level rise)**
  Rate the hazard level for the hospital in relation to the risk of other climatological hazards based on hazard maps, the history of such events and hazard modelling. Determine whether the hospital should be prepared to respond to an emergency or disaster due to other climatological hazards (based on exposure of the catchment population).

1.1.3 Biological hazards

- **Epidemics, pandemics and emerging diseases**
  With reference to any risk assessments, past incidents at the hospital and specific pathogens, rate the hazard level of the hospital related to epidemics, pandemics and emerging diseases. Determine whether the hospital should be prepared to respond to an emergency or disaster due to epidemics, pandemics and emerging diseases (based on exposure of the catchment population or the specialized role of the hospital for the treatment of patients with infectious diseases).
- **Foodborne outbreaks**
  With reference to any risk assessments and past incidents at the hospital location (including catchment area), rate the hazard level of the hospital related to foodborne outbreaks. Determine whether the hospital should be prepared to respond to an emergency or disaster due to foodborne outbreaks (based on exposure of the catchment population).
- **Pest attacks (e.g. infestations)**
  With reference to any risk assessments and past incidents at the hospital, rate the hospital's exposure to hazards from pest attacks or infestations (flies, fleas, rodents, etc.). Determine whether the hospital should be prepared to respond to an emergency or disaster due to pest attacks or infestations (based on exposure of the catchment population).
- **Other biological hazards**
  With reference to any risk assessments, rate the hazard level for the hospital in relation other biological hazards. Determine whether the hospital should be prepared to respond to an emergency or disaster due to other biological hazards (based on exposure of the catchment population or the specialized role of the hospital for the treatment of patients exposed to biological hazards).

Human-made hazards

1.1.4 Technological hazards

- **Industrial hazards (e.g. chemical, radiological)**
  Refer to regional and local hazard maps of industrial facilities or other hazard information and any past incidents involving industrial hazards, and rate the industrial hazard level for the hospital's location and potential contamination of the hospital's systems. Determine whether the hospital should be prepared to respond to an emergency or disaster due to industrial hazards (based on exposure of the catchment population or the specialized role of the hospital for the treatment of patients exposed to industrial hazards).
- **Fires (e.g. building)**
  Refer to local hazard maps or other hazard information on building fires inside and outside the hospital and any past incidents involving building fires, and rate the fire hazard level for the hospital. Determine whether the hospital should be prepared to respond to an emergency or disaster due to building fires (based on exposure of the catchment population or the specialized role of the hospital for the treatment of burns patients).
- **Hazardous materials (e.g. chemical, biological, radiological)**
  Refer to local hazard maps or other hazard information on hazardous materials (incidents and spills) inside and outside the hospital and any past incidents involving hazardous material spills or leaks, and rate the hazardous material hazard for the hospital and the potential contamination of its systems. Determine whether the hospital should be prepared to respond to an emergency or disaster due to hazardous materials (based on exposure of the catchment population or the specialized role of the hospital for the treatment of patients exposed to hazardous materials).
- **Power outages**
  Refer to any past incidents involving power outages for the hospital location, and rate the power outage hazard for the hospital. Determine whether the hospital should be prepared to respond to an emergency or disaster due to power outages.
- **Water supply disruption**
  Refer to any past incidents involving the disruption of the water supply for the hospital location, and rate the hazard for the hospital. Determine whether the hospital should be prepared to respond to an emergency or disaster due to disruption of the water supply.
- **Transportation incidents (e.g. air, road, rail, water transport)**
  Refer to records of past major transport incidents, and determine whether the hospital should be prepared to respond to an emergency or disaster due to transport incidents (based on exposure of the catchment population).

- **Other technological hazards (e.g. air pollution, structural collapses, food/water contamination, nuclear)**
  Refer to regional and local hazard maps or other hazard information and past incidents to identify other technological hazards for the hospital. Specify the hazard and rate the corresponding hazard level for the hospital location. Determine whether the hospital should be prepared to respond to an emergency or disaster due to other technological hazards (based on exposure of the catchment population or any specialized role of the hospital for the treatment of patients exposed to other technological hazards).

1.1.5 Societal hazards

- **Security threat to hospital building and staff**
  Refer to risk/threat assessments and past security incidents affecting the hospital and staff, and rate the security hazard level to the hospital and staff. Determine whether the hospital should be prepared to respond to an emergency or disaster due to security threats to the hospital building and staff.
- **Armed conflicts**
  Refer to risk assessments of armed conflicts and past incidents that have affected the hospital, and rate the hospital's hazard level in relation to armed conflicts. Determine whether the hospital should be prepared to respond to an emergency or disaster due to armed conflicts (based on exposure of the catchment population).
- **Civil unrest (including demonstrations)**
  Refer to risk assessments and past incidents of civil unrest that have affected the hospital, and rate the hospital's hazard level in relation to demonstrations and civil unrest. Determine whether the hospital should be prepared to respond to an emergency or disaster due to demonstrations and civil unrest (based on exposure of the catchment population).
- **Mass gathering events**
  Determine whether the hospital should be prepared to respond to an emergency or disaster due to mass gatherings (based on exposure of the catchment population).
- **Displaced populations**
  Refer to risk assessments and rate the hospital's hazard level in terms of people who have been displaced as a result of conflict, community unrest and other sociopolitical circumstances, or due to high levels of immigration. Determine whether the hospital should be prepared to respond to an emergency or disaster due to displaced populations.
- **Others societal hazards (e.g. explosions, terrorism)**
  Refer to risk assessments, regional and other hazard information and past incidents to identify other societal hazards. Specify the hazard and rate the corresponding hazard level for the hospital location. Determine whether the hospital should be prepared to respond to an emergency or disaster due to other societal hazards (based on exposure of the catchment population or any specialized role of the hospital in treatment of patients exposed to societal hazards).

1.2 Geotechnical properties of soils

Under this point, the aim is to have a general idea of the soil mechanics and the geotechnical parameters of the hospital location, as well as the level of stability (i.e. thickness of the stratum) of the soil type.

- **Liquefaction**
  With reference to the geotechnical soil analysis at the hospital site, rate the level of the facility's exposure to hazards from saturated and loose subsoil.
- **Clay soils**
  With reference to soil maps or other hazard information, rate the hospital's exposure to hazards from clay soil.
- **Unstable slopes**
  Refer to geological maps or other hazard information and specify the hospital's exposure to hazards from the presence of slopes.

Evaluators may also obtain access to soil or geotechnical reports which can inform their analysis. Should there be no soil or hazard maps or geotechnical reports, evaluators should not stop the process; instead they should rely on the best available information on liquefaction potential, soils and slopes from informed sources and use this information to estimate the level of the hazard.

Module 2: Structural safety

This module addresses the structural elements that are taken into account to calculate the hospital safety index. Columns, beams, walls, floor slabs, foundations etc. are structural elements that form part of the load-bearing system of the building. The issues addressed in this structural module should be assessed by structural engineers. Evaluators should assess the structural safety of all hospital buildings, including on-site staff residences, and should combine the evaluations into a single rating against each item for the hospital overall. Evaluators should record any key observations pertaining to the structural safety of specific buildings. Particular attention should be paid to occupied buildings and those which contribute most to acute care services in an emergency or disaster.

The module on structural safety is divided into two submodules, namely:

2.1Prior events affecting building safety

2.2Building integrity

This module consists of the following 18 items:

1. Prior major structural damage or failure of the hospital building(s)
2. Hospital built and/or repaired using current safety standards
3. Effect of remodelling or modification on the structural behaviour of the hospital
4. Structural system design
5. Condition of the building
6. Condition of construction materials
7. Interaction of nonstructural elements with the structure
8. Proximity of buildings (for earthquake-induced pounding)
9. Proximity of buildings (wind tunnel effect and fire)
10. Structural redundancy
11. Structural detailing, including connections
12. Ratio of column strength to beam strength
13. Safety of foundations
14. Irregularities in building structure plan (rigidity, mass, resistance)
15. Irregularities in elevation of buildings
16. Irregularities in height of storeys
17. Structural integrity of roofs
18. Structural resilience to hazards other than earthquakes and strong winds.

Many hospitals are located in hazard-prone areas (e.g. floodplain areas, coastal areas subject to storm surge and tsunami, or near to seismic faults or hazardous facilities). Evaluators should refer to Module 1 for an assessment of hazards which may affect the hospital. Evaluators need to use their knowledge and

expertise to assess the danger that hazards pose to structural elements of the hospital, including how the proximity to hazards makes the structural elements less safe.

It is recommended that evaluators should always refer to applicable national and local standards and building codes related to structural safety when evaluating a facility. Further references for Module 2 are indicated against items where appropriate and are listed at the end of this module. Where appropriate, items include guidance regarding recommended evaluation methods – interview, observation, review of documentation, and inspection.

2.1 Prior events affecting building safety

Submodule 2.1 consists of 3 items (1–3).

1. Prior major structural damage or failure of the hospital building(s)

Recommended evaluation methods: interview, review of documentation and inspection.

Evaluators should determine whether structural reports indicate that the level of safety has been compromised in the past by natural, technical or societal hazards or by other factors. The evaluation should be based on events equivalent in severity to those that current standards of structural safety are intended to protect against.

To obtain accounts of historical damage to a facility, it is important to interview personnel who have worked in the hospital for the longest time, irrespective of their position within the organization (i.e. include cleaning personnel, kitchen staff, and administration and support staff), as these can relate their experience of incidents or disasters in the past. Evaluators should ask specifically about structural damage that personnel may have observed. Evaluators should also request to see publication/accounts (e.g. formal/press/Internet reports or photographs). Certain reports might be accessible on the Internet or through public records (e.g. library). Evaluators should determine whether the structural safety has been compromised using the evidence collected from staff, reports, photographs or visual inspection. (References: 2).

IF SUCH AN EVENT HAS NOT OCCURRED IN THE VICINITY OF THE HOSPITAL, LEAVE BOXES BLANK AND PROVIDE COMMENT.

Safety ratings for item No. 1: *Low = Major damage and no repairs; Average = Moderate damage and building only partially repaired; High = Minor or no damage, or building fully repaired.*

2. Hospital built and/or repaired using the current safety standards

Recommended evaluation methods: interview, observation and inspection.

Evaluators should make an assessment of prior construction work in the facility and the standards that were applied. The assessment should use the current safety standard (which may differ from the old standard). Evaluators should search for evidence from contracts, or information gathered from interviewing, among others, procurement and maintenance staff and, if possible, construction personnel (e.g. design engineer, architect and/or contractor).

Evaluators should verify whether the building has been repaired, the date of repairs, and whether repairs were carried out using the appropriate standards for safe buildings at the time of the repairs. Evaluators should check whether the standard used for the repairs differs from the current safety standard which is the reference for assessing this item. (Reference: 17).

Safety ratings for item No. 2: *Low = Current safety standards not applied; Average = Current safety standards partially applied; High = Current safety standards fully applied.*

3. Effect of remodelling or modification on the structural behaviour of the hospital

Recommended evaluation methods: interview, observation and inspection.

Evaluators should verify whether modifications were carried out using current standards for safe buildings. Remodelling and modifications can be made using structural control – i.e. structural evaluation and proper rehabilitation or modification design that ensure good performance of the structure. It is unfair to rate as low a modified structure that meets the requirement of using an adequate structural design. Frequently, hospitals undergo modifications needed by different departments and services but without overall consideration of what effects they may have on the structure's resistance to hazards or future events, thus increasing the vulnerability of the facility and its occupants. For instance, filling in an open space between two columns with a masonry wall redistributes loads in a building, and a modification such as this could cause columns to fail. Evaluators should check for documented evidence such as drawings or fitted drawings. (References: 12, 13, 14, 15, 24).

Safety ratings for item No. 3: *Low = Major remodelling or modifications have been carried out with major compromising effect on the performance of the structure; Average = Moderate remodelling and/or modifications with minor effect on the performance of the structure; High = Minor remodelling and/or modifications; no modifications were carried out; or major remodelling and/or modification enhancing the structural behaviour or having no negative effect.*

2.2. Building integrity

Submodule 2.2 consists of 15 items (4–18).

4. Structural system design

Recommended evaluation methods: observation and inspection.

Evaluators should inspect visually, and/or through engineering drawings, the structural system design of the buildings for all types of hazards. Note that the term "design" also implies the application of the design in the construction of buildings. Evaluators should assess the overall quality of the structural system design of the hospital buildings, as there is wide variance in the performance of buildings due to the designs and standards to which they have been built. Particular attention should be paid to buildings in earthquake-prone zones and areas of high wind. Poor structural design indicates that damage from hazards to the structure of the hospital may cause building failure and collapse. For instance, if no evidence of reinforcement is found for concrete or masonry systems, then the structural system design should be rated as "low". Moderate structural design provides partial protection and would cover situations where the effect

of hazards may cause damage but this damage is not expected to cause building collapse. A good rating would indicate that the building should not collapse when affected by hazards. (References: 3, 12, 13, 14).

Safety rating for item No. 4: *Low = Poor structural system design; Average = Moderate structural system design; High = Good structural system design.*

5. Condition of the building

Recommended evaluation methods: observation and inspection.

Evaluators should inspect the building, both internally and externally, for signs of deterioration such as broken plaster, cracks or sinking structural elements, and should determine the causes. Evaluators should assess the location of the cracks and their angle to determine the condition of the building. When assessing any damaged structural elements, evaluators should determine their function in maintaining overall structural stability and strength. For example, the risk posed by a damaged column on the ground floor is not the same as the risk posed by a similarly damaged column on the top floor. (The condition of the building is closely related to type of construction materials used for structural elements.) A crack may occur for a variety of reasons; some indicate a serious problem (design, overload) and others do not (change in volume). If the building has been painted recently, check that cracks are not hidden. It is important to talk to the hospital's maintenance staff when conducting this investigation. (References: 12, 13, 14, 18, 24).

Safety ratings for item No. 5: *Low = Cracks on the ground and first floors; Major deterioration caused by weathering or normal ageing; Average = Some deterioration caused only by weathering or normal ageing; High = No deterioration or cracks observed.*

6. Condition of construction materials

Recommended evaluation methods: observation and inspection.

This item is closely related to item 5. When a structure is built primarily with reinforced concrete, the presence of cracks and rust can indicate that incorrect amounts of concrete components (cement, rock, sand and water) were used. This could also be evidence of water seepage into the concrete slab. As a result, permeability may be high and the resistance of materials low, which increases the vulnerability of these elements and puts the structure at risk. With regard to rusting iron and cracks in concrete, one or both of these conditions may be present. For example, concrete forms may show signs of rust, but cracks may or may not have evidence of oxidation. Evaluators should indicate whether the elements in poor condition are of structural value to the hospital building. Buildings may have indicators in place to measure movement which the evaluators can use. Evaluators may need to have a ruler to measure the size of any cracks. (References: 12, 13, 14, 18, 24).

Safety ratings for item No.6: *Low = Rust with flaking; cracks larger than 3 mm (concrete), excessive deformations (steel and wood); Average = Cracks between 1 and 3 mm present (concrete), moderate and visible deformations (steel and wood) or rust with no flaking; High = Cracks less than 1 mm (concrete), no visible deformations; no rust.*

7. Interaction of nonstructural elements with the structure

Recommended evaluation method: observation.

In extreme conditions, nonstructural elements – because of their weight and rigidity – can affect the behaviour of structural elements, putting the stability of a structure at risk. Evaluators must determine whether nonstructural elements are completely tied to the structure – i.e. if "short columns" are present, if joints are flexible and if expansion joints have been used. An example of nonstructural/structural interaction would be, for instance, if a nonstructural dividing wall falls during an earthquake because of a bad anchor and the wall falls onto a staircase beam, obstructing the staircase and, in the worst case, destroying it. It is important to speak to hospital's maintenance staff during this investigation and to look at records, plans and drawings. (References: 12, 13, 15).

Safety ratings for item No. 7: *Low = Partition walls rigidly attached to the structure, suspended ceilings or facades interacting with the structures, damage would have significant effect on the structure; Average = Some of the preceding nonstructural elements interacting with the structures, damage would not affect the structure; High = There are no nonstructural elements affecting the structure.*

8. Proximity of buildings (for earthquake-induced pounding)

Recommended evaluation methods: observation and inspection.

In the case of an earthquake, buildings that are too closely spaced, depending on their height and proximity, can pound against each other until damage is sustained. Evaluators should inspect the exterior of the hospital to determine whether such problems might arise. Most earthquake building codes consider a minimum separation of 10 cm when the shorter of two adjacent buildings is 10m high, which is 1.0% of the height of the building. Evaluators should check whether the floor plates are aligned. In buildings where floors are not aligned, pounding of floor slabs against adjacent columns or structural walls can cause serious damage that in severe cases can lead to collapse. Evaluators should also include the assessment of separation joints in buildings with multiple wings or distinct sections that are intended to perform as separate structures. (References: 12, 13, 15).

IF THE HOSPITAL IS NOT IN A HIGH/MODERATE SEISMIC ZONE, LEAVE BOXES BLANK AND PROVIDE COMMENT

Safety ratings for item No. 8: *Low = Separation is less than 0.5% of the height of the shorter of two adjacent buildings; Average = Separation is between 0.5% and 1.5% of the height of the shorter of two adjacent buildings; High = Separation is more than 1.5% of the height of the shorter of two adjacent buildings.*

9. Proximity of buildings (wind tunnel effect and fire)

Recommended evaluation methods: observation and inspection.

In the case of high wind events and fires, there can be wind tunnel effects between closely-spaced buildings. Pressure from the wind can build around certain sections of a structure, placing much greater force than the load for which a multistorey building was designed. The separation of buildings can also re-

duce the spread of fires from one building to another. Evaluators should inspect the exterior of the hospital to determine whether such problems might arise. It is important to talk to hospital staff as there may be a noticeable impact when high winds occur periodically. (References: 6, 12, 13, 15, 26, 27).

Safety ratings for item No. 9: *Low = Separation less than 5 m; Average = Separation between 5 m and 15 m; High = Separation more than 15 m.*

10. Structural redundancy

Recommended evaluation methods: observation and inspection.

Redundancy is a normal part of structural systems and is essential for the safety of buildings, especially in high winds and earthquakes. The evaluation aims to ensure that the hospital building can resist the lateral forces caused by hazards, such as high winds and earthquakes, in the two main orthogonal directions of the building.

Evaluators should review structural plans (i.e. engineering drawings) of the hospital building and should verify at the site whether the structure meets the design criteria in the two principal orthogonal directions. A building with fewer than three lines or axes of resistance in any of the major directions is vulnerable to major demands of resistance and rigidity.

The three lines of resistance do not guarantee structural redundancy in rigid-framed buildings, with structural beams and/or walls, and with good beam-column connections. In other structural systems it will be necessary to evaluate structural safety of other designs such as flat slab with flat beams and to note the safety level. In earthquake-prone areas, flat slab structural systems should not be permitted. Consequently such systems should attract a "low" rating in these circumstances. (References: 12, 13, 15).

Safety ratings for item No. 10: *Low = Fewer than three lines of resistance in each direction; Average = Three lines of resistance in each direction or lines without orthogonal orientation; High = More than three lines of resistance in each orthogonal direction of the building.*

11. Structural detailing, including connections

Recommended evaluation methods: observation and inspection.

Joints for structural components are among the most critical design elements for lateral loads. These joints are used in the structure of all buildings, and are especially important for hospitals in earthquake-prone areas. Notwithstanding the construction year of the building, evaluators should determine the characteristics of joints both through on-site observation and by reviewing structural plans (i.e. engineering drawings), and should apply clear-cut criteria to them; if the building is located in a moderate or high seismic zone, more emphasis should be given to detailing evaluation work. When dealing with prefabricated construction, evaluators must do a detailed examination of the joints; they will be numerous, not monolithic, and in most cases will be welded or wet joints. Evaluators should conduct visual assessments and should check drawings. Joints should be assessed for cracks or fractures, which would put the joints, and ultimately the structure, at risk. Prefabricated buildings that are prone to damage in earthquake shaking should be given a "low" safety rating in earthquake-prone areas. (References: 12, 13, 14, 15, 18, 24).

Safety ratings for item No. 11: *Low = No evidence of engineered building records, or built according to an old design standard; Average = Built according to previous design standards and no retrofitting work to a current standard; High = Built according to a current standard.*

12. Ratio of column strength to beam strength

Recommended evaluation methods: observation and inspection.

Columns are amongst the critical elements for the stability of the structure. They receive the load distributed by the beam and pass it on to the foundation. Even if beams are severely damaged, columns must resist loads in order to prevent the total collapse of the building. Columns therefore should always be stronger than beams. (References: 12, 13, 14, 18, 24).

Safety ratings for item No. 12: *Low = Strength of beams is obviously greater than strength of columns; Average = Strength of beams is similar to strength of columns; High = Strength of columns is greater than strength of beams.*

13. Safety of foundations

Recommended evaluation methods: observation and inspection.

Foundations are the most difficult structural elements to evaluate because they are neither accessible nor visible. To add to this difficulty, corresponding plans for foundations are often not available. If the facility is old the plans may not be archived in the administration, maintenance department or public record. In some cases the plans may be with a construction company that has done studies for the purpose of expansion, remodelling or repairs.

It is important to make every effort to access the plans to determine the type of foundations (e.g. shallow, deep, isolated and, if a combination, whether they are united or isolated). Buildings are more vulnerable to seismic forces when they do not have braced beams connected to the foundation.

When evaluating this item it is important to take into account the information about soils at the site from the submodule on "Geological hazards" in Module 1 in order to determine soil–structure interactions. The level of groundwater and type of soil at the building site play a critical role in determining the facility's vulnerability to floods and differential settlement of the foundations, and the associated effects on vertical structural elements. In earthquake-prone areas, liquefaction can occur if the building is on saturated, unconsolidated soils, as in the case of sandbeds, saturated silt or uncompacted fill. Liquefaction has caused severe damage to infrastructure, and evaluators should carefully substantiate whether such conditions are present at the hospital site. (References: 12, 13, 14, 15, 18, 24).

Safety ratings for item No. 13: *Low = No evidence that foundations were designed according to standards (foundation size, soil survey) and/or there is evidence of damage; no plans are available; Average = Little evidence (drawings, soil survey) that foundations were designed according to standards; and/or there is evidence for moderate damage; High = Strong evidence that foundations were designed according to standards with strong evidence of no damage.*

14. Irregularities in building structure plan (rigidity, mass, resistance)

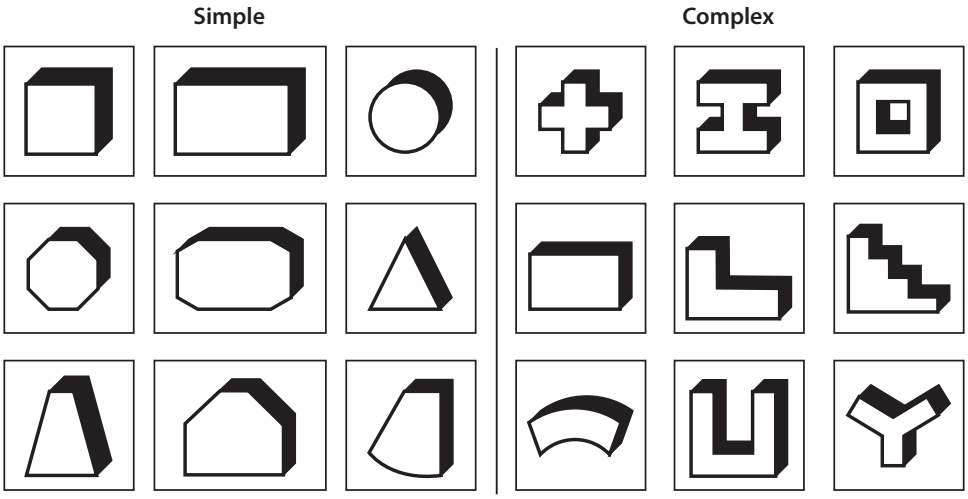
Recommended evaluation methods: observation and inspection.

Irregular structures can be expressed in terms of shape, configuration and torsional eccentricity (i.e. the distance between the centre of mass and the centre of rigidity). While evaluators inspect the exterior and interior of the hospital, they should look for inconsistencies in the hospital plan from the perspective of rigidity (shape and type of materials used for resistant vertical elements) as well as the distribution of mass (concentrated and distributed). Evaluators should try to identify at the site and by using diagrams whether seismic joints divide the structure into regular parts or whether irregular configurations are present, such as L-shaped, T-shaped, U-shaped or cruciform plans, or more complicated configurations.

Another aspect that evaluators should check is the relative position of the frames (framework of beams and columns) and the shear walls since this will determine the response of horizontal diaphragms (slabs) in terms of displacement and rotation. The presence of large openings in horizontal diaphragms due to interior patios or for access to stairs and elevators make the structure more vulnerable to lateral loads caused by earthquakes and intense hurricanes. During extreme phenomena such as earthquakes or high winds, poorly distributed mass can cause excessive loads in some areas of a structure, resulting in its collapse. Evaluators should determine if these conditions exist and whether there are structural elements designed to mitigate them. (References: 12, 13, 14, 15, 25).

Safety ratings for item No.14: *Low = Shapes are irregular and structure is not uniform; Average = Shapes on plan are irregular but structure is uniform; High = Shapes on plan are regular and structure has uniform plan, and there are no elements that would cause significant torsion.*

Simple and complex shapes in plan



15. Irregularities in elevation of buildings

Recommended evaluation methods: observation and inspection of each building.

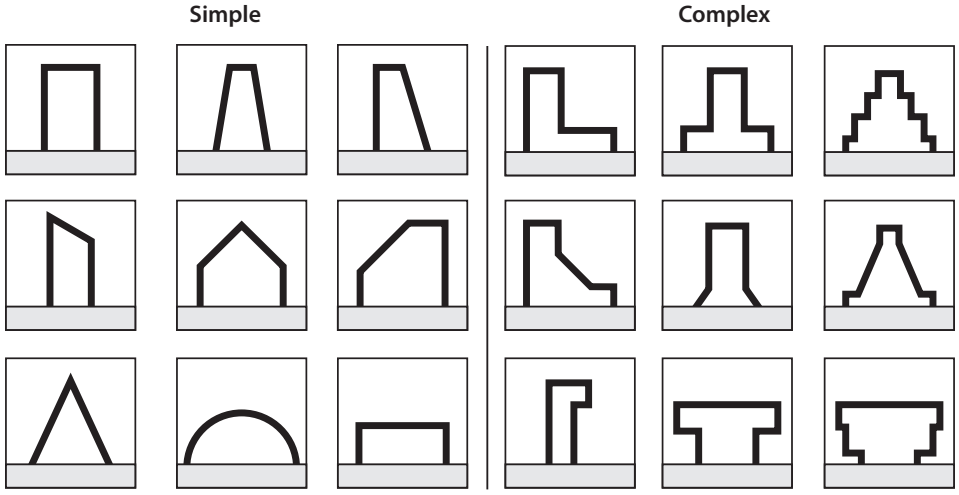
As in items Nos.14 and 16, evaluators must take note of any abrupt changes in the elevation of each building. The narrowness of the building (height-to-width ratio) in the principal orthogonal directions can give an idea of the building's ability to withstand vibrations generated by lateral loads caused by earthquake and wind forces.

Besides irregularities in the elevation of buildings, variation of the type – as well as mass and rigidity – of materials can alter resistance to loads that affect the building. Evaluators should determine whether elements (such as columns and walls) are symmetrically distributed in height, to the edges, providing rotational rigidity.

Evaluators should take note of high concentrations of mass on upper floors of a hospital, owing to the placement of heavy items such as machinery, equipment and water tanks on upper floors. These can increase inertial forces and cause excessive displacement. (References: 12, 13, 14, 15, 25).

Safety ratings for item No. 15: *Low = Significant discontinuous or irregular elements, significant variation in elevation of buildings; Average = Several discontinuous or irregular elements, some variation in the elevation of buildings; High = No significant discontinuous or irregular elements, little or no variation in elevation of buildings.*

Simple and complex shapes in elevation



16. Irregularities in height of storeys

Recommended evaluation methods: observation and inspection.

As in items Nos.14 and 15, evaluators must take note of any abrupt changes in the height of storeys.

Evaluators should check differences in height between the floors (often the case in the lobby and lower floors of hospitals) which can cause concentrations of tension in changes of level. A so-called "soft floor", an undesirable feature in earthquake-prone zones, can be present owing to significant changes in rigidity due to variations in height. Evaluators should be aware that an in-fill wall can convert a column designed for support along its entire height into a "short" column. Short columns have caused the collapse of buildings that were supposedly resistant to seismic forces. (References: 12, 13, 14, 15, 25).

Safety ratings for item No.16: *Low = Height of storeys differs by more than 20%; Average = Storeys have similar heights (they differ by less than 20% but more than 5%); High = Storeys are of similar height (they differ by less than 5%).*

17. Structural integrity of roofs

Recommended evaluation methods: observation and inspection.

Evaluators should assess the slope of the roof, roof overhangs and roof deck connections to resist uplift loads. The objective of this item is to ensure that the roof is completely and securely fastened, welded, riveted or cemented. Evaluators should look for large roof overhangs of more than 50 cm in high wind areas. They should also check that reinforced cast is in place so that concrete roof decks have exceptionally good wind performance.

Satisfactory connections include a high frequency of fasteners. For steel roof decks, there should be screw attachment rather than puddle welds or powder-driven pins; for precast concrete decks, there should be anchor plates and nuts; and for wood-sheathed roof decks, there should be screws and fixations in the corner regions of the roof. (References: 3, 12, 13, 14, 15).

Safety ratings for item No.17: *Low = Monopitch or flat light roofs, and/or large roof overhangs; Average = Pre-stressed concrete roof, gable roof with gentle slope, satisfactorily connected, no large roof overhangs; High = Reinforced cast in place on concrete roof deck or hipped light roof, satisfactory connections, no large roof overhangs.*

18. Structural resilience to hazards other than earthquakes and strong winds

Recommended evaluation method: inspection.

This item focuses on structural safety for multiple hazards other than earthquakes and strong winds. A hospital may have taken action to increase its safety with regard to certain hazards, but not to the full range of hazards that may affect the facility, thus leaving the hospital at high risk. With regard to hazards present in the area where the hospital is located, structural expertise is needed to assess whether the building as a whole has the level of structural safety necessary to enable it to continue providing health services in emergencies and disasters. Evaluators should refer to hazards which may affect the site of the hospital (see Module 1).

Evaluators should assess the global structural performance and the resilience of the building structure for single or multiple hazards other than high winds (sustained or periodic) and earthquakes (e.g. other

meteorological hazards, flooding and other hydrological hazards, landslides and other geological hazards). Evaluators should use their knowledge and expertise to assess the danger that these hazards could pose to the structural elements of the hospital. Evaluators should assess how hazards, and the proximity of the hospital to these hazards, make the structural elements of the hospital less safe.

Evaluators should verify whether the hospital is adequately designed – from the structural standpoint – to withstand other phenomena (e.g. landslides, rockfalls, volcanic eruptions, floods, fires and explosions), and whether preventive or corrective measures necessary to improve the level of safety have been implemented. Evaluators should identify any measures that have been adopted to reduce the risk to structural safety (e.g. anti-flood gates). Evaluators should assess the possible behaviour of the complete building in light of all the other hazards in the area. For example, a hospital may be located on an "unstable" incline and have a risk of sliding or, alternatively, a resilience measure such as a wall of containment may have been built to stabilize the incline and protect the building. It should be noted that a building can be adequately designed to resist earthquakes and hurricanes but can still be very vulnerable to floods or volcanic eruptions.

Safety ratings for No. 18: *Low = Low structural resilience to hazards present at the site of the hospital; Average = Satisfactory structural resilience (taking account of structural risk reduction measures in place); High = Good structural resilience (taking account of risk reduction measures in place).*

References for Module 2: Structural safety

Note: Although not specifically listed here, it is recommended that evaluators always refer to applicable national and local standards and building codes related to Module 2: Structural Safety when evaluating a facility.

1. Código Técnico de la Edificación. Partes I y II. Madrid: Instituto Nacional de la Vivienda de España; 2006.
2. Hospitales Seguros: sistematizacion de experiencias en la Republica Dominicana. Washington (DC): Organización Panamericana de la Salud (Pan American Health Organization); 2013.
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4. Reducing the risks of nonstructural earthquake damage – a practical guide. Washington (DC): Federal Emergency Management Agency; 2011.
5. Guidelines for design and construction of hospital and health care facilities. Washington (DC): The American Institute of Architects Press; 1997.
6. NFPA 101: Life safety code. Quincy (MA): National Fire Protection Association; 2006.
7. NFPA 99: Health care facilities code. Quincy (MA): National Fire Protection Association; 2012a.
8. NFPA 5000: Building construction and safety code. Quincy (MA): National Fire Protection Association; 2012b.

9. NFPA 10: Standards for portable fire extinguishers. Quincy (MA): National Fire Protection Association; 2013a.

10. NFPA 13: Standard for the installation of sprinkler systems. Quincy (MA): National Fire Protection Association; 2013b.

11. NFPA 80: Standard for fire doors and other opening protectives. Quincy (MA): National Fire Protection Association; 2013c.

12. 2012 International Building Code. Washington (DC): International Code Council; 2012.

13. Eurocodes: building the future. (The European Commission website on Eurocodes) (http://eurocodes.jrc.ec.europa.eu, accessed 22 August 2014).

14. American Institute of Steel Construction (website) (https://www.aisc.org, accessed 22 August 2014).

15. Minimum design loads for buildings and other structures: ASCE Standard ASCE/SEI 7-10. Reston (VA): American Society of Civil Engineers; 2010.

16. ASME A17.1-2007/CSA B44-07: Safety code for elevators and escalators (ANSI A17: Codigo de Seguridad Standard Nacional Americano para Ascensores y Escaleras Mecanicas). New York (NY): American Society of Mechanical Engineers; 2007.

17. Guidelines for design and construction of hospitals and outpatient facilities. Dallas (TX): Facility Guidelines Institute; 2014.

18. ASTM International – Standards Worldwide. American Society for Testing Materials; 2014.

19. Neufert E. Arte de proyectar en arquitectura (end edition). Barcelona: Galaxia Gutemberg; 2010.

20. The interagency emergency health kit 2011: medicines and medical devices for 10 000 people for approximately three months. Geneva: World Health Organization; 2011.

21. Rodgers J, Cedillos V, Kumar H, Tobin LT, Yawitz K. Reducing earthquake risk in hospitals – from equipment, contents, architectural elements and building utility systems. New Delhi: GeoHazards International and GeoHazards Society; 2009.

22. Wagenaar C, editor. The architecture of hospitals. Rotterdam: NAi Publishers; 2006.

23. Guidelines for safe disposal of unwanted pharmaceuticals in and after emergencies. Geneva: World Health Organization; 1999.

24. ACI 318. Building code requirements for reinforced concrete. Detroit (MI): American Concrete Institute; 2002.

25. EQ Tips: How architectural features affect buildings during earthquakes? Indian Institute of Technology Kanpur and Building Materials and Technology Promotion Council (website) (http://www.iitk.ac.in/nicee/EQTips/EQTip06.pdf, accessed 22 August 2014).

26. NFPA 220: Standard on types of building construction. Quincy (MA): National Fire Protection Association; 2012.

27. NFPA 221: Standard for high challenge fire walls, fire walls and fire barrier walls. Quincy (MA): National Fire Protection Association; 2012.

Module 3: Nonstructural safety

This module enables evaluators to conduct an assessment of the nonstructural elements of hospitals. The results contribute to the overall calculation of the hospital safety index. There are four submodules, as follows:

3.1 Architectural safety

3.2 Infrastructure protection, access and physical security

3.3 Critical systems

3.4 Equipment and supplies.

Nonstructural elements are critical to the functioning of the hospital but are distinct from structural elements as they do not form part of the load-bearing system of the hospital buildings. Nonstructural elements include the architectural elements, emergency access and exit routes to and from the hospital, critical systems (e.g. electricity, water supply, waste management, fire protection), medical, laboratory and office equipment (whether fixed or mobile), supplies used for analysis and treatment, and so forth. It is recommended that the architectural safety submodule is assessed by a structural engineer, architect or qualified building professional, while the other submodules could be assessed by persons with expertise and experience in hospital and health engineering, facilities management and/or hospital operations.

The assessment of the nonstructural elements should take into account the increased demand for hospital services in response to emergency and disaster situations. Evaluators should assess the nonstructural safety of all hospital buildings, including on-site staff residences, and should combine the evaluations into a single rating against each item for the hospital overall. Evaluators should record any key observations pertaining to the nonstructural safety of specific buildings. Particular attention should be paid to occupied buildings and those which contribute most to acute care services in an emergency or disaster. The assessment should be more rigorous in those areas that are critical for providing both health care and associated services in an emergency or disaster.

This module consists of the following 93 items:

19. Major damage and repair of nonstructural elements
20. Condition and safety of doors, exits and entrances
21. Condition and safety of windows and shutters
22. Condition and safety of other elements of the building envelope (e.g. outside walls, facings)
23. Condition and safety of roofing
24. Condition and safety of railings and parapets
25. Condition and safety of perimeter walls and fencing
26. Condition and safety of other architectural elements (e.g. cornices, ornaments, chimneys, signs)
27. Safe conditions for movement outside the hospital buildings
28. Safe conditions for movement inside the building (e.g. corridors, stairs)
29. Condition and safety of internal walls and partitions

30. Condition and safety of false or suspended ceilings
31. Condition and safety of the elevator system
32. Condition and safety of stairways and ramps
33. Condition and safety of floor coverings
34. Location of hospital's critical services and equipment in relation to local hazards
35. Hospital access routes
36. Emergency exit and evacuation routes
37. Physical security of building, equipment, staff and patients
38. Capacity of alternate sources of electricity (e.g. generators)
39. Regular tests of alternate sources of electricity in critical areas
40. Condition and safety of alternate source(s) of electricity
41. Condition and safety of electrical equipment, cables and cable ducts
42. Redundant system for the local electric power supply
43. Condition and safety of control panels, overload breaker switches and cables
44. Lighting system for critical areas of the hospital
45. Condition and safety of internal and external lighting systems
46. External electrical systems installed for hospital usage
47. Emergency maintenance and restoration of electric power supply and alternate sources
48. Condition and safety of antennas
49. Condition and safety of low- and extra-low-voltage systems (Internet and telephone)
50. Alternate communications systems
51. Condition and safety of telecommunications equipment and cables
52. Effect of external telecommunications systems on hospital communications
53. Safety of sites for telecommunications systems
54. Condition and safety of internal communications systems
55. Emergency maintenance and restoration of standard and alternate communications systems
56. Water reserves for hospital services and functions
57. Location of water storage tanks
58. Safety of the water distribution system
59. Alternate water supply to the regular water supply
60. Supplementary pumping system
61. Emergency maintenance and restoration of water supply systems

62. Condition and safety of the fire protection (passive) system
63. Fire/smoke detection systems
64. Fire suppression systems (automatic and manual)
65. Water supply for fire suppression
66. Emergency maintenance and restoration of the fire protection system
67. Safety of nonhazardous wastewater systems
68. Safety of hazardous wastewater and liquid waste
69. Safety of nonhazardous solid waste system
70. Safety of hazardous solid waste system
71. Emergency maintenance and restoration of all types of hospital waste management systems
72. Fuel reserves
73. Condition and safety of above-ground fuel tanks and/or cylinders
74. Safe location of fuel storage away from hospital buildings
75. Condition and safety of the fuel distribution system (valves, hoses, connections)
76. Emergency maintenance and restoration of fuel reserves
77. Location of storage areas for medical gases
78. Safety of storage areas for the medical gas tanks and/or cylinders
79. Condition and safety of medical gas distribution system (e.g. valves, pipes, connections)
80. Condition and safety of medical gas cylinders and related equipment in the hospital
81. Availability of alternative sources of medical gases
82. Emergency maintenance and restoration of medical gas systems
83. Adequate location of enclosures for HVAC equipment
84. Safety of enclosures for HVAC equipment
85. Safety and operating condition of HVAC equipment (e.g. boiler, exhaust)
86. Adequate supports for ducts and review of flexibility of ducts and piping that cross expansion joints
87. Condition and safety of pipes, connections and valves
88. Condition and safety of air-conditioning equipment
89. Operation of air-conditioning system (including negative pressure areas)
90. Emergency maintenance and restoration of HVAC systems
91. Safety of shelving and shelf contents
92. Safety of computers and printers
93. Safety of medical equipment in operating theatres and recovery rooms

94. Condition and safety of radiology and imaging equipment
95. Condition and safety of laboratory equipment and supplies
96. Condition and safety of medical equipment in emergency care services unit
97. Condition and safety of medical equipment in intensive or intermediate care unit
98. Condition and safety of equipment and furnishings in the pharmacy
99. Condition and safety of equipment and supplies in the sterilization services
100. Condition and safety of medical equipment for obstetric emergencies and neonatal care
101. Condition and safety of medical equipment and supplies for emergency care for burns
102. Condition and safety of medical equipment for nuclear medicine and radiation therapy
103. Condition and safety of medical equipment in other services
104. Medicines and supplies
105. Sterilized instruments and other materials
106. Medical equipment specifically used in emergencies and disasters
107. Supply of medical gases
108. Mechanical volume ventilators
109. Electromedical equipment
110. Life-support equipment
111. Supplies, equipment or crash carts for cardiopulmonary arrest.

Many hospitals are located in hazard-prone areas (e.g. floodplain areas, coastal areas subject to storm surge and tsunami, or near to seismic faults or hazardous facilities). Evaluators should refer to Module 1 for an assessment of hazards which may affect the hospital. Evaluators need to use their knowledge and expertise to assess the danger that hazards pose to nonstructural elements of the hospital, including how the proximity to hazards makes the nonstructural elements less safe.

It is recommended that evaluators should always refer to applicable national and local standards and building codes related to nonstructural safety when evaluating a facility. Further references for Module 3 are indicated against the items where applicable and are listed at the end of this module. Where appropriate, items include guidance regarding recommended evaluation methods – interview, observation, review of documentation, and inspection.

3.1 Architectural safety

Submodule 3.1 consists of 15 items (19–33).

Architectural elements are essential to the performance of the building but do not form part of the load-bearing system. Architectural elements are evaluated to determine their vulnerability to a range of internal and external hazards. Architectural safety involves: doors, windows, internal and exterior walls, facings, roofing, suspended ceilings, floor coverings and elevators, as well as the pathways for staff and patients inside and outside the building, such as corridors, stairways and ramps. Evaluators should verify the condition and safety of elements and whether any potential damage to the elements would impede the performance of hospital operations. These elements should be evaluated by structural engineers, architects or qualified building professionals.

19. Major damage and repair of nonstructural elements

Recommended evaluation methods: interview, observation and inspection.

Evaluators should verify whether the hospital's nonstructural elements were affected by any hazards (natural, biological, technological, societal) or other factors, and whether repairs have been conducted. To get historical accounts of damage to a facility, evaluators should ask for reports about the extent of nonstructural damage and the repairs, and should talk with personnel who have worked the longest in the hospital (irrespective of their position within the organization, e.g. cleaning personnel, kitchen staff, administration, and support staff). They should request to see publication/accounts (e.g. formal/press/internet reports, photographs). Certain reports might be accessible on the Internet or through public records (e.g. library). The focus should be on damage which may have affected the safety and function of particular nonstructural elements. Evaluators should determine if the nonstructural safety has been compromised using the evidence collected or from visual inspection of the damage and repairs. Evaluators should verify whether the nonstructural elements have been repaired, the date of repairs, and whether repairs were carried out using the appropriate standards for nonstructural elements at the time of the repairs. (References: 2, 12, 13, 15).

IF SUCH AN EVENT HAS NOT OCCURRED IN THE VICINITY OF THE HOSPITAL, LEAVE BOXES BLANK AND PROVIDE COMMENT.

Safety ratings for item No. 19: *Low = Major damage and no repairs completed; Average = Moderate damage, building only partially repaired; High = Minor or no damage, or building fully repaired.*

20. Condition and safety of doors, exits and entrances

Recommended evaluation methods: observation and inspection.

Evaluators should check the condition of the hospital's doors, exits and entrances and their ability to resist wind, fire, and seismic and other forces. Doors should be completely attached to the frames with no obvious gaps (between the door and frame, or between the frame and wall). Doors and door frames are a good indication whether the adjacent structures have moved, especially if there are gaps, if the door is difficult to open, or if there is excessive wear. In the case of automated doors, evaluators should check if there is a provision to open the door safely and if there are alternative manual operations. Doors, exits and entrances should be free of obstacles and wide enough to allow rapid movement of patients and hospital

staff in emergency situations. Evaluators should pay special attention to doors, exits and entrances to critical areas for emergency situations, such as emergency department, intensive care unit, operating theatres, etc. (References: 2, 8, 11, 17, 18, 19).

Safety ratings for item No. 20: *Low = Doors, exits and entrances in poor condition, subject to damage which would impede the function of this and other elements, systems or operations; entrance width is less than 115 cm; Average = In fair condition, subject to damage but damage would not impede the function of this and other elements, systems or operations; or entrance width is less than 115 cm; High = In good condition, no or minor potential for damage that would impede the function of this and other elements, systems or operations; and entrance width is equal to or larger than 115 cm.*

21. Condition and safety of windows and shutters

Recommended evaluation methods: observation and inspection.

Windows, shutters and frames should be able to withstand appropriate forces such as wind or impact damage, especially in critical areas of the hospital (e.g. emergency department, operating theatres, intensive care unit, sterilization unit, pharmacy, etc.). Evaluators should check the thickness and type of glass in the windows and the integrity of the frame with the wall. It is advisable to use windows with laminated glass or polycarbonate glazing in critical areas, especially for hospitals at high risk of earthquakes which often cause breakage of glass due to the significant deflexions of the building.

Where wooden frames and shutters are used, they should be checked for rot, moisture and termite damage. If frames are not secure, wind and rain can ingress into the building, damaging medical equipment, which may impact on patient care and the safety of staff and patients. (References: 8, 11, 17, 18, 19).

Safety ratings for item No. 21: *Low = Windows and shutters in poor condition, subject to damage which would impede the function of this and other elements, systems or operations (e.g. weak protective glazing); Average = In fair condition, subject to damage but damage would not impede the function of this and other elements, systems or operations; High = In good condition, no or minor potential for damage that would impede the function of this and other elements, systems or operations; protective glass (e.g. polycarbonate glazing, blast film) has been added in critical wards.*

22. Condition and safety of other elements of the building envelope (e.g. outside walls, facings)

Recommended evaluation methods: observation and inspection.

Evaluators should review the technical and construction status of the elements of the building envelope, including outside walls and facings, which can be made of different materials such as masonry, glass, wood and aluminium as well as composite materials. The elements should be reviewed to ensure that they are not cracked, misshapen or loose. It is recommended that, in earthquake-prone zones, facings should not be veneered but should be integrated into the wall. In earthquake-prone zones or high-wind areas, these walls should be appropriately braced to the structural elements so that they resist seismic and wind forces. If a building envelope has fixed sections of glass or wood, the evaluator should apply the same criteria as for windows and shutters made of these materials. Analysis should be more rigorous at hospital entrances and in the critical areas responsible for providing health and associated services in emergencies and disasters.

Safety ratings for item No. 22: *Low = Building envelope in poor condition, subject to damage which would impede the function of this and other elements, systems or operations; Average = In fair condition, subject to damage but damage would not impede the function of this and other elements, systems or operations; High = In good condition, no or minor potential for damage that would impede the function of this and other elements, systems or operations.*

23. Condition and safety of roofing

Recommended evaluation methods: observation and inspection.

Evaluators should make a thorough assessment of the roof by visiting or observation. Evaluators should check for impermeability of the roof, the safety and condition of equipment located on the roof, and drainage. Leakage from water systems on a roof can put a hospital, or sections of the hospital, out of service. The location, weight and safety of equipment on the roof can affect the roof's vulnerability to different natural forces. (References: 13, 15, 17, 19).

Safety ratings for item No. 23: *Low = Roofing in poor condition, subject to damage which would impede the function of this and other elements, systems or operations; Average = In fair condition, subject to damage but damage to element(s) would not impede function of this and other elements, systems or operations; High = In good condition, no or minor potential for damage that would impede the function of this and other elements, systems or operations.*

24. Condition and safety of railings and parapets

Recommended evaluation methods: observation and inspection.

This item is comparable to item No. 22 in significance, and the same criteria should be used to review these elements. Evaluators should assess the safety and levels of protection provided by railings and parapets to stairways, corridors and walkways inside and outside the hospital, as well as roof access and roof perimeters, considering whether their failure could endanger occupants and hospital operations. Evaluators should keep in mind the importance of these elements in preventing injuries from falls by patients, staff and visitors. Unattached parapets have been known to fall down during earthquake shaking, killing people below and also impeding access. (References: 13, 15, 17, 19).

Safety ratings for item No. 24: *Low = Railings and parapets in poor condition, subject to damage which would impede the function of this and other elements, systems or operations; Average = Subject to damage but damage to element(s) would not impede the function of this and other elements, systems or operations; High = No or minor potential for damage that would impede the function of this and other elements, systems or operations.*

25. Condition and safety of perimeter walls and fencing

Recommended evaluation methods: observation and inspection.

The security and functionality of the hospital can be affected by the condition of surrounding walls and fencing that define the hospital grounds. Without some means of control at the perimeter, emergency and disaster conditions may invoke an influx of people to the hospital that may compromise hospital functions. The evaluators should check this aspect in detail when surveying the hospital grounds and neighbouring areas. Evaluators may be able to obtain a good perspective of the issues from an elevated position (e.g. upper floors of the building) or from aerial photographs. (References: 13, 15, 17, 19).

Safety ratings for item No. 25: *Low = Perimeter walls and fencing in poor condition, subject to damage which would impede the function of this and other elements, systems or operations; Average = In fair condition, subject to damage but damage to element(s) would not impede the function of this and other elements, systems or operations; High = In good condition, no or minor potential for damage that would impede the function of this and other elements, systems or operations.*

26. Condition and safety of other architectural elements (e.g. cornices, ornaments, chimneys, signs)

Recommended evaluation methods: observation and inspection.

The criteria outlined for items 22, 23 and 24 can also be used to evaluate other architectural elements. Evaluators should verify check other architectural elements of the hospital that have not been taken into account under previous items. Special attention should be given to the condition of anchors and supports of exterior architectural elements. For instance, chimneys should be structurally sound, be capable of resisting seismic or wind loads and have the stability required for their height, whether they are self-supporting or braced. Seismic shaking can cause chimneys to fall, resulting in considerable damage and even death. It is not advisable to use window boxes or other similar adornments on the exterior of buildings since, besides the risk posed if they fall, these elements can increase building and seismic loads. The evaluator should examine the safety of signage inside and outside the hospital since this could fall and harm occupants or damage the facility.

Safety ratings for item No. 26: *Low = Other architectural element(s) in poor condition, subject to damage which would impede the function of this and other elements, systems or operations; Average = In fair condition, element(s) are subject to damage but damage would not impede the function of this and other elements, systems or operations; High = In good condition, no or minor potential for damage that would impede the function of this and other elements, systems or operations.*

27. Safe conditions for movement outside the hospital buildings

Recommended evaluation methods: observation and inspection.

Movement in the hospital grounds outside the buildings must be ensured so that pedestrians, ambulances and supply transport can access the facility with the speed required during emergencies and disasters. This item also complements item 35 on access routes, which focuses on roads outside the hospital grounds, and item 36 which focuses on emergency exit and evacuation routes. External obstacles to access can severely disrupt the function of the facility. Evaluators should observe whether there are trees, lamp posts and monuments and architectural designs that could fall because of natural forces and obstruct pedestrian and vehicle access to the facility. The impact on access for people with mobility impairments and wheelchairs should be considered and tested. The pavement within the hospital grounds should be checked for potholes, raised areas or other obstacles that could impair pedestrian and vehicle traffic. (References: 19).

Safety ratings for item No. 27: *Low = Obstacles or damage to structure or road and walkways will impede vehicle and pedestrian access to buildings or endanger pedestrians; Average = Obstacles or damage to structure or road and walkways will not impede pedestrian access, but will impede vehicle access; High = No obstacles, or potential for only minor or no damage that will not impede pedestrian or vehicle access.*

28. Safe conditions for movement inside the building (e.g. corridors, stairs)

Recommended evaluation methods: observation and inspection.

Evaluators should verify that conditions are safe for movement throughout the facility. Interior corridors should be spacious and free of obstacles to ensure ease of movement for personnel, stretchers and medical equipment. Special attention should be given to stairways and exits because of their importance if evacuation occurs during earthquakes or other emergencies. Access for people with mobility or sensory impairments, as well as wheelchair access, should be considered. Adequate signage must be present to facilitate the movement of staff, patients and visitors. Areas with restricted access should be under the surveillance of hospital security personnel. (References: 8, 11, 17, 19).

Safety ratings for item No. 28: *Low = Obstacles and damage to element(s) will impede movement inside the building and endanger occupants; Average = Obstacles or damage to elements will not impede movement of people but will impede movement of stretchers, wheeled equipment; High = No obstacles, potential for no or minor damage which will not impede movement of people or wheeled equipment.*

29. Condition and safety of internal walls and partitions

Recommended evaluation methods: observation and inspection.

Internal walls and partitions can be made of masonry, glass, wood, aluminium etc., and may be a combination of these materials. Evaluators should review the technical and construction aspects of these elements to ensure they are not cracked, deformed or loose. Evaluators should rate the hospital on the basis of the condition of the materials and the level of bracing against the hazards identified as potentially affecting the hospital. In earthquake-prone and high-wind areas, interior walls should be adequately braced by structural elements so that they can resist seismic shaking and wind forces. The evaluation of internal walls should be more rigorous in critical areas such as intensive care units, emergency department, operating theatres, laboratories etc. (References: 1, 8, 11, 17, 18, 19).

Safety ratings for item No. 29: *Low = Internal walls and partitions in poor condition, subject to damage which would impede the function of this and other elements, systems or operations; Average = In fair condition, element(s) are subject to damage but damage would not impede the function of this and other elements, systems or operations; High = In good condition, no or minor potential for damage that would impede the function of this and other elements, systems or operations.*

30. Condition and safety of false or suspended ceilings

Recommended evaluation methods: observation and inspection.

There is a wide variety of false or suspended ceilings used in buildings. Those made of metal are the heaviest and cause the greatest damage if they fall. The level of bracing is a major determinant of the safety ratings for the hospital. Because the bracing is usually not visible, evaluators should request relevant personnel (e.g. maintenance staff) to take some ceiling sections apart so the condition of the ceilings and anchors, and the weight and stability of ceiling tiles, can be checked. In earthquake-prone zones both angled and vertical bracing should be used to brace ceilings from horizontal seismic forces. In areas where these elements can be subjected to strong winds, they can fall, become projectiles, collide with other ob-

jects and, in the worst case, injure people. If they do fall, they can obstruct critical areas and passageways in the hospital, thus affecting its functional capacity. (References: 1, 8, 15, 17, 18, 19).

IF THE HOSPITAL DOES NOT HAVE FALSE OR SUSPENDED CEILINGS, LEAVE BOXES BLANK AND PROVIDE COMMENT.

Safety ratings for item No. 30: *Low = False or suspended ceilings in poor condition, subject to damage which would impede the function of this and other elements, systems or operations; Average = In fair condition, element(s) subject to damage but damage would not impede the function of this and other elements, systems or operations; High = In good condition, no or minor potential for damage that would impede the function of this and other elements, systems or operations.*

31. Condition and safety of the elevator system

Recommended evaluation methods: observation and inspection.

While elevators should not be used during an internal or external emergency or disaster, they play an important role after the event. Evaluators should verify that the elevators (including all types of lifts) function properly and can meet their load capacity.

Evaluators should take into account that elevators are the main means of transport for many patients, the elderly and disabled. When more than one elevator is out of service, especially in multistoried structures, the functional capacity of the facility may be seriously affected. Visual inspection of the elevators and cables (which may become entangled in disaster situations) can be supplemented by information from maintenance and inspection records for elevators. (References: 15, 16, 19).

IF THERE ARE NO ELEVATORS, LEAVE BOXES BLANK AND PROVIDE COMMENT.

Safety ratings for item No. 31: *Low = Elevator system in poor condition, subject to damage which would impede the function of this and other elements, systems or operations; Average = In fair condition, element(s) subject to damage but damage would not impede the function of this and other elements, systems or operations; High = In good condition, no or minor potential for damage that would impede the function of this and other elements, systems or operations.*

32. Condition and safety of stairways and ramps

Recommended evaluation methods: observation and inspection.

Special attention should be given to the safety of stairways and ramps because of their importance in the case of evacuation. Evaluators should ensure that they are free of obstacles or of items that could fall and obstruct them. They should have railings so that they can be used safely at their maximum capacity, the stairs themselves are free from damage and have clearly marked or defined edges keeping in mind that

hospital patients will be more vulnerable than typical users. Evaluators should consider whether damage or failure of stairways and ramps could endanger occupants of the hospital. Additional attention should be focused on areas where there is the highest concentration of people and use. (References: 16, 19).

IF THERE ARE NO STAIRS AND RAMPS, LEAVE BOXES BLANK AND PROVIDE COMMENT.

Safety ratings for item No.32: *Low = In poor condition, subject to damage or there are obstacles, which would impede the function of this and other elements, systems or operations; Average = In fair condition, subject to damage but damage and obstacles would not impede the function of this and other elements, systems or operations; High = In good condition, no obstacles, potential for no or minor damage that would impede the function of this and other elements, systems or operations.*

33. Condition and safety of floor coverings

Recommended evaluation methods: observation and inspection.

Floors can be made of a variety of materials, including terrazzo, ceramic or clay tile, linoleum, wood etc. They may be attached with adhesives, be laid over a membrane (such as a floating floor), or suspended. Evaluators should verify that the flooring is watertight, anti-skid, and free of cracks or loose sections, especially in critical and high-traffic areas. There should be no uneven sections or depressions that could cause people to fall or cause carts and equipment to tip over. In areas where there are large numbers of conduits, cables and suspended floors, evaluators should ensure that the flooring is braced to resist lateral seismic loads. (References: 17, 18, 19).

Safety ratings for item No. 33: *Low = Floor coverings in poor condition, subject to damage which would impede the function of this and other elements, systems or operations; Average = In fair condition, subject to damage but damage would not impede function; High = In good condition, no or minor potential for damage that would impede the function of this and other elements, systems or operations.*

3.2 Infrastructure protection, access and physical security

Submodule 3.2 consists of 4 items (34-37).

This submodule focuses on checking the proximity of hospital building to local hazards and how the overall layout of the hospital protects critical services from these hazards and from security threats. The hospital should also have good road and pedestrian access and exit routes so that it operates effectively during emergencies and disasters.

34. Location of hospital's critical services and equipment in the hospital in relation to local hazards

Recommended evaluation methods: interview, observation and inspection.

Many facilities lose critical services (e.g. emergency care), systems and equipment (e.g. patients' records or power generators) upon which health-care services depend due to positioning these services

and equipment in locations that are vulnerable to local hazards. For instance, hospitals that store patients' records and emergency power generators in underground space may be placing them at risk of flooding which would destroy the records and submerge the generators, thus affecting both normal and emergency functions. Evaluators should review the safety of the location of critical services and equipment and verify the measures taken to protect critical supplies such as emergency power, medicines and patients' records. The safety and location of some critical systems and supplies in relation to local hazards are addressed in other items in this module and should not be duplicated here.

Safety ratings for item No. 34: *Low = No protection measures taken; subject to damage, failure and disruption of critical services and hospital operations in emergencies and disasters; Average = Partial measures to protect critical services from local hazards are taken; subject to damage with some disruption of critical services and hospital operations in emergencies or disasters; High = Many measures are taken to protect critical services; high probability that critical services and hospital will operate with no or limited disruption in emergencies and disasters.*

35. Hospital access routes

Recommended evaluation methods: interview, observation, review of documentation (including maps) and inspection.

Access is essential if the hospital is to function properly. The emphasis in this item is on access routes outside the hospital grounds. Evaluators should review the main access routes to the hospital. Maps showing micro- and macro-locations of the hospital are helpful. Evaluators should determine the effectiveness of the hospital's security and protection system in terms of vehicle and pedestrian access. Access for people with mobility impairments should also be reviewed. Interviews with hospital employees, patients and, where possible, people living near the facility, can provide information about the types of routes and at what time of day routes are congested.

Evaluators should note the presence and condition of waterways (e.g. creeks, rivers) and storm drains that service the area, and should determine whether flooding or storm run-off would flood certain access routes, making them impassable. Evaluators should note structures and trees along the access routes that would impede traffic if they fell during an emergency or a disaster such as an earthquake, or in a high-wind event such as a cyclone.

Alternate routes should be identified in case major access routes are obstructed. It is important to determine whether alternate routes are taken into account in the hospital's emergency and disaster risk management programmes, including response plans. (References: 1, 8, 19).

Safety ratings for item No. 35: *Low = Access routes subject to obstacles and damage that would impede access and the function of other elements, systems or operations; Average = Access routes subject to some obstacles and damage that would not impede access and function; High = No or minor potential for obstacles or damage that would impede access and the function of other elements, systems or operations.*

36. Emergency exits and evacuation routes

Recommended evaluation methods: observation and inspection.

Evaluators should verify that hospital exit and evacuation routes are clearly marked and free of obstacles to enable emergency evacuation. Evaluators should confirm that evacuation routes are indicated

both inside and outside the hospital. They should check that emergency doors are not locked from the inside so that they do not impede an emergency evacuation. If the hospital relies on automatic doors, check that these doors can be opened manually or there are alternative exit points. (References: 1, 8, 11, 17, 19).

Safety ratings for item No. 36: *Low = Exit and evacuation routes are not clearly marked and many are blocked; Average = Some exit and evacuation routes are marked and most are clear of obstacles; High = All exit and evacuation routes are clearly marked and free of obstacles.*

37. Physical security of building, equipment, staff and patients

Recommended evaluation methods: interview, observation, review of documentation, and inspection.

Evaluators should verify that there are physical security measures in place to:

- prevent unauthorized entry
- prevent violence and kidnapping (especially from newborn and child wards)
- reduce vandalism
- secure equipment and supplies from theft.

Physical security of hospitals is essential to convey a sense of security to patients and the community.

The main items to be secured are:

- perimeter
- cashier
- personnel and patient files
- pharmacy
- psychiatric unit
- nursery
- tool stores.

The measures for security include:

- physical design and layout (e.g. walls, fences)
- access control (e.g. security cards)
- locks and alarms
- closed-circuit television (CCTV) and closed circuit digital video (CCDV) systems
- asset tracking and inventory control
- clear signage.

All of the above should be supported by hospital policies, procedures and staff awareness and training. (References: 1, 8, 19).

Safety rating for item No. 37: *Low = No measures are in place; Average = Some physical security protection is in place (e.g. locked storage for supplies and equipment, asset tracking and inventory control); High =*

Wide range of security measures in place (e.g. design and layout, physical barriers, access control and door security systems, locked storage for supplies and equipment).

3.3 Critical systems

Submodule 3.3 is divided into 8 sections from 3.3.1 to 3.3.8 and consists of 53 items (38–90).

3.3.1 Electrical systems

3.3.2 Telecommunications systems

3.3.3 Water supply system

3.4.4 Fire protection system

3.3.5 Waste management systems

3.3.6 Fuel storage systems (e.g. gas, gasoline and diesel)

3.3.7 Medical gases systems

3.3.8 Heating, ventilation and air-conditioning (HVAC) systems.

This submodule focuses on the safety, capacity, operational management, preventive maintenance and restoration of critical systems for the functioning of the hospital. Critical systems include electrical, telecommunications, water supply, fire protection, waste management, fuel storage, medical gases, and heating, ventilation and air conditioning (HVAC) systems. The failure or disruption of critical systems can stop or impede the functioning of hospitals. Failure does not usually put the structural stability of a building at risk but can endanger people and the contents of a building. Evaluators should determine the condition, safety and stability of critical systems (including the equipment, connections and networks) and whether systems equipment can function during and after a disaster (e.g. whether there are reserve water tanks, back-up systems etc.). The evaluators should focus attention on systems for critical areas of the hospital where there is the greatest demand for health care in emergencies and disasters. Evaluators should verify that there are plans for operating and maintaining the systems in emergencies and disasters, including staff arrangements. The staff responsible for critical systems should also have been trained in emergency preparedness and response, and should be able to communicate effectively in emergency situations.

A number of general maintenance items are aimed at measuring the level of availability and accessibility of documents and the level of training of personnel who are essential when responding to an emergency. For maintenance, the hospital should follow the legal framework established in each country by the Ministry of Health or other relevant authorities. In general, maintenance involves planning, programming and implementing the maintenance activity within a time frame in accordance with technical requirements (according to the technical documents). The maintenance procedures also include supervision and verification that activities are aligned with the plan and are adequate for the type of system, infrastructure and surroundings. Maintenance activities may be verified by a combination of visual inspection and examination of maintenance records with dates, location, inventory number, frequency of maintenance, name of the responsible officer, and the actions taken. As a general rule, the costs of maintenance activities should not be less than 5% of the total budget.

3.3.1 Electrical systems

Section 3.3.1 consists of 10 items (38–47).

38. Capacity of alternate sources of electricity (e.g. generators)

Recommended evaluation methods: interview, observation, review of documentation (including records), and inspection.

This item addresses both the capacity of alternate sources and the length of delay in starting the alternate source of power for critical areas of the hospital in emergency and disaster situations. Evaluators should verify that the alternate source(s) of power begin(s) to operate within seconds of the hospital losing power and continue(s) to operate to cover power demands for critical services throughout the hospital – particularly in the emergency department, intensive care unit, sterilization units, operating theatres and maternity unit (i.e. areas of the hospital that are most critical to meeting service demands in times of emergency. Item 39 covers regular tests of alternate sources of electricity. Uninterrupted power supply (UPS) and battery back-up may provide an interim measure prior to the generator starting to supply power to essential areas. Evaluators should confirm that the hospital's power plant operators have training in emergency preparedness and response. All work areas should be checked to see that there are flashlights and basic communications equipment available.

In earthquake-prone areas, it should be ensured that batteries for the UPS and/or for starting up generators will not fall and be damaged, rendering back-up power unavailable. If batteries are likely to fall in an earthquake, the alternate source of power may be rated as low. Evaluators should check if the generator and auxiliary units are at risk of water damage in flood-prone areas.

Batteries should be stored safely to avoid posing a hazard, as follows:

- Storage areas should be ventilated separately.
- Batteries should be sealed.

For further safety considerations concerning other types of batteries (e.g non-sealed batteries) please refer to Item 53. (References: 2, 17).

Safety ratings for item No. 38: *Low = Alternate source(s) is (are) missing, or covers less than 30% of demand in critical areas, or can only be started manually; Average = Alternate source(s) covers 31–70% of demand in critical areas and starts automatically in less than 10 seconds in critical areas; High = Alternate source(s) start(s) automatically in less than 10 seconds and cover(s) more than 70% of demand in critical areas.*

39. Regular tests of alternate sources of electricity in critical areas

Recommended evaluation methods: interview, observation, review of documentation (including records), and inspection.

Evaluators should determine how frequently generator performance tests with satisfactory results are carried out. This can be achieved by examining maintenance and test records. It allows for potential failures in the system to be anticipated and can indicate measures that need to be taken should a failure occur. Evaluators can also determine how problems with generator function, repairs and potential failures are communicated to the unit responsible for maintenance.

Safety ratings for item No. 39: *Low = Tested at full load every 3 months or more; Average = Tested at full load every 1 to 3 months; High = Tested at full load at least monthly.*

40. Condition and safety of alternate source(s) of electricity

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

Evaluators should determine whether or not the generator(s) can be used indoors or outdoors, and based on this, the most appropriate location for them. For outdoor generators, evaluators should inspect the casing and any form of protective covering. Depending on the location, the potential for flood damage, vandalism or theft of generators should be evaluated. The vulnerability of generators to strong winds, seismic forces or proximity to adjacent structures that might fall and cause damage should also be evaluated. Drainage at the generator's location should be evaluated (i.e. how run-off is managed if the equipment is outside and, if placed indoors, whether there are floor drains or openings. Visual inspection can be supplemented by information from maintenance and inspection records.

For hospitals in high-wind or earthquake-prone areas, evaluators should ascertain whether the generator is well-anchored and braced, without the possibility of falling or shifting. This involves inspection of supports for the generator in the ground or flooring and the condition and type of connections (i.e. checking for corrosion or other deterioration). If springs are used to avoid vibration and noise, they must be well-anchored since these devices amplify seismic waves. The connections for fuel lines and electricity cables must be flexible to avoid breakage should the generator shift or fall. The lower that these heavy pieces of equipment are placed in the structure, the less the chance that they will fall over, but they may still slide.

There should be easy and safe access to the equipment. The possibility that doors or other exits could be blocked by cables or fuel lines if the equipment shifts or falls should be considered.

Evaluators should check the availability and storage of fuel, confirming that supplementary tanks are always full and are located so that fuel can reach the generator by gravity rather than relying on pumping at the time of an emergency. Evaluators should inspect the physical condition of the fuel tanks and electrical and hose connections. Batteries can be highly dangerous, particularly when charging, and are prone to serious risk in an earthquake, wind, flood or fire event. The condition of the batteries and replacement batteries for the starter should also be inspected to ensure that they cannot be damaged. Evaluators should check for protection against electrical discharge caused by atmospheric changes – i.e. earthing arrangements for lightning. (References: 2, 7, 19).

Safety ratings for item No. 40: *Low = No alternate sources; generators are in poor condition;, there are no protective measures; Average = Generators are in fair condition; some measures provide partial protection and security; High = Generators are in good condition, well-secured and in good working order for emergencies.*

41. Condition and safety of electrical equipment, cables and cable ducts

Recommended evaluation methods: observation and inspection.

Evaluators should check the condition of the electrical networks throughout the hospital. These should be protected from flooding and fire, and in earthquake-prone zones and areas of high winds they should be anchored. They should be channelled through cable racks or conduits that protect them from

twisting, breaking or from general deterioration. When cables travel along roofs that empty through drainpipes or gargoyles, the cables should be positioned above the overflow level. When the building has a basement or other areas that are likely to flood, evaluators should inspect the location of sockets, large switchgear or isolators and whether they need to be raised. In earthquake-prone areas, when electricity lines pass from building to building or over expansion joints in the same building, these joints should have sufficient flexibility to accommodate the relative movements during earthquakes.

An important element is the separation of electrical networks from other systems that they may affect – such as water supply or sewage systems. If they are in close proximity to protective systems for electrical atmospheric discharge, consideration should be given to metal shielding and additional electrical earthing and bonding.

Evaluators should inspect the position of outside power lines in relation to features on the hospital grounds. All power lines on hospital grounds should be placed underground to protect them from damage and flying debris during high winds. If electricity poles are located on hospital grounds, evaluators should ensure that transformers are well anchored. The possibility that poles could fall because of soil liquefaction, wind or other hazards should be considered. Tree branches can break or interfere with above-ground power lines; likewise, tree roots can interfere with buried power lines. (References: 2, 7, 19).

Safety ratings for item No. 41: *Low = Electrical equipment, power lines, cables and ducts are in poor condition, there are no protective measures; Average = Electrical equipment, power lines, cables and ducts are in fair condition; some measures provide partial protection and security; High = Electrical equipment, power lines, cables and ducts are in good condition, well-secured and in good working order.*

42. Redundant system for the local electric power supply

Recommended evaluation methods: observation and inspection.

The failure of local power supplies can cause a "domino" effect in the hospital so that successive outages can occur. Evaluators should confirm that there is redundancy in the power supply, without counting on the hospital's own emergency power-generating system. If possible, there should be more than one power supply entrance to the hospital from the local power supply, and additional entrances should be from other circuits that are independent of the internal emergency system.

Safety ratings for item No. 42: *Low = There is only one entrance for the local power supply; Average = There are two entrances for the local power supply; High = There are more than two entrances for the local power supply.*

43. Condition and safety of control panels, overload breaker switches and cables

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

Evaluators should check the accessibility, condition and operation of the general distribution board, isolators, switchgear, and control panels throughout the facility. Locations should be checked to ensure that access cannot be blocked, doors and windows are intact, measures are in place for the prevention of fire and that there is sufficient drainage to avoid flooding.

The function of the distribution board, the capacity of the breaker, its connections to the system, and the supports or anchors used for all of the panels and corresponding equipment should be checked. This could be done by a combination of examining maintenance records and visual inspection. Distribution boards or panels should be labelled to indicate which control and protection devices serve each circuit in different areas. Evaluators should also check that the control panels are protected from the risk of fire, overload and mechanical damage (e.g. earth leakage circuit breakers, power overload breakers, load test and auto changeover switches to generators).

Connections to the emergency back-up system, emergency lighting and interior alarm systems should be inspected. If these connections are located close to the emergency generator, all cables should be appropriately channelled, in good condition and identifiable. (References: 2, 7, 19).

Safety ratings for item No. 43: *Low = Control panels or other elements are in poor condition, there are no protective measures; Average = Control panels or other elements are in fair condition; some measures provide partial protection; High = Control panels or other elements are in good condition, well-protected and in good working order.*

44. Lighting system for critical areas of the hospital

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

Evaluators should review lighting in critical areas of the hospital, including the emergency department, intensive care unit, operating theatre, laboratories etc. They should test levels of lighting in rooms, the function of lighting fixtures, and the safety of their bracing or supports. Some lights are suspended from ceilings, others are attached to the structure. In the case of lighting used in surgery or obstetrics, manufacturers' installation instructions generally suggest that they be bolted to beams. Evaluators should ensure that lighting fixtures are not supported by false ceilings, especially where there are earthquake hazards. Where water filtration occurs on upper floors, leaks could cause short circuits in light fixtures. These areas should also have rechargeable lamps. Evaluators should confirm that lighting is connected to the emergency power system or UPS. Visual inspection can be supplemented by information from maintenance and inspection records. (References: 2, 7, 19).

Safety ratings for item No. 44: *Low = Poor level of lighting; there are no protective measures; Average = Lighting is satisfactory in the critical areas; some measures provide partial protection; High = Good levels of lighting and protection measures in place.*

45. Condition and safety of internal and external lighting systems

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

Lighting systems are one of the major nonstructural elements in a hospital. If lighting does not function correctly, especially in critical areas, it will have a major effect on how the hospital functions. Evaluators should ensure that both internal and external lighting are operational and correctly sectioned so that any area that needs lighting has it. Evaluators should work with maintenance staff to determine whether there is sufficient stock of lighting supplies (e.g. flashlights, head-torches, batteries and light bulbs in case

of light failure in a disaster). They should ensure that emergency lighting systems are adequate for the level and type of use of an area, especially on stairs and walkways, in corridors and in the critical medical and nonmedical areas of the hospital. Lighting should be clear of plants or other vegetation which could pose a physical risk or affect performance. Visual inspection can be supplemented by information from maintenance and inspection records.

Safety ratings for item No. 45: *Low = Internal and external lighting systems are in poor condition, there are no protective measures; Average = In fair condition; some measures provide partial protection; High = In good condition, well-protected and in good working order.*

46. External electrical systems installed for hospital usage

Recommended evaluation methods: observation and inspection.

Evaluators should verify the existence and capacity of external substations or transformers that provide power to the hospital either on hospital grounds or in close vicinity. These systems should be completely enclosed and there should be labels and signs clearly indicating that they are power sources. They should be isolated from fuel tanks. The substations should not be subject to damage from flooding or heavy rain. Anchors or supports should be sufficient to prevent them from tipping over or sliding. Evaluators should take into account the possibility of oil leaks in the case of a transformer and breaks in electrical cables. Transformers or substations should not be placed close to vegetation – especially trees – because branches can break or interfere with above-ground power lines. Likewise, tree roots can interfere with buried lines. Power sources should be protected from lightning and other atmospheric electrical discharge.

Safety ratings for item No. 46: *Low = No electrical substations installed for hospital demands; Average = Substations installed; some measures provide partial protection, but would be vulnerable to damage or disruption, do not provide enough power to the hospital; High = Electrical substations installed, well-protected, and provide enough power to the hospital in an emergency or disaster.*

47. Emergency maintenance and restoration of electric power supply and alternate sources

Recommended evaluation methods: interview, review of documentation (plans and records), and inspection.

The maintenance division should provide the operations manual for electrical power systems, as well as preventive maintenance records. Evaluators should verify that there are emergency procedures for maintaining systems in emergency/disaster situations. Evaluators should check that personnel have been trained to an appropriate standard to maintain the correct level of safety of the electrical power supply and alternate source (e.g. generators) of the hospital in both routine and emergency/disaster situations.

Safety ratings for item No. 47: *Low = Documented procedures and maintenance/inspection records do not exist; Average = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, but resources are not available; High = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, and resources are in place for implementing emergency maintenance and restoration.*

3.3.2 Telecommunications systems

Section 3.3.2 consists of 8 items (48–55).

48. Condition and safety of antennas

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

Evaluators should verify the condition of antennas, satellite dishes, external control boxes and their roof fixings, bracings and supports. Antennas and lightning rods are exposed and attached to the highest part of the structure and are therefore vulnerable to strong winds and storms. There should be at least three tie-downs at 120° intervals; four tie-downs should be spaced at 90° intervals. Grounding devices for lightning rods should be correctly installed and should not be used to anchor other systems. Access walkways to antennas and related equipment should be safe and well-protected from hazardous phenomena. Visual inspection can be supplemented by information from maintenance and inspection records. (References: 2, 19).

IF THERE ARE NO ANTENNAS, LEAVE BOXES BLANK AND PROVIDE COMMENT

Safety ratings for item No. 48: *Low = Antennas and bracing in poor condition, there are no protective measures; Average = Antennas and bracing are in fair condition, some measures provide partial protection; High = Antennas and bracing are in good condition, well-secured and protection measures are in place.*

49. Condition and safety of low- and extra-low-voltage systems (Internet and telephone)

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

Low-voltage and extra-low-voltage systems may have antennas, transmission equipment, line and voltage controllers, receivers, wiring and a grounding mechanism so evaluators should verify the status of each part. Evaluators should verify that cables are properly connected in strategic areas to avoid system overload. Cables for computer and telephone networks should be protected from events such as high winds and flooding, so that the systems can function in adverse conditions. The main components of low-voltage and extra-low-voltage systems, such as servers and network hubs, should be in protected areas that are free of items that could potentially block access and ingress.

To connect the telephone exchange to each of the extensions or telephones in a building, there is a system of wires that must be segregated from other electrical sources to avoid overloading the system and to protect against their being damaged by different voltages. Likewise, internal communications wires must be segregated. The wires should be protected according to the appropriate standards and legislation – for instance, protection in electrical tubes or boxes, and placement above the floor (e.g. at 0.5 metres). Visual inspection can be supplemented by information from maintenance and inspection records. (References: 2, 19).

Safety ratings for item No. 49: *Low = Low voltage systems in poor condition, there are no protective measures; Average = Low voltage systems in fair condition, some measures provide partial protection; High = Good condition, well-secured and other protection measures in place.*

50. Alternate communications systems

Recommended evaluation methods: observation and inspection.

Evaluators should verify the condition of the hospital's alternate independent communications systems (including radio-communications, satellite telephone, Internet, mobile telephones, pagers) to maintain internal as well as external contact in the event of an emergency or disaster. Components of internal networks should be reviewed to ensure that vulnerabilities at different points of the system have been eliminated. It is important to keep in mind that internal and external communications depend on the operation of the emergency power generation system in case of an emergency or disaster (see items 38–40) and to internal and external communications in Module 4 (see item 125).

Safety ratings for item No. 50: *Low = Alternate communications systems do not exist, are in poor condition, or do not function; Average = Hospital-wide alternate communications system in fair condition, but is not tested on an annual basis; High = Alternate communication system in good condition and tested at least annually.*

51. Condition and safety of telecommunications equipment and cables

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

The condition and functionality of the telecommunications equipment and cables in the hospital should be checked. In seismic zones or areas of high winds, the evaluators should verify that telecommunications equipment (radios, satellite telephone, video conferencing system, patch panel, server rack etc.) are well-protected and anchored for increased security. Outside cables on the hospital grounds should be in underground conduits to protect them from damage during high winds and other hazards. Telephone exchange consoles, computers and servers should have anchors to prevent tipping or sliding. In areas which require anchoring and/or bracing, the quality of anchors and braces should be assessed. There should be adequate conduit tubing for cables to prevent them from deteriorating. Mobile telephone towers in the vicinity of the hospital should have back-up generators. Visual inspection can be supplemented by information from maintenance and inspection records.

Safety ratings for item No. 51: *Low = Telecommunications equipment and cables are in poor condition; there are no protective measures; Average = Equipment and cables are in fair condition; some measures provide partial protection; High = In good condition, well-secured and protected from hazards.*

52. Effect of external telecommunications systems on hospital communications

Recommended evaluation methods: interview, review of documentation (plans and records), and inspection.

External telecommunications systems, radio transmitters and similar systems that are placed near the hospital may cause interference to hospital communications networks. Evaluators should verify that exterior telecommunications systems do not interfere with the communications of the hospital. This can be done by examining maintenance records, site plans and drawings, and by talking with staff.

Safety ratings for item No. 52: *Low = External telecommunications systems cause major interference with hospital communications; Average = External telecommunications system cause moderate interference with hospital communications; High = External communications cause no interference with hospital communications.*

53. Safety of sites for telecommunications systems

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

Evaluators should check the condition and safety of the sites for the telephone exchange and computer network server. Depending on the type and size of the exchange, the space must accommodate switching equipment, power supply, storage batteries and climate control equipment. There must also be room for operators and maintenance workers to carry out maintenance functions.

Entry ducts should have fire barriers, doors must open completely and away from the room, suspended ceilings that can fall easily should be avoided, and no pipelines should be co-located here. Doors and windows should close tightly to keep out wind and water, and doors should have moderate fireproofing. Lighting should be adequate for personnel to work, but the equipment should be protected from direct sunlight. To avoid water damage, water filtration apparatus, toilets and bathrooms should not be on floors above the equipment.

In areas that are prone to high winds (including hurricanes, cyclones and tornados), telecommunications centres must be placed away from facades. Cables and wires should be encased in conduit tubing to prevent deterioration. In earthquake-prone zones and areas of high winds, all equipment should be anchored according to its weight and dimensions. Evaluators should verify that installations are not subject to explosion in case of sparks.

These premises should be at least 4 m away from sources of electromagnetic interference such as imaging equipment, transformers, motors and radio transmission systems.

Access to the telecommunications centres must be restricted and controlled. Visual inspection can be supplemented by information from maintenance and inspection records.

Battery storage areas should be ventilated separately. Batteries should be sealed. If other types of batteries are used (non-sealed batteries) for reasons of economy, these should not be placed in the same location as the telephone switchboard, and their location must have the following specifications:

- It should be away from equipment and the operator, and antacid treatment must be applied to the floors and walls up to 1500 mm above the finished floor level.
- It should not have an outlet or interruptor placed inside, outfitted with shatterproof lamps, and doors should have moderate fireproofing. The battery should be protected from direct sunlight.
- There should be a sink with a salt-water battery. (References: 2, 19).

Safety ratings for item No. 53: *Low = Sites for telecommunications systems are in poor condition, at high risk of failure due to hazards; there are no protective measures; Average = Sites in fair condition; some measures provide partial protection; High = Good condition, well-secured and other protective measures in place.*

54. Condition and safety of internal communications systems

Recommended evaluation methods: observation and inspection.

The evaluation should verify the condition of loudspeakers, public address systems, speaker systems, intercoms and similar systems that serve to facilitate communication with personnel, patients and visitors to the hospital. Evaluators should also confirm the existence of audible systems such as bells and horns that are used as alarms or alerts for evacuation. The existence of redundant and alternate systems for internal communication guarantees that personnel, patients and visitors are contacted quickly and clearly in emergencies and disasters. The evaluators should request that the internal communications systems are tested and should confirm that messages were well received. (References: 2, 19).

Safety ratings for item No. 54: *Low = Internal communications systems do not exist or are in poor condition; Average = Internal communications systems are in fair condition, but there are no alternate systems; High = Internal communications and back-up systems are in good working order.*

55. Emergency maintenance and restoration of standard and alternate communications systems

Recommended evaluation methods: interview, review of documentation (plans and records), and inspection.

The maintenance division should provide the operations manual and preventive maintenance records for electrical power systems. Evaluators should verify that there are emergency procedures for maintaining standard and alternate communications systems in emergency/disaster situations. Evaluators should check that personnel have been trained to an appropriate standard to maintain the correct level of safety of the communications system and the alternate source of communications in the hospital in both routine and emergency/disaster situations.

Safety ratings for item No. 55: *Low = Documented procedures and maintenance/inspection records do not exist; Average = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, but resources are not available; High = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, and resources are in place for implementing emergency maintenance and restoration.*

3.3.3 Water supply system

Section 3.3.3 consists of 6 items (56–61).

56. Water reserves for hospital services and functions

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

Evaluators should verify that water tanks have a permanent reserve that is sufficient to provide water for at least 72 hours in accordance with official national guidance, in addition to a water reserve for fires (it is advised to provide at least 300 litres daily per bed). Evaluators should also verify that water storage is sufficient to satisfy essential services. This could be ascertained from service and maintenance records.

Typically, water storage for hospitals is in cisterns or reserve tanks on the ground floor and elevated tanks. It is important to check locations in the hospital that are not served by the main water system and to confirm that their reserves are sufficient for 72 hours. If wells, boreholes or aquifers exist on hospital grounds, the percentage of water supply they provide and whether they are used regularly or as reserves should be ascertained. (References: 2, 7, 17).

Safety ratings for item No. 56: *Low = Sufficient for 24 hours or less, or water tank does not exist; Average = Sufficient for more than 24 hours but less than 72 hours; High = Guaranteed to cover at least 72 hours.*

57. Location of water storage tanks

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

Evaluators should visit all water tanks, whether elevated on separate towers, on the building or inside the building, or pressurized or hydropneumatic systems, to determine the safety of the installations and of the site. Cisterns should not be located in areas susceptible to flooding, because of the risk of contamination, and they should not be placed in areas with landslide hazards. In earthquake-prone areas, connections to water tanks must have adequate flexibility to withstand shaking. Any breakages in lines can result in the entire back-up water storage draining away and also undesirable water ingress/flooding of some parts of the hospital.

Water storage tanks should have appropriate covers to prevent access by non-authorized personnel and to stop items from falling inside. The tanks should not show cracking, damage, corrosion or vegetation/allergen growth. It is important to determine whether the failure of a water tank would flood critical areas of the hospital, and there should be provision to direct overflow safely away in such an event. Visual inspection can be supplemented by information from maintenance and inspection records.

Elevated tanks should meet these same criteria in addition to being supported by above structural roof elements. Special attention should be given to the means by which plastic tanks are supported and anchored. In high winds they can tip over if they are empty, which will affect the attached pipes. Air valves extend above the level of the tank cover and should be braced to avoid movement or breakage in high winds. Any hydraulic network components on the roof should be anchored. (References: 2, 7, 17).

IF THE HOSPITAL DOES NOT HAVE A WATER STORAGE TANK, LEAVE BOXES BLANK AND PROVIDE COMMENT

Safety ratings for item No. 57: *Low = The site is vulnerable with high risk of failure (e.g. structural, architectural and/or system vulnerabilities); Average = The site is exposed to moderate risk of failure (e.g. structural, architectural and/or system vulnerabilities); High = The site is not exposed to visually identifiable risks (e.g. structural, architectural and/or system vulnerabilities).*

58. Safety of the water distribution system

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

Evaluators should verify the condition and proper function of all elements of the water distribution system, including storage tanks, valves, pipes and connections. The components connecting the local water service to the cisterns are a critical part of the network. The cistern float valve controls the amount of water that enters the tank and shuts off flow when the cistern is full. If the valve is not in proper working condition, water will be wasted without filling the cistern, and the run-off can erode structural supports.

Evaluators should check the general condition of the hospital water distribution network to ensure that water reaches the necessary service points. Leaking pipes can cause damage in any of the areas where they are located: along suspended ceilings, behind walls and underground. Pipe connections are vulnerable and should be checked for signs of deterioration. It is important to check that flexible connections are used, for example, between exterior tanks and points where pipes enter the building and between pumps and impulsion pipes. Flexible connections should be used where components are in contact with structural elements, and should be firmly anchored so that the structure and water pipes move together if there is seismic shaking.

In areas with extremely cold weather, evaluators should also consider the measures to protect from freezing temperatures which could affect the functioning of the water distribution system. Evaluators should also check that the pipe lagging is in place and is protecting appropriate pipes from cold and hot temperatures in order to maintain the system's appropriate temperature range.

The water system should comply with the current legal standards for water for human consumption. There should be a water safety plan which is aimed at assessing and managing the potable water system, including regular water quality testing and maintenance The materials to be used for supplying water should adhere to the following requirements:

- They should be able to function effectively to provide the required services, including in hazard situations.
- All equipment to be installed should be of low water consumption.

In areas at risk of volcanic eruptions, covers should be designed to be watertight and should be able to protect against contamination of the water, as well as sustaining the weight of deposits; it would be advisable to design covers with a slope.

In areas where there are patients with mental health conditions or there are prisoners, plumbing fittings should be protected against the possibility of vandalism, noise and suicide.

Visual inspection can be supplemented by information from maintenance and inspection records. (References: 2, 7, 17).

Safety ratings for item No. 58: *Low = Less than 60% are in good operational condition; Average = Between 60% and 80% are in good condition; High = Above 80% are in good condition.*

59. Alternate water supply to the regular water supply

Recommended evaluation methods: interview and inspection.

Evaluators should identify the agency or mechanism to supply or restore water service to the hospital if the existing regular water supplies (e.g. public mains systems) fail.

There should be redundancy in all critical or lifeline systems, and it is advisable for the facility's main cistern to be supplied by the local service in at least two places that can maintain the necessary reserve capacity. Another option is to use private wells or boreholes to supply the facility; their availability should therefore be confirmed. The evaluator should identify the entity responsible for restoring local water supply if it fails, and should check the facility's access by tanker trucks supplying water storage tanks. (References: 2, 7, 17).

Safety ratings for item No. 59: *Low = Provides less than 30% of daily demand in an emergency or disaster scenario; Average = Provides 30–80% of daily demand in an emergency or disaster scenario; High = Provides more than 80% of daily demand in an emergency or disaster scenario.*

60. Supplementary pumping system

Recommended evaluation method: observation.

As mentioned elsewhere, critical systems should be redundant, beginning with systems inside the hospital. Evaluators should identify the existence and operation of the supplementary or back-up pumping system in case water supply is interrupted. The number of pumps will depend on the water flow and its variations, as well as on the need to have reserve equipment to deal with emergency situations. At least two pumps should be in place (to ensure that there is a back-up if one pump fails) to move water between reserve and compensation tanks if the main system fails in an emergency. They should be used alternately but, if they are too big, more units should be installed, resulting in lower safety factors with more alternate sources and lower operation costs. It is best if all pumps are identical. If they are not, the reserve equipment should be similar to the pump with the highest capacity. Evaluators should identify the existence and operation of supplemental power and connection to the back-up power supply (for pumping) and supplementary pumps (in case of pump failure). Supplementary pumps should be able to meet the minimum demand for water needs of the hospital. The same requirements apply to water distribution and booster pump sets in the facility that are independent from the main pumping system.

Safety ratings for item No. 60: *Low = There is no back-up pump and operational capacity does not meet minimum daily demand; Average = Supplementary pumps are in fair condition but would not meet the minimum daily demand for water; High = All supplementary pumps and back-up systems are operational and would meet the minimum demand for water.*

61. Emergency maintenance and restoration of water supply systems

Recommended evaluation methods: interview and documentation (including records).

The evaluator should verify whether maintenance personnel have been trained to an appropriate standard to maintain the correct level of safety of the water quality controls and supplies and alternative water sources of the facility. The maintenance division should provide the operations manual and preventive maintenance records for the water supply systems. Evaluators should verify that there are emergency procedures for maintaining the water supply systems in emergency/disaster situations. Evaluators should check that personnel have been trained to an appropriate standard to maintain the correct level of safety of water quality controls, supplies and alternative sources to the hospital in both routine and emergency/disaster situations.

Safety ratings for item No. 61: *Low = Documented procedures and maintenance/inspection records do not exist; Average = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, but resources are not available; High = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, and resources are in place for implementing emergency maintenance and restoration.*

3.3.4 Fire protection system

Section 3.3.4 consists of 5 items (62–66).

62. Condition and safety of the fire protection (passive) system

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

The hospital must be completely protected against fire, since this type of hazard can stop services in a hospital when they are most needed. Hospitals are considered to be buildings which are extremely difficult to evacuate; therefore, the most important aspect of fire safety is to have the best means of prevention and protection in place.

Protection of patients and staff when there is a building fire is of utmost concern. Passive fire protection measures will be based on the combustible level of each area, the level of compartmentalization, the use of incombustible material, fireproof doors, firewalls, and the location of doors and windows in respect to other buildings and other areas.

The main objective should be to prevent fires from starting and, if a fire starts, to prevent its spread in order to avoid the total evacuation of the building.

Evaluators should determine whether the hospital design incorporates firewalls, doors and designated escape routes, which provide a high level of safety. They should also review the fire protection measures in areas at highest risk of fire, including boiler rooms, fuel tank storage, medical gases, electrical panels, electrical switch rooms, pharmacy etc. Evaluators can find this information in maintenance records, the facility's fire plans, and policies and procedures.

Partial evacuations should be prioritized, preferably to an area on the same level (horizontal evacuation), and as a last resort to other floors (vertical evacuation). To enable this, it is important to have a building structure that limits the risk of the fire spreading both within and outside the affected units, compartmentalising the fire by sectors with fire resistance in place. Floors should be divided into fire sections and each section should have enough space to hold all patients from one neighbouring section. The sections should have adequate means of evacuation available, including exit routes and direct exits to external safety areas, so that occupants can safely leave the building or reach a safe location within the building. (References: 1, 2, 4, 6, 7, 8, 11, 19).

Safety ratings for item No. 62: *Low = Element(s) are subject to damage, and damage would impede the function of this and other elements, systems or operations; Average = Element(s) are subject to damage but damage would not impede function; High = No or minor potential for damage that would impede the function of this and other elements, systems or operations.*

63. Fire/smoke detection systems

Recommended evaluation methods: interview, review of documentation (plans and records), and inspection.

The early detection of fire and/or smoke is a critical line of defence against fire in hospitals. Evaluators should review the installation, maintenance and testing of the fire and smoke detection systems throughout the hospital. There should be detectors and fire alarms that are both visual and audible. The system must allow for the transmission of local alarms, general alarms and verbal instructions. They will also review the fire protection measures in areas at highest risk of fire, including boiler rooms, fuel tank storage, medical gases, electrical panels, electrical switch rooms, pharmacy, laboratories, storage for unsealed batteries etc. Personnel responsible for testing and verifying the maintenance record and technical documents from manufacturers and installers should be interviewed. Evaluators may check the functioning of one of the fire alarms in an unstaffed part of the hospital where manual detection of fires may be delayed and may lead to heavy losses.

Evaluators can confirm this information on service maintenance records, fire drawings and plans for the facility. (References: 1, 6, 7, 8, 10, 11).

Safety ratings for item No. 63: *Low = No system has been installed; Average = System is partially installed, or infrequently maintained and tested; High = System is installed and well-maintained and tested frequently.*

64. Fire suppression systems (automatic and manual)

Recommended evaluation methods: interview, observation, review of documentation (plans and records), and inspection.

Evaluators should verify that formal inspections by the proper authority are regularly performed to assess the risks from fire and other hazards. Portable fire extinguishing devices should be accessible, clearly marked and labelled, and in usable condition. Expiry dates on extinguishers should be checked. Sprinkler systems should be examined and checked against maintenance service records for good operation. Where sprinkler heads drop down from a suspended ceiling, evaluators should ensure that the sprinkler system has enough flexibility and/or space to move and is not likely to be broken due to differential movement between the sprinkler piping system and the ceiling.

There must be a sufficient number of functional water hydrants or dry risers available or connected to a permanent supply of water. Evaluators should confirm that all aspects of the extinguisher systems are tested on a regular basis and that personnel responsible for using the equipment have had practical training and have been tested on how to use it in a time of need. Note the expiry and/or refill dates of fire extinguishers and of flow tests for fire hydrants. Examine logbooks and service and maintenance records of the equipment tests and dates of inspections by emergency/fire-fighting personnel.

The hospital should have equipment and adequate installations for controlling and extinguishing fires through a combination of portable extinguishers in area of high risk (pharmaceuticals and medical equipment storage, sterilization units, clinical laboratories etc.); mobile extinguishers; and functional water hydrants or dry risers.

Evaluators should check that activities assigned to the fire safety team for preventing and suppressing fires are carried out in accordance with plans. The fire safety team should consist of at least 10 persons

from different shifts. This team draws up bulletins with basic recommendations for avoiding fires, carries out visits to area of risk and identifies evacuation routes.

The hospital should have a direct telephone connection to the nearest fire station. The local firefighters should know the most recent layout of the hospital and should conduct drills on the premises. When the alarm goes off, the personnel in charge should point firefighters towards the source and ensure they have the necessary access for a rapid and effective response. There should be an emergency elevator (to be used exclusively by firefighters) in inpatient areas and the intensive care unit when those areas are more than15 metres above ground level. (References: 1, 6, 7, 8, 9, 10, 19).

Safety ratings for item No. 64: *Low = No system has been installed; inspections do not occur; Average = System is partially installed, or system is installed, but no maintenance or testing; inspections are incomplete or outdated; High = System is fully installed and regularly maintained and tested frequently; inspections are complete and up to date.*

65. Water supply for fire suppression

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

Evaluators should confirm that there is a source for a permanent supply of water that can be used effectively in case of fire. This supply is additional to the water supply used for the general functioning of the hospital and for hospital services. The source could be reticulated water mains or a water source for fire – such as water reservoirs, a nearby lake or stream, or properly maintained and serviced external fire hydrants. Water pumps (electric or diesel) which link to the fire extinguisher system should be tested on a regular basis. Evaluators can find this information by reviewing site drawings, plans, and the facility's policies and procedures. (References: 6, 7, 8, 10, 19).

Safety ratings for item No. 65: *Low = A source of permanent supply which could be used for fire suppression does not exist; Average = A source of permanent supply of water is available for fire suppression; there is limited capacity available, and no maintenance and testing has been conducted; High = A source of permanent water supply with significant capacity for fire suppression is available, regularly maintained and frequently tested.*

66. Emergency maintenance and restoration of the fire protection system

Recommended evaluation methods: interview, observation, review of documentation (plans and records), and inspection.

The maintenance division should provide the operations manual for the fire protection systems, as well as records showing preventive maintenance of fire extinguishers and fire hydrants. Evaluators should verify that:

- A manual plus training on the management of fire protection systems are available.
- There are records of preventive maintenance of extinguishers and hydrants.
- The equipment is to be found in the appropriate places and is freely accessible.
- The network of pipes, pumps and accessories is exclusively for the hydrants.

- Hoses are appropriately joined to the valves on the cabinets for the hydrants.
- The network of hydrants has its own water cistern.
- The fire safety officer (warden) team in the hospital has been established.
- Personnel are trained and drills have been carried out.
- A plan of action and procedures for fire response are available.
- Inflammable materials and liquids are stored in safe places that are reserved exclusively for these substances. (References: 1, 6, 7, 8, 9, 10, 19).

Safety ratings for item No. 66: *Low = Documented procedures and maintenance/inspection records do not exist; Average = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, but resources are not available; High = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, and resources are in place for implementing emergency maintenance and restoration.*

3.3.5 Waste management systems

Section 3.3.5 consists of 5 items (67–71).

67. Safety of nonhazardous wastewater systems

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

Nonhazardous wastewater or sewerage systems consist of a network of pipes that carry the wastewater from the hospital to the sewer unit or to a separate system. They also include special systems such as septic tanks, infiltration wells and oxidation ponds, as well as filters, hydraulic traps or siphons. These systems treat and dispose of residuals, prevent the entrance of odour or insects from the treatment or excreta systems, and unclog and clean the pipes.

Ventilation systems maintain atmospheric pressure within wastewater systems. Grease, plaster, mud and sand must be filtered out to allow for the effective performance of treatment and excreta systems.

Evaluators should, therefore, verify the physical and functional condition of equipment, clamps and anchors, the means of discharge or evacuation, leakages due to defective or missing hardware, and the state of the waste vents in covers. Evaluators should look for leaks in the system and should assess the state of the registry (presence of faecal matter). They should check overflows of deposits, the location of treatment tanks, pits and septic tanks, percolation of wells, grease, plaster or mud traps and so on, and the proximity of wastewater systems to potable water systems, verifying that the sanitation system lies downstream from the potable water system.

Evaluators should ensure that facilities for hospital wastewater disposal do not have the possibility to contaminate local serviceable drinking water. Evaluators should verify types of independent or combined systems for water intake through the base of the system (drains, showers, others) as a result of rain or flooding. They should check the operation of the valves that prevent sewage water from regurgitating back into the cistern, as well as the location of the treatment systems in respect to the potable water management system. Visual inspection can be supplemented by information from drawings, plans and site records.

Evaluators should check if there are sufficient toilets (at least 1 per 15 patients and staff) that are functioning and accessible and that safely separate the user from excreta. (References: 2, 5, 7, 19, 22).

Safety ratings for item No. 67: *Low = System for nonhazardous wastewater disposal does not exist or is in poor condition; Average = System is in fair condition, but little or no evidence of compliance and maintenance; High = Wastewater disposal system is in good condition with good capacity and evidence of compliance and maintenance.*

68. Safety of hazardous wastewater and liquid waste

Recommended evaluation methods: interview, observation, review of documentation (plans and records), and inspection.

The characteristics of each of the wastewater systems define the form of disposal and whether the waste would be in conventional form or in a form that can be removed by the authorized entity. The responsible division of the hospital (e.g. engineering or maintenance) should ensure that hazardous wastewater does not drain into the public sewage system and does not contaminate drinking water.

Dangerous residual liquids can be divided into two groups: those that are pre-treated and which can then be discharged into the sanitation system, and those which cannot be discharged and need manual removal by an authorized entity. In both cases the hospital must ensure the standards, and the system must be assessed according to the established standards of the country.

Liquids that can be discharged into the sanitation system through pre-treatment include oils and fats, explosive mixtures, colourings, corrosive waste and some radioactive matters, depending on the level of concentration.

Liquid waste from operating rooms may be infectious if it has come into contact with liquid or semi-liquid substances such as blood, semen, vaginal secretions, saliva, purulent secretions and placenta or cerebrospinal, synovial, pleural, peritoneal or amniotic fluid. Other liquids that do not contain concentrations of drugs or radioactive substances can be handled as nonhazardous liquids and may be discharged to community sewer systems.

The hospital sanitation system will track where the substances are discharged once treated in order to obtain a sample for analysis to verify the safety of landfill material to the environment or to determine possible action to ensure safety of the environment.

Evaluators can find this information by examining maintenance and service records, site drawings and plans. (References: 7, 19).

Safety ratings for item No. 68: *Low = System for hazardous wastewater disposal does not exist or is in poor condition; Average = System in fair condition but little or no evidence of compliance and maintenance; High = Disposal system has good capacity and evidence of compliance and maintenance.*

69. Safety of nonhazardous solid waste system

Recommended evaluation methods: interview, observation and inspection.

The responsible division of the hospital (e.g. engineering or maintenance) should ensure that solid waste does not pollute the environment and does not cause any risk to health.

Like liquid waste, solid waste is classified as hazardous or nonhazardous with each type treated differently. There are three important steps to the management of waste that should be checked by evaluators, namely:

- *Segregation or classification of waste.* This is key as wrong classification can cause problems later and lead to loss of time. The level of preparedness of personnel and the establishment of biosecurity protocols must be checked, including the use of appropriate containers for different types of waste – such as high-resistance red polypropylene bags for hazardous substances, sharps containers, containers for special elements, and black bags for nonhazardous waste.
- *Handling and storage.* Personnel in charge of handling should know the different types of waste and correct management. They should wear personal protective clothing and equipment and should adhere to the routes and schedules established. Nonhazardous materials can be placed in areas served by the municipal services, separate from hazardous materials.
- *Collection and transportation.* Transportation to the place of final treatment or disposal will be in special, closed vehicles with specific timelines, leaving the collection area perfectly clean.

Solid waste should be disposed of in a safe and proper manner in accordance with appropriate legislation and guidance. (References: 7, 19, 23).

Safety ratings for item No. 69: *Low = System for solid waste disposal does not exist or is in poor condition; Average = System is in fair condition, but little or no evidence of compliance and maintenance; High = Disposal system is in good condition with good capacity and evidence of compliance and maintenance.*

70. Safety of hazardous solid waste system

Recommended evaluation methods: interview, observation, review of documentation (plans and records), and inspection.

The evaluators should ensure that hazardous solid waste does not pollute the environment and does not cause any risk to health. Solid waste should be managed and disposed of in a safe and proper manner in accordance with appropriate legislation and guidance. Some specific hazardous wastes (i.e. sharps, non-sharps, infectious wastes, blood samples, pharmaceuticals) require special consideration. There are three important steps to the management of hazardous solid waste that should be checked by evaluators, namely:

- *Segregation or classification of waste.* The level of preparedness of personnel and the establishment of biosecurity protocols must be checked, including the use of appropriate containers for different types of waste, such as high-resistance red polypropylene bags for hazardous substances, sharps containers, and containers for special elements.
- *Handling and storage.* Hazardous materials should be safely stored in sealed bags. The area must be located away from inpatient services (in service areas) and closed in a way that prevents break-ins. The location should be covered but accessible for cleaning, protected to avoid flooding or leakage outside the area, clearly marked with the universal symbol, accessible to transportation teams, and with enough storage space to hold the amount of waste that accumulates between collections.
- *Collection and transportation.* Transportation to the place of final treatment or disposal will be in special, closed vehicles with specific timelines, leaving the collection area perfectly clean. Containers used for hazardous materials should be placed away from traffic areas, should be secured to walls so that they cannot be moved easily, and must have safety covers.

Visual inspection can be supplemented by information from maintenance and inspection records. (References: 7, 19, 23).

Safety ratings for item No. 70: *Low = System for hazardous waste disposal does not exist or is in poor condition; Average = System is in fair condition but little or no evidence of compliance and maintenance; High = Disposal system is in good condition with good capacity and evidence of compliance and maintenance.*

71. Emergency maintenance and restoration of all types of hospital waste management systems

Recommended evaluation methods: interview, review of documentation (plans and records),.

The maintenance division should provide the operations manual and preventive maintenance records for hazardous solid waste management systems. Evaluators should verify that there are emergency procedures for maintaining hazardous solid waste systems in emergency/disaster situations. Evaluators should check that personnel have been trained to an appropriate standard to maintain the correct level of safety of waste management systems of the hospital in both routine and emergency/disaster situations.

Safety ratings for item No. 71: *Low = Documented procedures and maintenance/inspection records do not exist; Average = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, but resources are not available; High = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, and resources are in place for implementing emergency maintenance and restoration.*

3.3.6 Fuel storage systems (e.g. gas, gasoline and diesel)

Section 3.3.6 consists of 5 items (72–76).

72. Fuel reserves

Recommended evaluation methods: observation and inspection.

Evaluators should verify that the hospital has fuel supplies or storage tanks of adequate size and safety. Evaluators should verify the level of demand for fuel at the maximum capacity of the hospital, taking into account the additional capacity required to respond to emergencies and disasters. The evaluators should check the size of reserve tanks to ensure that the reserve is sufficient to meet the demand for each type of fuel at the maximum capacity of the hospital for at least 72 hours (bearing in mind there may be a high increase in service demand) to enable the hospital to respond in emergencies and disasters. Evaluators should observe how much fuel is available at the time of the assessment. They should also determine how often fuels are delivered and whether supplies can be delivered effectively during emergencies or following disasters, especially if access and road networks have been compromised. Hospitals that do not have fuel reserves or fuel tanks and provided with fuel from petrol stations on a contractual basis, for instance, should be given a low rating. In earthquake-prone areas, the fuel connections between the generator and the tank should be flexible. (References: 2, 7, 19).

Safety ratings for item No. 72: *Low = Sufficient for 24 hours or less, or fuel tank does not exist; Average = Sufficient for more than 24 hours but less than 72 hours; High = Guaranteed to cover at least 72 hours.*

73. Condition and safety of above-ground fuel tanks and/or cylinders

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

The fuels used for the generators, hospital boilers and other services may differ, so it is important that all fuel tanks are very clearly labelled and, where possible, stored in different areas. In earthquake-prone zones and high-wind areas, it is important that fuel tanks are well-anchored to prevent them from tipping. Evaluators should visit the fuel tanks and cylinders to determine the safety and security of the installations and the tanks/cylinders, and should verify that the tanks/cylinders are safe and secure from hazards (e.g. anchors, banded enclosures, safe from fire). Fuel tanks should be located at least 2 m away from power lines and from combustible elements such as weeds or dry grass, in a radius of at least 3 metres. If tanks are located in publicly accessible places, they must be protected by a security gate with a lock or padlock.

Where tanks/cylinders are supported by concrete or brick walls, the walls should be checked for cracks and the braces or anchors checked for signs of sinking or general deterioration. Large horizontal tanks can slide and break connection hoses, so in seismic areas they should be supported with clamps or flexible connections. Evaluators should check that there are appropriate isolation valves to ensure that fuel tanks can be isolated in the event of damaged pipework.

It is important to keep in mind that the heavier the tank/cylinder and the higher its centre of gravity, the greater is the likelihood that it will tip over. Cylinders positioned vertically should be anchored/supported in at least three directions.

Visual inspection can be supplemented by information from maintenance and inspection records. (References: 7, 19).

IF THERE IS NO FUEL TANK, LEAVE BOXES BLANK AND PROVIDE COMMENT.

Safety ratings for item No. 73: *Low = Tanks are in poor condition; there are no anchors or tank enclosure; tanks are not safely located with respect to hazards; Average = Tanks are in fair condition, anchors and bracing are inadequate for major hazards; tank enclosure has some safety and security measures; High = Tanks are in good condition; anchors and bracing are in good condition for major hazards; the tank enclosure has adequate safety and security.*

74. Safe location of fuel storage away from hospital buildings

Recommended evaluation methods: observation and inspection.

Evaluators should verify that the tanks containing combustible liquids are accessible clearly marked and labelled and are a safe distance from key clinical and nonclinical facilities (e.g. high dependency unit, theatre areas, electrical plant, boilers, kitchens) in the event of fire or damage. Where tanks are enclosed, the enclosure should be built of noncombustible materials and should be well-ventilated, well-marked and well-illuminated, behind secure fencing, under surveillance (where possible), and should have a security alarm. At the same time, they should be easily accessible for maintenance and so that fire response personnel to deal with any potential emergencies.

Fuel tank storage areas should have good drainage and should be in locations that are not prone to flooding, landslides or soil liquefaction. In the case of strong winds, they should be protected from flying objects. Fuel stores should be sheltered from construction and any other activities that could potentially cause damage them. In addition to reviewing the site, evaluators should check that the fire protection equipment associated with the fuel storage is functional. (References: 7, 19).

IF THERE IS NO FUEL TANK, LEAVE BOXES BLANK AND PROVIDE COMMENT.

Safety ratings for item No. 74: *Low = Fuel storage is not accessible and is not located in a secure site; Average = Site in fair condition and in fair location in relation to hazards; some measures provide partial protection; High = In good condition and good location, well-secured and other protection measures in place; fuel tanks are accessible.*

75. Condition and safety of the fuel distribution system (valves, hoses, connections)

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

Fuel leaks are extremely dangerous and it is important to control them carefully. This implies correct performance of all valves, hoses and connections. Evaluators should ensure that connections are flexible where they are attached to equipment and where they cross structural elements. However, connections joined to structural elements should be rigid, assuming there is no possibility of settling.

Visual inspection can be supplemented by information from maintenance and inspection records.

IF THERE IS NO FUEL DISTRIBUTION TANK, LEAVE BOXES BLANK AND PROVIDE COMMENT.

Safety ratings for item No. 75: *Low = Less than 60% of the system is in safe operational condition; Average = between 60% and 90% of the system is in good operational condition and has automatic shut-off valves; High = More than 90% of the system is in good operational condition and has automatic shut-off valves.*

76. Emergency maintenance and restoration of fuel reserves

Recommended evaluation methods: interview and review of documentation (plans and records).

The maintenance division should provide the operations manual and preventive maintenance records for fuel supplies. Evaluators should verify that there are emergency procedures for the maintenance of fuel supply systems. Evaluators should also verify that personnel have been trained to an appropriate standard to maintain the correct level of safety, quantity of the fuel supplies and alternate sources to the hospital in both routine and emergency/disaster situations.

Safety ratings for item No. 76: *Low = Documented procedures and maintenance/inspection records do not exist; Average = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, but resources are not available; High = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, and resources are in place for implementing emergency maintenance and restoration.*

3.3.7 Medical gases systems

Section 3.3.7 consists of 6 items (77–82).

77. Location of storage areas for medical gases

Recommended evaluation methods: observation and inspection.

Oxygen supply banks, as well as storage tanks of medical gases, should be located outside the hospital building because of the risk of tank discharge and explosion. Evaluators should verify that there is a site designated solely for storage of tanks and/or cylinders and related equipment for medical gases, and that only this equipment occupies the designated area. These areas should be well-ventilated, well-illuminated and clearly marked and labelled. There should be secure enclosure around the site, with signage indicating that the gases and equipment are dangerous. The location should be in an area unlikely to flood, at a distance from any heat sources, and protected from flying or falling debris. The site should be easily accessible for facilities, maintenance and fire response personnel. (References: 2, 7).

Safety ratings for item No. 77: *Low = No sites reserved for medical gases, or sites for medical gases are at high risk of failure due to hazards; there are no protective measures, and storage is not accessible; Average = Reserved areas in fair condition and fair location; some measures provide partial protection; High = In good condition, well-secured and other protective measures are in place; storage is accessible.*

78. Safety of storage areas for medical gas tanks and/or cylinders

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

Evaluators should visit areas where medical gas bottles, tanks and cylinders are stored to verify that they are safe and secure and that they are prevented from falling over and protected from hazards (e.g. obstacles, fire, anchors, braces). The size of the storage areas must also be adequate for the correct handling of bottles, tanks and cylinders from deliveries. Each cylinder containing gas must have permanent marks that show whether it has pure gas or a mix of gases inside. Storage areas should also show the types of risks and safety measures to be taken, so that the necessary control actions are applied when manipulating the cylinders. The cylinders should not be painted.

In earthquake-prone zones and high-wind areas, medical gas tanks in storage areas should be well-braced or anchored. If these tanks or cylinders are stored in undesignated parts of the hospital, such as corridors, the rating should be "low". Evaluators should ascertain that the personnel responsible for managing medical gases know all safety procedures and isolation requirements for each type of gas being used. Fire extinguishing equipment must be available, and personnel must be trained in its use.

Visual inspection can be supplemented by information from maintenance and inspection records. (Reference: 7).

Safety ratings for item No. 78: *Low = Medical gas tanks and cylinders in storage areas are poor condition; no protection measures, not secured; personnel are not trained to operate medical gas and fire extinguishing equipment; Average = Medical gas tanks and cylinders in storage areas are in fair condition, some measures provide partial protection; the quality of anchors and braces is inadequate; personnel are trained to operate equipment; High = Good condition, well-secured and protected, anchors are of good quality for major hazards; medical gas and fire extinguishing equipment operated by qualified personnel.*

79. Condition and safety of medical gas distribution system (e.g. valves, pipes, connections)

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

Evaluators should verify that storage devices and distribution networks use colour-coding and labelling to identify different types of medical gases. In addition to different colours, the bottles or cylinders for each type of gas use different valve configurations, eliminating the hazard of connecting the wrong type of gas to the supply.

The major danger if gas tanks fall is that the valves will break and there will be an uncontrolled flow of pressurized gases escaping into atmosphere with dangerous consequences. Evaluators should inspect the operation of the retaining valves in the cylinder banks, outage valves and intake points; they should ensure that couplings are flexible, and there is enough play to tolerate small movement, but that tanks cannot fall or knock against each other while they are connected to the supply bank. Tubing should be protected and correctly anchored to structural elements. Flexible couplings should be used where tubing crosses structural joints. It is important to examine the network for leaks. It will be necessary to check the alarm system, the capacity of operators and the maintenance system, as documented in the maintenance log-book and records.

Visual inspection can be supplemented by information from maintenance and inspection records. (Reference: 7).

Safety ratings for item No. 79: *Low = Less than 60% of the system is in good working condition; Average = Between 60% and 80% of the system is in good working condition; High = More than 80% of the system is in good working condition.*

80. Condition and safety of medical gas cylinders and related equipment in the hospital

Recommended evaluation methods: interview, observation, review of documentation (plans and records), and inspection.

Gas bottles, tanks and cylinders are usually located in the service areas where they are used. They contain a variety of gases that are under high pressure; some are toxic, others are flammable. In general, the gas containers should be well-ventilated, braced or anchored to avoid damage to their valves if they fall, and to avoid injuring patients and staff or damaging other equipment. Each oxygen outlet should have a valve that can close the supply. Quick access to the premises is necessary and the location of the keys should be clearly marked for authorized personnel to use.

In earthquake-prone zones and high-wind areas, vertical oxygen tanks should be anchored in three or four directions with welded connections, bolts or evenly spaced tie-downs; horizontal tanks should be anchored to walls so they cannot slide as a result of shaking during seismic events. Medical gas distribution pipes should have flexible connections when passing from building to building or across expansion/seismic joints in earthquake-prone regions.

Visual inspection can be supplemented by information from maintenance and inspection records. (Reference: 7).

Safety ratings for item No. 80: *Low = Medical gas tanks and cylinders in hospital areas are in poor condition, no protective measures; not secured; Average = Medical gas tanks and cylinders are in fair condition; the quality of anchors and braces is inadequate; some measures provide partial protection; High = Good condition, well-secured and protected; anchors are of good quality for major hazards.*

81. Availability of alternative sources of medical gases

Recommended evaluation methods: interview, review of documentation (plans and records), and inspection.

Evaluators should verify that alternative or standby sources for medical gases have an oxygen supply bank with the necessary reserve capacity and have reserve cylinders or bottles available. It should also be confirmed whether the supplier of medical gases is in the vicinity and has reserves available to enable an appropriate supply chain in an emergency. Evaluators can obtain this information through supplier contract details and organizational policies and procedures.

Safety ratings for item No. 81: *Low = Alternative sources are not available; Average = Alternative sources in place but delivery of supplies takes longer than 15 days; High = Sufficient alternative sources are available at short notice (less than 15 days).*

82. Emergency maintenance and restoration of medical gas systems

Recommended evaluation methods: interview and review of documentation (plans and records),.

The maintenance division should provide the operations manual and preventive maintenance records for the medical gas system. Evaluators should verify that there are emergency procedures for maintaining the medical gas system in emergency/disaster situations. Evaluators should check that personnel have been trained to an appropriate standard to maintain the correct level of safety of the hospital's medical gas systems in both routine and emergency/disaster situations.

Safety Ratings for item No. 82: *Low = Documented procedures and maintenance/inspection records do not exist; Average = Documented procedures exist, maintenance/inspection records are up to date, and personnel have been trained, but resources are not available; High = Procedures exist, maintenance/inspection records are up to date, personnel have been trained, and resources are in place for implementing emergency maintenance and restoration.*

3.3.8 Heating, ventilation, and air-conditioning (HVAC) systems

Section 3.3.8 consists of 8 items (83–90).

83. Adequate location of enclosures for HVAC equipment

Recommended evaluation methods: observation and inspection.

Enclosures for boilers should be located away from the hospital building. Preferably, they should be housed in installations with some roof cover, isolated from fuel storage, in areas that are easy to access and difficult to obstruct or flood. When central air-conditioning units are on the roof of buildings they should be protected from the weather. Any HVAC equipment should be easy to access (obstacles to access should be cleared) and positioned in locations that are protected from flooding. (References: 2, 7, 17, 19).

Safety ratings for item No. 83: *Low = HVAC enclosures are not accessible and they are not located in a safe site; there are no protective measures; Average = HVAC enclosures are accessible, located at a safe site; some measures provide partial protection from hazards; High = HVAC enclosures are accessible, in a safe location and protected from hazards.*

84. Safety of enclosures for HVAC equipment

Recommended evaluation methods: interview, observation and inspection.

Evaluators should confirm that enclosures for HVAC equipment are always accessible and are large enough to allow the operators to work comfortably on the equipment. Extractors for steam should ventilate the boiler room. Evaluators should confirm that lighting is adequate to see the controls and that there is adequate drainage for run-off of water. The control panel should be steam-proof and protected from the temperature of the boiler. The enclosure should be equipped with fire-extinguishing equipment and alternate emergency lighting.

The following information should be clearly marked in the boiler room:

- instructions for stopping the system with emergency alarms and quick-cut mechanisms;
- name, telephone number and address of the person or entity responsible for building maintenance;
- address and telephone number of the nearest fire station and the person responsible for the building;
- location of the fire extinguisher in the room and signs to other fire extinguishers;
- signs to the fire exits;
- a map of the emergency exit route. (References: 7, 19).

Safety ratings for item No. 84: *Low = HVAC equipment is not accessible; no protective measures for safe operation and maintenance; Average = HVAC is accessible; some measures provide partial protection; High = HVAC equipment is accessible, wide range of protection measures in place.*

85. Safety and operating condition of HVAC equipment (e.g. boiler, exhaust)

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

Key areas of the hospital are dependent on the proper operation of HVAC equipment. These areas include the kitchen, sterilization centre, refrigerators, medicine storage, laundry, operating rooms and intensive care unit.

Boilers and other HVAC equipment can pose major risks in disasters. They can tip over due to seismic shaking, breaking the water pipes and causing flooding. The water supply for the fire-extinguishing system can be put at risk when water connections are broken. In earthquake-prone areas, all pipes should have flexible connections. Fire danger increases if cables or gas hoses are cut or liquid fuel spills. Evaluators should confirm that the boiler is anchored to the foundation. Individual hot-water heaters should be connected at the top and bottom to a solid wall. Solar heaters are usually located on roofs and are vulnerable to strong winds as well as seismic forces. Evaluators should confirm that these elements are well-fastened to the roofing structure.

The evaluator should make a basic inspection of the condition of the controls and the exterior appearance of the boiler, and should review laboratory analysis of the water and check operation of the equipment alarm. The hospital should have at least two boilers so that, if one is undergoing maintenance or fails, the other will function. Untreated water used in boilers can cause deterioration, so a water softener should be used. Deposits of scale will be evident if the water softener is not adequate; these deposits lessen efficiency and corrode the metal. The most common failures in this equipment occur because of the controls. If overheating or pressure variations coincide with the failure of a safety valve, there can be an explosion. Evaluators should see that extractors function correctly to eliminate steam from boiler rooms, from the kitchen and from operating rooms.

Evaluators should ask if the operator has a copy of the operation and maintenance manual (for daily cleaning) and how often preventive maintenance is carried out by specialists. (References: 7, 19).

Safety ratings for item No. 85: *Low = HVAC equipment in poor condition, not maintained; Average = HVAC equipment in fair condition; some measures provide partial protection, but no regular maintenance; High = Good condition, well-secured and protected from hazards (e.g. anchors are of good quality); regular maintenance and testing of controls and alarms conducted.*

86. Adequate supports for ducts and review of flexibility of ducts and piping that cross expansion joints

Recommended evaluation methods: observation and inspection.

All heating, ventilation and air-conditioning (HVAC) ductwork pipes should be in good condition and must be supported adequately by the building structure. In earthquake-prone areas, there should be no possibility of horizontal movement. Connections should be flexible, while the bracing should be rigid but should allow ductwork to move in three directions. In areas of high winds, ductwork that crosses roofs should be anchored, and should be placed above the level of the roof's drains.

Evaluators should check the distance between supports to ensure that there are no deflections caused by the weight of the ducts, which could cause them to fall. Where internal ductwork is hidden by false

ceilings, ceiling tiles should be removed to check the ducts. Ductwork should be flexible across expansion joints. Ductwork that crosses between blocks of buildings units should be inspected to ensure that it is not damaged and corrosion has not started to occur around the ducts adjacent to each block or building. (References: 7, 17, 19).

Safety ratings for item No. 86: *Low = Supports are lacking and connections are rigid; Average = Supports are in fair condition or connections are flexible; High = Supports are in good condition and connections are flexible.*

87. Condition and safety of pipes, connections and valves

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

Pipes should travel through conduits so that they are protected from humidity and corrosion when passing through walls or fixtures or where they breach a fire compartment. Evaluators should check that valves operate and should review the condition of pipes in kitchens, boilers or other areas where there is steam to ensure that coatings or piping are protected. Evaluators should check that condensation will not affect the insulation of piping and that leaks from upper floors will not affect elements and services below. Humidity can ruin false ceilings and other hospital elements or equipment that come into contact with the piping.

Piping should have flexible connections where it crosses expansion joints of the building, and spans from building to building in earthquake-prone areas or where it is connected to a rigid piece of equipment. The pipes should be supported at a distance from electrical panels or wiring. Safety valves or air valves for steam or for hot or room-temperature water respond to seismic amplifications such as inverted pendulums, so they should have lateral supports.

Visual inspection can be supplemented by information from maintenance and inspection records.

Safety ratings for item No. 87: *Low = Less than 60% of pipes are in good condition; limited protective measures against hazards; Average = Between 60% and 80% are in good condition; some measures provide partial protection against hazards; High = Above 80% are in good condition and are well-secured and protected against hazards.*

88. Condition and safety of air-conditioning equipment

Recommended evaluation methods: observation, review of documentation (plans and records), and inspection.

Evaluators should check the condition and safety of air-conditioning units which may be local or central, compact or not. Central air-conditioning units may be compact or split with a fan coil unit. As not all air-conditioning systems can accommodate all requirements of areas with very high sanitation requirements (e.g. operating rooms, intensive care units) and other areas of the hospital, evaluators should check the physical and technical condition of the equipment, including its suitability for servicing the area where it is installed.

Air-conditioning units are very heavy and are generally located in areas with ventilation, such as on roofs, upper floors of the hospital, or floors dedicated to building machinery and equipment. Because of their weight, air-conditioning units can significantly change the behaviour of the structure. Unless they are well-secured or anchored, the units can move or overturn and, as a result, can cause partial or total collapse of the building.

Smaller split systems have the evaporator inside and the compressor and condenser outside, on the roof, patio or elsewhere. The outside equipment is vulnerable to strong winds and floods and must be well-anchored and located out of reach of water that would damage the electrical system. Indoor units should be firmly anchored to structural elements; if they should fall they could injure people or damage other equipment. The condition and safety of window units or small portable units should also be checked.

Visual inspection can be supplemented by information from maintenance and inspection records. (References: 7, 15, 19).

Safety ratings for item No. 88: *Low = Air-conditioning units in poor condition, not secured; Average = Air-conditioning units are in fair condition; some measures provide partial protection (e.g. quality of anchors and braces is inadequate); High = Good condition, well-secured and protected from hazards (e.g. anchors are of good quality).*

89. Operation of air-conditioning system (including negative pressure areas)

Recommended evaluation methods: observation and inspection.

Evaluators should check the ability of the hospital to establish zones for the air-conditioning systems to reduce the spread of infectious diseases or fire. If there are negative pressure rooms in areas of high risk for infectious diseases, evaluators should check that these zones can be isolated from the air-conditioning system. (References: 7, 19).

Safety ratings for item No. 89: *Low = Air-conditioning system has no capability for establishing zones of the hospital; Average = Air-conditioning system can establish zones, but has no capacity to separate air circulating between high-risk areas and other areas of the hospital; High = Air-conditioning system can isolate air from high-risk areas; negative pressure rooms are available.*

90. Emergency maintenance and restoration of HVAC systems

Recommended evaluation methods: interview and review of documentation (plans and records),.

The hospital's maintenance division should provide the operations manual and preventive maintenance records for the HVAC systems. Evaluators should verify that there are emergency procedures for maintaining the HVAC systems in emergency/disaster situations. Evaluators should check that personnel have been trained to an appropriate standard to maintain the correct level of safety of the hospital's HVAC systems in both routine and emergency/disaster situations.

Safety ratings for item No. 90: *Low = Documented procedures and maintenance/inspection records do not exist; Average = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, but resources are not available; High = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, and resources are in place for implementing emergency maintenance and restoration.*

3.4 Equipment and supplies

Submodule 3.4 is divided into two sections from 3.4.1 to 3.4.2 and consists of 23 items (91-111).

This is the fourth submodule on nonstructural elements. It has two sections:

3.4.1 Office and storeroom furnishings and equipment (fixed and movable)

3.4.2 Medical and laboratory equipment and supplies used for diagnosis and treatment.

All staff use a large range of equipment (medical, diagnostic and office equipment), nonclinical services and supplies to provide treatment to patients and fulfil other critical roles in the hospital. Evaluators should determine the condition, safety and stability of all equipment to protect it from damage that has the potential to cause injury to building occupants and to disrupt the functioning of the hospital services. The module also includes evaluation of the location of operating theatres to ensure they are safe from hazards, the capacity to provide ancillary services, and the availability of supplies for the continued delivery of health services. In general, but especially in hospitals prone to earthquakes and high winds, items hung on walls and above desks (clocks, pictures, televisions etc.) should not hang directly above a workstation or door, and should be well-attached or anchored to the wall. Particularly in earthquake-prone zones, filing cabinets on wheels should have chocks or should be attached to walls to keep them from sliding; filing drawers should have latches to keep them from sliding open. Evaluators should consider potential damage caused by floods, fire or strong winds: these forces can break large windows, damaging the furnishings and contents of offices and other rooms.

3.4.1 Office and storeroom furnishings and equipment (fixed and movable)

Section 3.4.1 consists of 2 items (91–92).

91. Safety of shelving and shelf contents

Recommended evaluation methods: observation and inspection.

Evaluators should verify that shelving (whether as shelving units or wall attachments) and its contents should be safely secured from falling. Shelves should not pose an occupational hazard or be at risk of falling in a hazard event. The evaluator should check that they are located where they will not obstruct emergency access, evacuation routes or emergency exits. Shelves of medical contents should all have lips or railings to prevent bottles or other material from falling.

In hospitals prone to earthquakes and high winds, evaluators should verify that shelves are anchored to the walls and/or are braced and that the contents are secured. Clinical areas, offices, libraries and clinical records archives commonly have shelving units with glass doors. These units should be connected to each other and unbreakable material should replace the glass. Where there are rows of high, free-standing shelves, these must be anchored to the floor, connected to each other at the top by ties that cross the room and attached to the wall at each end of the row of shelves. Connecting the shelves increases lateral stability, lessening the chance that they will fall. For tall shelving made of combustible material, the condition of lighting fixtures and wiring near the shelves should be inspected. (References: 2, 7, 15, 19).

Safety ratings for item No. 91: *Low = Shelving is not safely located (or in seismic and wind-prone areas not attached to walls in more than 20% of cases); Average = Shelving is safely located (and attached to walls in*

seismic and wind-prone areas) and contents are secured in 20–80% of cases; High = More than 80% of shelving and the contents of shelves are safely located, attached to walls, and contents are secured.

92. Safety of computers and printers

Recommended evaluation methods: observation and inspection.

Much of a hospital's information is found on its computers. To ensure that a facility continues to function, computers and their contents must be secured against damage caused by natural hazards.

Evaluators should verify that computer tables are secure and will not move. If tables are on wheels, the wheels should be in the locked position. Where there is raised access flooring that allows computer wiring to run under the floor, the evaluators should check anchors to the structural slab and vertical and horizontal bracing.

In hospitals which are at risk of flooding or heavy rain, computer centres and computers, particularly servers, should be located where they will not be at risk of water damage. Basements and ground-floor areas are particularly susceptible to flooding. Sprinkler systems for firefighting systems may also damage computers and other electronic equipment. (References: 15, 19).

Safety ratings for item No. 92: *Low = No measures to protect computers from hazards are in place; Average = Computers are in safe locations, some measures offer partial protection from hazards; High = Computers are in safe locations, well-secured and good protective measures in place.*

3.4.2 Medical and laboratory equipment and supplies used for diagnosis and treatment

Section 3.4.2 consists of 21 items (93–111).

93. Safety of medical equipment in operating theatres and recovery rooms

Recommended evaluation methods: observation and inspection.

Evaluators should verify that medical equipment is safely secured with respect to natural and other hazards. Operating theatres and recovery rooms should not be located where they are most vulnerable to the effects of natural hazards, including flooding, earthquakes and winds.

In hospitals in earthquake-prone zones or at risk of high winds, the evaluators should verify that lamps, equipment for anaesthesia and surgical tables are operational and that table or cart wheels are all locked, and in turn should be secured to the operating table when in use. Ceiling light fixtures in surgery should function, the hinges on the extension arm should be properly adjusted, and fixtures should be well-anchored to beams to prevent them from swinging. Braces, latches and castor brakes on all equipment should be inspected.

Life support equipment should be completely anchored, eliminating the possibility of disconnection from the patient. Flexible hoses and tubes with swivel connectors and automatic shut-off valves should be used for connecting equipment to medical gases, water or steam. Cables that connect equipment to a power source should pass through a conduit so that they cannot tangle during rotational motion. Equipment should not be placed above the patient. When not in use, equipment should be braced against a wall, with brakes applied to carts and rolling tables. (References: 2, 7, 15, 19).

Safety ratings for item No. 93: *Low = The operating theatres are in an unsafe location, equipment is lacking or in poor condition or there are no protective measures; Average = The operating theatres are in a safe location, equipment is in fair condition, and some measures provide partial protection; High = Operating theatres are in a safe location, equipment is in good condition, is well-secured and measures provide protection.*

94. Condition and safety of radiology and imaging equipment

Recommended evaluation methods: interview, observation and inspection.

Evaluators should verify that radiology and imaging equipment is safely secured with respect to natural hazards. They should be located where flooding cannot damage them. In hospitals in earthquake-prone zones or high-wind areas, evaluators should verify that the condition of X-ray equipment and carts holding the equipment is in good condition and is secured; brakes for cart wheels must be functional. Where computed axial tomography (CAT) scanners are used, evaluators should verify that they function and safety measures are in place. Operators should be familiar with all safety protocols for using the equipment. Criteria used in this item (94) can be applied to other equipment that should be anchored.

In earthquake-prone areas, adequate anchors for this heavy equipment are needed to keep it from tipping or moving. The higher the centre of gravity of these items, the greater the possibility they will tip over. Power connections and other connections should be flexible; it is better for cables to be disconnected than to break. Hospital equipment is highly sensitive to sudden changes in voltage (e.g. computed tomography scanner, mammography equipment, excimer laser, magnetic resonance imaging scanner) so evaluators should ensure that this equipment has voltage regulators and earth-grounding to protect equipment from electrical discharge. (References: 7, 15, 19).

Safety ratings for item No. 94: *Low = The radiology and imaging equipment is not in a safe location, equipment is lacking or in poor condition, or there are no protective measures; Average = The equipment is in a safe location, is in fair condition, and some measures offer partial protection; High = Equipment is in a safe location, is in good condition, well-secured and measures provide good protection.*

95. Condition and safety of laboratory equipment and supplies

Recommended evaluation methods: interview, observation and inspection.

The instructions to evaluators in items 93 and 94 should be taken in consideration when evaluating the condition and safety of laboratory equipment. When inspecting the laboratory, evaluators should pay special attention to handling and securing biological samples. Biosafety measures should be in place. If biological and chemical containers break or leak at any time, technicians, patients or the laboratory itself could be contaminated. Further safety measures may be required to protect laboratory equipment and supplies from movement or damage due to hazardous phenomena. Refrigeration units for laboratory supplies should be inspected to ensure that they are in good order and their contents are secured. In hospitals in earthquake-prone zones or high-wind areas, shelving used for storage of laboratory supplies, including biological and chemical containers, must be well-anchored (see item 93). There should be adequate fire protection items or systems (extinguishers, standpipe systems etc.) and laboratory staff must be trained in operating this equipment. (References: 7, 15, 19).

Safety ratings for item No. 95: *Low = Biosafety measures are poor, laboratory equipment is lacking or in poor condition, or there are no protective measures; Average = Biosafety measures are in place, the equipment is in fair condition, and some measures provide partial protection; High = Biosafety measures in place, equipment is in good condition, well-secured and measures provide good protection.*

96. Condition and safety of medical equipment in emergency care services unit

Recommended evaluation methods: observation and inspection.

The instructions for evaluators in items 93 and 94 should be taken into consideration when assessing the condition and safety of equipment in the emergency care services unit. Evaluators should check that this equipment – which includes crash carts, oxygen tanks, monitors etc. – is in working order and is secured. (References: 7, 15, 19).

Safety ratings for item No. 96: *Low = The medical equipment is lacking or in poor condition, or there are no protective measures; Average = The equipment is in fair condition and some measures provide partial protection; High = Equipment is in good condition, well-secured and measures provide good protection.*

97. Condition and safety of medical equipment in intensive or intermediate care unit

Recommended evaluation methods: interview, observation and inspection.

The instructions for evaluators in items 93 and 94 should be taken into account when assessing the condition and safety of equipment in the intensive care unit. Evaluators should check that basic and specialized intensive care equipment is in good working order and is well-secured. This equipment includes life-support systems, ventilators, resuscitation equipment, oxygen tanks, monitors etc. The most rigorous inspection should be carried out in the quarantine units of the hospital because of the added hazards of contamination or infection. (References: 7, 15, 19).

Safety ratings for item No. 97: *Low = The medical equipment is lacking or in poor condition, or there are no protective measures; Average = The equipment is in fair condition and some measures provide partial protection; High = Equipment is in good condition, is well-secured and measures provide good protection.*

98. Condition and safety of equipment and furnishings in the pharmacy

Recommended evaluation methods: observation and inspection.

The instructions for evaluators in items 93 and 94 should be taken into account when assessing the condition and safety of equipment in the pharmacy. Refrigeration units for medicine and other supplies should be inspected to ensure that they are in good order and their contents are secured. In hospitals in earthquake-prone zones or high-wind areas, shelving used for storage of medicines must be well-anchored (see item 93). Because some materials in the pharmacy are flammable, there should be adequate fire protection items or systems (extinguishers, standpipe systems etc.) and pharmacy staff must be trained in operating this equipment. Measures should be in place to ensure that the pharmacy is secured against theft. (References: 7, 15, 19).

Safety ratings for item No. 98: *Low = The equipment in the pharmacy is lacking or in poor condition, or there are no protective measures; Average = The equipment is in fair condition and some measures provide partial protection; High = Equipment is in good condition, is well-secured and measures provide good protection.*

99. Condition and safety of equipment and supplies in the sterilization services

Recommended evaluation methods: observation and inspection.

The instructions for evaluators in items 93 and 94 should be taken into account when assessing the condition and safety of equipment in the hospital's sterilization services (in a unit or otherwise). Evaluators should check the condition of autoclaves and should review the operator's training in managing them in cases of emergency. Water leaks originating outside the units and possible contamination of stored items are concerns in sterilization units, so evaluators should determine whether there are water filtration systems on upper floors, water outlets or, in the worst case, toilets that could contaminate stored items. Proper labelling for routing sterile and contaminated equipment should be checked. Evaluators must ensure that safety measures are being used for shelving and trolleys where sterilized materials are stored (see item 92); materials can be contaminated if shelves or trolleys tip over during a seismic event.

Autoclaves are heavy and they should be completely anchored in earthquake-prone zones. Water supply to autoclaves should have flexible connections in earthquake-prone areas. Evaluators must also ensure that fire protection items or systems are present (including extinguishers, standpipe systems etc.) and that the staff are qualified to use them. The proximity of doors and windows to the materials being sterilized should be checked, as well as the materials used for the doors and windows. (References: 7, 15, 19).

Safety ratings for item No. 99: *Low = Equipment is lacking or in poor condition, or there are no protective measures; Average = Equipment is in fair condition and some measures provide partial protection; High = Equipment is in good condition, is well-secured and measures provide good protection.*

100. Condition and safety of medical equipment for obstetric emergencies and neonatal care

Recommended evaluation methods: observation and inspection.

The instructions for evaluators in items 93 and 94 should be taken into account when assessing the condition and safety of equipment for obstetric emergencies and neonatal care. While a hospital may not have specialized services for neonatal care, evaluators should check that equipment and supplies are available for a basic level of emergency care for obstetric emergencies and neonatal care. Evaluators should check that equipment is in working order and is secured. Specific neonatal equipment includes incubators, resuscitation equipment, oxygen tanks, monitors etc. Sanitation and hygiene should be rigorously reviewed in these units, particularly in birthing rooms, because of the vulnerable condition of newborns. Doors and windows should be able to resist strong winds; if water penetrates the area, specialized equipment can be damaged or destroyed. It is difficult to transfer newborns to other areas of the hospital because of their vulnerability. (References: 7, 15, 19).

Safety ratings for item No. 100: *Low = Equipment is lacking or in poor condition, or there are no protective measures; Average = Equipment is in fair condition and some measures provide partial protection; High = Equipment is in good condition, is well-secured and measures provide good protection.*

101. Condition and safety of medical equipment and supplies for emergency care for burns

Recommended evaluation methods: observation and inspection.

The instructions for evaluators in items 93 and 94 should be taken into account when assessing the equipment for emergency care for burns. While a hospital may not have specialized services for burns patients, evaluators should check that equipment and supplies are available for a basic level of emergency care for burns. Evaluators should check that basic and/or specialized burn care equipment and supplies are in good working order and well-secured. This equipment includes life-support systems, ventilators, oxygen tanks, monitors, crash carts etc. (References: 7, 15, 19).

Safety ratings for item No. 101: *Low = Equipment is lacking, is in poor condition, or there are no protective measures; Average = Equipment is in fair condition and some measures provide partial protection; High = Equipment is in good condition, is well-secured and measures provide good protection.*

102. Condition and safety of medical equipment for nuclear medicine and radiation therapy

Recommended evaluation methods: interview, observation and inspection.

The instructions for evaluators in items 93 and 94 should be taken into account when assessing the condition and safety of equipment for nuclear medicine and radiation therapy. Evaluators should check the handling, condition and safety of samples. Supplies should be stored in areas where they cannot fall or be hit by other objects. If containers break or leak, technicians and patients could be contaminated. Further safety measures may be required to protect equipment from movement or damage due to hazardous phenomena. Drums used for radioactive waste must be in safe locations and have secure covers. It is important to verify that radiation sensors and chambers for handling samples function correctly, and that signs indicate restricted areas. As in other areas of the hospital, fire-extinguishing equipment should be checked and evaluators should verify that staff know how to operate it. (References: 7, 15, 19).

IF THE HOSPITAL DOES NOT HAVE THESE SERVICES, LEAVE BOXES BLANK AND PROVIDE COMMENT.

Safety ratings for item No. 102: *Low = Equipment is lacking, is in poor condition, or there are no protective measures; Average = Equipment is in fair condition and some measures provide partial protection; High = Equipment is in good condition, is well-secured and measures provide good protection.*

103. Condition and safety of medical equipment in other services

Recommended evaluation methods: interview, observation and inspection.

Many of the elements addressed in items 93 and 94 will be applicable in other services of the hospital not already addressed. These could include infectious disease services, cardiology, orthopaedics, paediatrics, maternity, physiotherapy etc. Evaluators should carry out a review of the remaining areas, giving the most weight to areas that would influence the overall functioning of the hospital. (References: 7, 15, 19).

Safety ratings for item No. 103: *Low = More than 30% of equipment is at risk of material or functional failure and/or equipment puts the entire service's operation at direct or indirect risk; Average = Between 10% and 30% of equipment is at risk of loss; High = Less than 10% of equipment is at risk of loss.*

104. Medicines and supplies

Recommended evaluation methods: interview, review of documentation (plans and records), and inspection.

Evaluators should verify the level of demand for medicines and supplies at planned maximum capacity of the hospital, taking into account the types of services provided by the hospital and the additional capacity required to respond to emergencies and disasters. Evaluators should check if the availability of medicines will cover this maximum demand for at least 72 hours to ensure that the hospital can sustain the provision of services in an emergency or disaster. The WHO List of Essential Drugs can be used as a reference. (Reference: 20).

Safety ratings for item No. 104: *Low = Nonexistent; Average = Supply covers less than 72 hours at maximum capacity; High = Supply guaranteed for at least 72 hours at maximum hospital capacity.*

105. Sterilized instruments and other materials

Recommended evaluation methods: interview, review of documentation (plans and records), and inspection.

Evaluators should verify the level of the demand for sterilized instruments at the hospital's maximum capacity, taking into account the types of services provided and the additional capacity required to respond to emergencies and disasters. Evaluators should check if the availability of medicines will cover this maximum demand for at least 72 hours to ensure that the hospital can sustain the provision of services in an emergency or disaster. Evaluators should confirm that the hospital has a supply of sterilized materials for use in an emergency (evaluators can check the supply prepared for the following day), and that it has the means to sterilize instruments and provide sterilized materials to cover maximum demand for at least 72 hours. (Reference: 20).

Safety ratings for item No. 105: *Low = Nonexistent; Average = Supply cover less than 72 hours at maximum capacity; High = Supply is guaranteed for at least 72 hours at maximum hospital capacity.*

106. Medical equipment specifically used in emergencies and disasters

Recommended evaluation methods: interview, review of documentation (plans and records), and inspection.

Evaluators should verify the existence and maintenance of medical equipment and instruments used in the hospital specifically in emergencies – such as endotracheal intubation kits, chest drain sets, surgical sets, neck collars, backboards and pelvic binders, infusion/transfusion sets, emergency obstetric kits, nebulizers, oxygen masks etc. Evaluators should verify the level of the demand for medical instruments at the maximum capacity of the hospital, taking into account the types of services provided and the additional capacity required to respond to emergencies and disasters. Evaluators should check that the availability of instruments will cover the maximum demand for at least 72 hours. (Reference: 20).

Safety ratings for item No. 106: *Low = Nonexistent; Average = Supply covers less than 72 hours at maximum hospital capacity; High = Supply guaranteed for at least 72 hours at maximum hospital capacity.*

107. Supply of medical gases

Recommended evaluation methods: interview, review of documentation (plans and records), and inspection.

Evaluators should verify the level of demand for medical gases at the maximum capacity of the hospital, taking into account the types of services provided by the hospital and the additional capacity required to respond to emergencies and disasters. They should also check that the availability of medical gases will cover maximum demand for at least 15 days to ensure that the hospital can provide services in emergencies. Evaluators should check the reserve capacity of each type of medical gas used in the hospital, taking into account both the central supply bank and the cylinders or bottles in areas of service. The 15-day supply standard is used because large quantities of medical gases are required and deliveries of these gases tend to be infrequent. Evaluators should verify the existence of up-to-date emergency contact details (e.g. telephone numbers, addresses) of medical gas suppliers. It is also important to confirm the frequency of deliveries of gases.

Safety ratings for item No. 107: *Low = Less than 10 days' supply; Average = Supply for between 10 and 15 days; High = Supply for at least 15 days.*

108. Mechanical volume ventilators

Recommended evaluation methods: interview, review of documentation (plans and records), and inspection.

Evaluators should verify that an inventory of the quantity, condition and protocols for use of this equipment is available (usually from the Hospital Emergency/Disaster Committee). Evaluators should verify the level of demand for mechanical volume ventilators at the maximum capacity of the hospital, taking into account the types of services provided by the hospital and the additional capacity required to respond to emergencies and disasters. Evaluators should check that the ventilators available will cover this maximum demand for at least 72 hours to ensure that the hospital can sustain the provision of services in an emergency or disaster.

Safety ratings for item No. 108: *Low = Nonexistent; Average = Supply covers less than 72 hours at maximum hospital capacity; High = Supply guaranteed for at least 72 hours at maximum hospital capacity.*

109. Electromedical equipment

Recommended evaluation methods: interview, review of documentation (plans and records), and inspection.

Evaluators should verify that an inventory of the quantity, conditions and protocols for use of electromedical or clinical engineering equipment is available (usually from the Hospital Emergency/Disaster Committee). Evaluators should verify the level of demand for electromedical equipment (e.g. portable electrocardiographs, blood gas monitors, surgical cautery equipment, syringe pumps, ultrasound machines) at the maximum capacity of the hospital, taking into account the types of services provided by the hospital and the additional capacity required to respond to emergencies and disasters. Evaluators should check that the availability of electromedical equipment will cover this maximum demand for at least 72 hours to ensure that the hospital can sustain the provision of services in an emergency or disaster.

Safety ratings for item No. 109: *Low = Nonexistent; Average = Supply covers less than 72 hours at maximum hospital capacity; High = Supply guaranteed for at least 72 hours at maximum hospital capacity.*

110. Life-support equipment

Recommended evaluation methods: interview, review of documentation (plans and records), and inspection.

Evaluators should verify that an inventory of the quantity, condition and protocols for the use of this equipment (e.g. defibrillators, ventilators) is available (usually from the Hospital Emergency/Disaster Committee). Evaluators should verify the level of the demand for life-support equipment at the maximum capacity of the hospital, taking into account the types of services provided by the hospital and the additional capacity required to respond to emergencies and disasters. Evaluators should check that the availability of life-support equipment will cover this maximum demand for at least 72 hours to ensure that the hospital can sustain the provision of services in an emergency or disaster.

Safety ratings for item No. 110: *Low = Nonexistent; Average = Supply covers less than 72 hours at maximum hospital capacity; High = Supply guaranteed for at least 72 hours at maximum hospital capacity.*

111. Supplies, equipment or crash carts for cardiopulmonary arrest

Recommended evaluation methods: interview, review of documentation (plans and records), and inspection.

Evaluators should verify that an inventory of the quantity, condition, locations and protocols for the use of this equipment and of supplies for managing cardiopulmonary arrest is available (usually from the Hospital Emergency/Disaster Committee). Evaluators should verify the level of the demand for cardiopulmonary arrest at the maximum capacity of the hospital, taking into account the types of services provided by the hospital and the additional capacity required to respond to the most likely emergencies and disasters. Evaluators should check that the availability of these supplies and equipment will cover this planned maximum capacity for at least 72 hours to ensure that the hospital can sustain the provision of services in an emergency or a disaster.

Safety ratings for item No. 111: *Low = Nonexistent; Average = Supplies and equipment for cardiopulmonary emergencies (or crash carts) in good condition but cover less than 72 hours at maximum hospital capacity; High = Supplies and equipment for cardiopulmonary emergencies (or crash carts) guaranteed in good condition and adequate supplies for at least 72 hours at maximum hospital capacity.*

References for Module 3: Nonstructural safety

Note: Although not specifically listed here, it is recommended that evaluators always refer to applicable national and local standards and building codes related to Module 3: Nonstructural safety when evaluating a facility.

1. Código Técnico de la Edificación. Partes I y II. Madrid: Instituto Nacional de la Vivienda de España; 2006.
2. Hospitales Seguros: sistematización de experiencias en la Republica Dominicana. Washington (DC): Organización Panamericana de la Salud (Pan American Health Organization); 2013.
3. Risk management series. Design guide for improving hospital safety in earthquakes, floods, and high winds. Washington (DC): Federal Emergency Management Agency; 2007 (http://www.fema.gov/media-library-data/20130726-1609-20490-1678/fema577.pdf, accessed 22 August 2014).
4. Reducing the risks of nonstructural earthquake damage – a practical guide. Washington (DC): Federal Emergency Management Agency; 2011.
5. Guidelines for design and construction of hospital and health care facilities. Washington (DC): The American Institute of Architects Press; 1997.
6. NFPA 101: Life safety code. Quincy (MA): National Fire Protection Association; 2006.
7. NFPA 99: Health care facilities code. Quincy (MA): National Fire Protection Association; 2012a.
8. NFPA 5000: Building construction and safety code. Quincy (MA): National Fire Protection Association; 2012b.
9. NFPA 10: Standards for portable fire extinguishers. Quincy (MA): National Fire Protection Association; 2013a.
10. NFPA 13: Standard for the installation of sprinkler systems. Quincy (MA): National Fire Protection Association; 2013b.
11. NFPA 80: Standard for fire doors and other opening protectives. Quincy (MA): National Fire Protection Association; 2013c.
12. 2012 International Building Code. Washington (DC): International Code Council; 2012.
13. Eurocodes: building the future. (The European Commission website on Eurocodes) (http://eurocodes.jrc.ec.europa.eu, accessed 22 August 2014).
14. American Institute of Steel Construction (website) (https://www.aisc.org, accessed 22 August 2014).
15. Minimum design loads for buildings and other structures: ASCE Standard ASCE/SEI 7-10. Reston (VA): American Society of Civil Engineers; 2010.
16. ASME A17.1-2007/CSA B44-07: Safety code for elevators and escalators (ANSI A17: Código de Seguridad Standard Nacional Americano para Ascensores y Escaleras Mecánicas). New York (NY): American Society of Mechanical Engineers; 2007.

17. Guidelines for design and construction of hospitals and outpatient facilities. Dallas (TX): Facility Guidelines Institute; 2014.

18. ASTM International – Standards Worldwide. American Society for Testing Materials; 2014.

19. Neufert E. Arte de proyectar en arquitectura (end edition). Barcelona: Galaxia Gutemberg; 2010.

20. The interagency emergency health kit 2011: medicines and medical devices for 10 000 people for approximately three months. Geneva: World Health Organization; 2011.

21. Rodgers J, Cedillos V, Kumar H, Tobin LT, Yawitz K. Reducing earthquake risk in hospitals – from equipment, contents, architectural elements and building utility systems. New Delhi: GeoHazards International and GeoHazards Society; 2009.

22. Wagenaar C, editor. The architecture of hospitals. Rotterdam: NAi Publishers; 2006.

23. Guidelines for safe disposal of unwanted pharmaceuticals in and after emergencies. Geneva: World Health Organization; 1999.

Module 4: Emergency and disaster management

This module considers the level of the preparedness of a hospital's organization and personnel, and of its essential operations to provide patient services in response to an emergency or disaster. While it is recommended that all hospitals should have an emergency and disaster risk management programme that addresses risk assessment, hazard and vulnerability reduction, preparedness, response and recovery, the focus of this particular module of the Hospital Safety Index is the readiness of the hospital to respond to emergencies and disasters. The hospital's emergency and disaster risk management programme should be supported by relevant hospital and health-sector policies or directives which give the necessary authority for the Hospital Emergency/Disaster Committee and the designated emergency management coordinator to plan, coordinate and implement the hospital's emergency and disaster risk management programme. The emergency and disaster risk management programme should also be linked to other relevant hospital policies and programmes such as those for hospital corporate risk management and hospital business continuity management.

Evaluation objectives for this module are to determine:

- what organizational, personnel and operational aspects of the hospital should be considered for emergency and disaster management;
- what plans and capacities are available to enable the hospital to be ready to respond effectively to major emergencies and disasters, and to manage mass casualties;
- the relevant responses, ratings and score for this module of the Hospital Safety Index.

Prior to an evaluation, it is advisable for a hospital to conduct a self-evaluation using the Safe Hospitals Checklist.

This module has 7 submodules, as follows:

4.1 Coordination of emergency and disaster management activities

4.2 Hospital emergency and disaster response and recovery planning

4.3 Communication and information management

4.4 Human resources

4.5 Logistics and finance

4.6 Patient care and support services

4.7 Evacuation, decontamination and security

This module consists of the following 40 items:

112. Hospital emergency/disaster committee

113. Committee member responsibilities and training

114. Designated emergency and disaster management coordinator

115. Preparedness programme for strengthening emergency and disaster response and recovery

116. Hospital incident management system
117. Emergency Operations Centre (EOC)
118. Coordination mechanisms and cooperative arrangements with local emergency/disaster management agencies
119. Coordination mechanisms and cooperative arrangements with the health-care network
120. Hospital emergency or disaster response plan
121. Hospital hazard-specific subplans
122. Procedures to activate and deactivate plans
123. Emergency and disaster response plan exercises, evaluation and corrective actions
124. Hospital recovery plan
125. Emergency internal and external communication
126. External stakeholder directory
127. Procedures for communicating with the public and media
128. Management of patient information
129. Staff contact list
130. Staff availability
131. Mobilization and recruitment of personnel during an emergency or disaster
132. Duties assigned to personnel for emergency or disaster response and recovery
133. Well-being of hospital personnel during an emergency or disaster
134. Agreements with local suppliers and vendors for emergencies and disasters
135. Transportation during an emergency
136. Food and drinking-water during an emergency
137. Financial resources for emergencies and disasters
138. Continuity of emergency and critical care services
139. Continuity of essential clinical support services
140. Expansion of usable space for mass casualty incidents
141. Triage for major emergencies and disasters
142. Triage tags and other logistical supplies for mass casualty incidents
143. System for referral, transfer and reception of patients
144. Infection surveillance, prevention and control procedures
145. Psychosocial services
146. Post-mortem procedures in a mass fatality incident

147. Evacuation plan

148. Decontamination for chemical and radiological hazards

149. Personal protection equipment and isolation for infectious diseases and epidemics

150. Emergency security procedures

151. Computer system network security

Evaluators should refer to Module 1 for an assessment of the hazards or events for which the hospital should be prepared to provide an emergency or disaster response. Note that the range of events may extend beyond those hazards which could directly affect the safety of the hospital. For instance, the hospital may need to be prepared to receive and treat patients in response to a flood when the hospital is not affected or damaged by the flood itself. The hospital should also be prepared to respond to internal hazards, such as hospital building fires, critical system failure (e.g. water, power) and security threats which can affect the safety of the building, patients, visitors and staff, and the functioning of the hospital. Evaluators should use their knowledge and expertise to assess the preparedness of the hospital to respond to emergencies and disasters.

It is recommended that evaluators should always refer to applicable national and local standards and codes related to hospital emergency and disaster management when evaluating a facility. Further references for Module 4 are listed at the end of this module. Where appropriate, items include guidance regarding recommended evaluation methods – interview, observation, review of documentation, and inspection.

4.1 Coordination of emergency and disaster management activities

Submodule 4.1 consists of 8 items (112–119).

Submodule 4.1 assesses the hospital organization and the capacity of key hospital personnel required for effective coordination of hospital emergency and disaster management, with a focus on preparedness and response.

The Hospital Emergency/Disaster Committee, sometimes known as the Hospital Emergency/Disaster Management Committee or Emergency/Disaster Risk Management Committee, should be established as a multidepartmental and multidisciplinary entity. The committee has an overall organizational leadership and coordination role over the emergency and disaster management functions of the hospital, and with health, emergency management and other actors at local and national levels. The Hospital Emergency/Disaster Committee defines the levels of authority, roles and responsibilities within a hospital so that activities and services are in line with the hospital's overall goals and roles in the health-care system and in local or national emergency and disaster management arrangements. Committee membership is drawn from different hospital departments and aims to promote collaboration and improve efficiency and effectiveness of communications throughout the hospital before, during and after emergencies and disasters. While not the focus of this assessment, the Hospital Emergency/Disaster Committee may also have responsibility for conducting risk assessments (including safety assessments), providing oversight of measures to reduce hazards and vulnerability, and improving the overall safety and security of the health facility. The committee may have responsibility for assigning, and providing direction to, a staff member to carry out the day-to-day responsibilities for coordinating the emergency and disaster management activities, particularly for strengthening the preparedness of the hospital.

112. Hospital Emergency/Disaster Committee

Recommended evaluation methods: interview and review of documentation (including terms of reference).

Evaluators should verify that a committee has been formally established (with policy directives) to coordinate hospital emergency response and recovery operations. Responsibility would also include coordination of preparedness measures to develop the readiness of the hospital for response and recovery. Evaluators should verify that the hospital positions on the Hospital Emergency/Disaster Committee are occupied by senior personnel from different and key hospital departments/disciplines (e.g. hospital director, director of administration, chief of nursing, medical director, chief of surgery, chief of laboratory services, chief of maintenance, chief of emergency services, chief of transportation, chief of security and chief of support services). The leadership and commitment of senior executives provides critical support for emergency and disaster management, including for preparedness, response and recovery.

Evaluators should obtain a copy of the committee's terms of reference and verify that the list of members corresponds to current personnel. Evaluators should determine if the committee functions effectively by meeting on a regular basis and taking action to fulfill its responsibilities via effective leadership and coordination.

Safety ratings for item No. 112: *Low = Committee does not exist, or 1–3 departments or disciplines represented; Average = Committee exists with 4–5 departments or disciplines represented, but is not fulfilling functions effectively; High = Committee exists with 6 or more departments or disciplines represented and is fulfilling functions effectively.*

113. Committee member responsibilities and training

Recommended evaluation methods: interview and review of documentation.

Evaluators should determine whether committee members are fulfilling their collective and individual responsibilities regarding emergency and disaster management (i.e. in preparedness, response and recovery operations). Members should have participated in internal or external training courses that enable them to understand the role of the committee with respect to hospital emergency and disaster management and their individual roles. Evaluators should look for evidence of active participation by members in coordination meetings, joint assessments, planning and implementation of activities in preparedness, response and recovery.

Safety ratings for item No. 113: *Low = Committee does not exist or members are untrained and responsibilities not assigned; Average = Members have received training and have been officially assigned; High = All members are trained and are actively fulfilling their roles and responsibilities.*

114. Designated emergency and disaster management coordinator

Recommended evaluation methods: interview and review of documentation (including terms of reference).

Evaluators should verify whether a staff member has been designated as the hospital emergency/disaster management coordinator, and how much of that person's time is devoted to emergency and disaster management. Evaluators should check whether emergency and disaster management is the person's main

responsibility. If this responsibility is assigned to a staff member but it is not his/her main task, there is a risk that emergency management responsibilities (e.g. with regard to preparedness, response and recovery) will not be given enough time or financial and human resources to enable it to be implemented.

Safety ratings for item No. 114: *Low = There is no staff member who has been assigned responsibilities as the emergency/disaster management coordinator; Average = Emergency/disaster management coordination tasks have been assigned to a staff member, but it is not his/her main task; High = A staff member is assigned the emergency and disaster management coordination responsibilities as his/her main task, and is fulfilling the role of implementing the hospital's preparedness programme.*

115. Preparedness programme for strengthening emergency and disaster response and recovery

Recommended evaluation methods: interview and review of documentation (including action plan and activity report).

Evaluators should verify that the Hospital Emergency/Disaster Committee has a programme or action plan to strengthen the preparedness of the hospital for response and recovery to emergencies and disasters. The preparedness activities should by supported by a budget and included as part of the annual work programme of the hospital. Evaluators should determine if preparedness activities are being implemented in accordance with the programme or action plan. Actions to strengthen preparedness may be included alongside measures to address facility risk assessment, hazard prevention and vulnerability reduction as part of an overall risk management programme.

Safety ratings for item No. 115: *Low = A programme for strengthening preparedness, response and recovery does not exist or, if it exists, no preparedness activities are being implemented; Average = A programme for strengthening preparedness, response and recovery exists and some activities are being implemented; High = A programme for strengthening preparedness, response and recovery is being fully implemented under the leadership of the Hospital Emergency/Disaster Committee.*

116. Hospital incident management system

Recommended evaluation methods: interview and review of documentation (including plans and reports).

Evaluators should verify if there are any incident management arrangements for the command, control and coordination of the different hospital departments in hospital emergency and disaster response. This also includes coordination with external agencies to support local and hospital emergency response. Evaluators should consider the availability of a hospital incident management structure with proper identification of key personnel and corresponding job action sheets (JAS), properly trained coordination staff, and plans for activation, development of incident action plans, intelligence-gathering, monitoring of response, briefing/debriefing and demobilization. Procedures should have been tested as part of a full-scale exercise or separately as a command post functional exercise at least annually.

Safety ratings for item No. 116: *Low = No arrangements for hospital incident management exist; Average = Staff assigned to key hospital incident management positions but with no written procedures to operationalize its functions; High = Hospital incident management procedures exist and are fully operational with properly trained personnel to assume different coordination roles and responsibilities.*

117. Emergency Operations Centre (EOC)

Recommended evaluation methods: interview, review of documentation (plans and records) and inspection.

Evaluators should verify that an EOC has been designated in a safe and secure location. The EOC should already be equipped or there should be arrangements to rapidly equip a converted meeting room for immediate set-up and operation. Evaluators should determine that minimum equipment and supplies are readily available to set up the EOC for communications, information management (documentation, monitoring boards/screens), identification, security, and well-being of EOC staff. The EOC should be backed up by an information management system that supports emergency operations and that can link to data from the hospital's information management system. There should be a procedure for setting up and managing the EOC, including designation of a responsible person to set up and ensure smooth operation of the logistical aspects of the centre. There should be an alternate EOC with the same characteristics.

Safety ratings for item No. 117: *Low = The EOC is not designated or is in an unsafe or insecure location; Average = The designated EOC is in a safe, secure and accessible location, but would have limited operational capacity immediately in an emergency; High = The EOC is in a safe, secure and accessible location with immediate operational capacity.*

118. Coordination mechanisms and cooperative arrangements with local emergency/disaster management agencies

Recommended evaluation methods: interview and review of documentation (including arrangements and reports).

Evaluators should verify that formal coordination mechanisms and cooperative arrangements exist between the hospital and local emergency/disaster management agencies (e.g. local emergency management coordination committees, emergency services, civil protection, fire, police) in order to support hospital functions in time of emergency or disaster. The arrangements could include assistance with patient transfers and diversion of other incoming patients, traffic diversion, security, communications, logistics, decontamination, fire suppression etc. Arrangements should have been tested in regular exercises (at least annually).

Safety ratings for item No. 118: *Low = No arrangements exist; Average = Arrangements exist but are not fully operational; High = Arrangements exist and are fully operational.*

119. Coordination mechanisms and cooperative arrangements with the health-care network

Recommended evaluation methods: interview and review of documentation (including arrangements and reports).

Evaluators should verify that formal coordination mechanisms and cooperative arrangements exist between the hospital and local health authorities, public, private and other nongovernmental hospitals (especially neighbouring hospitals), practitioners and volunteer groups to ensure provision of essential health services in the community during times of emergency or disaster. Appropriate elements should have been tested in regular exercises.

Safety ratings for item No. 119: *Low = No arrangements exist; Average = Arrangements exist but are not fully operational; High = Arrangements exist and are fully operational.*

4.2 Hospital emergency and disaster response and recovery planning

Submodule 4.2 consists of 5 items (120–124).

This submodule evaluates the hospital's operational planning for internal and external emergency and disaster events. The purpose of the emergency and disaster planning is to identify measures that should be put into practice before, during and after an emergency or disaster so that the hospital is ready to respond and essential hospital services continue to function. The hospital's plans and procedures for emergency or disaster response should be documented and detailed in an existing hospital emergency or disaster response plan which:

- integrates the hospital response plan with the community or local response plan, and with health response plans at other levels;
- provides for cooperation with other services and institutions;
- includes referral and counter-referral of patients (to and from other facilities);
- takes into account technical and logistical support, as appropriate to the type of organization and complexity of the facility.

Evaluators should ensure that hospital response and recovery planning will enable the hospital to conduct the following actions:

- Before: Anticipate events which are expected to affect the hospital and its operations, and that may require an emergency or disaster response.
- During: Activate and implement the response plan and procedures, including the hospital incident management plan.
- After: Return to normal activities and hospital operations. Evaluate the effectiveness of the preparedness measures and the response, such as with an after-action review (AAR), leading to planning for corrective actions. Plans and procedures for resuming normal function and repairing any damage should be addressed in a recovery plan which may be separate or may be part of the response plan.

120. Hospital emergency or disaster response plan

Recommended evaluation methods: interview and review of documentation (plans).

Evaluators should verify that the hospital has a documented, routinely reviewed and updated all-hazards emergency or disaster response plan that defines actions to be taken in anticipation of, during and after any type of emergency or disaster to which the hospital is expected to respond. Evaluators should review the plan and confirm if the hospital has the necessary resources to implement it.

Evaluators should check the content of the response plan. At least the content of the all-hazards plan includes sections on the hospital incident management system, coordination, logistics, roles and responsi-

bilities of key staff and departments, human and financial resources, patient reception and management, including triage and decontamination, communication, staff welfare and security as a minimum.

Response and recovery plans should also be reviewed after exercises (see Item 123) and after a major incident. Evaluators should verify if an AAR is conducted after a major incident affecting the hospital, including identification of lessons for planning corrective action. This should be a major part of the response plan and should be included as one of the major tasks for the Hospital Emergency/Disaster Committee and staff who coordinate emergency management activities in the hospital. It may take the form of a debriefing of the hospital personnel who were involved in the incident response. The results are collated and presented to the committee for further actions, including improvement and updating of plans.

Safety ratings for item No. 120: *Low = Plan is not documented; Average = Documented plan is complete, but is not easily accessible, not up to date (more than 12 months since the last update); High = Plan is complete, easily accessible, reviewed/updated at least annually, and resources are available to implement the plan.*

121. Hospital hazard-specific subplans

Recommended evaluation methods: interview and review of documentation (plans).

Evaluators should refer to Module 1 for an assessment of hazards which may affect the hospital. Evaluators should verify that hazard-specific response subplans (sometimes called contingency plans) are established for the most likely external and internal emergency scenarios (e.g. associated with specific geological, hydrometeorological, biological, technological and societal hazards). Evaluators should review the hazard-specific subplans (e.g. flood, building fire, epidemic, airplane crash, terrorist incident) and confirm if the hospital has the necessary resources to implement the plans. When the hospital emergency response plan (see item 120) has addressed all the requirements for responding to specific hazards, then the hospital should be rated "high" for item 121.

Safety ratings for item No. 121: *Low = Hazard-specific response subplans are not documented; Average = Documented plans are complete but not easily accessible, not up to date (more than 12 months since last review/update); High = Documented plans are complete, reviewed/updated at least annually, and resources are available to implement the plans.*

122. Procedures to activate and deactivate plans

Recommended evaluation methods: interview and review of documentation (including procedures),

Evaluators should verify that there are procedures for how, when and by whom the emergency response plan, subplans and contingency plans are activated and deactivated, including triggers and early warning mechanisms. In particular, evaluators should determine :

- what type of signal is used and the criteria for activating plans for internal or external events;
- who has the responsibility for activating and deactivating the hospital's emergency or disaster response plans;
- whether hospital staff have been trained in the activation procedures;
- how often the activation procedures are tested.
- activation procedures out of office hours, at weekends and during holidays.

Activation may be triggered or requested by local authorities, the civil defence organization, emergency services, public safety agencies, a central agency responsible for health/medical emergencies, or other outside entities. These requesting entities may be able to provide information about what casualties the hospital could expect – such as the type of the event, the number of casualties, the nature of their injuries or other health effects, estimated time of arrival at the hospital etc.

Safety ratings for item No. 122: *Low = Procedures do not exist or exist only as a document; Average = Procedures exist, personnel have been trained, but procedures are not updated or tested annually; High = Up-to-date procedures exist, personnel have been trained, and procedures have been tested at least annually.*

123. Hospital emergency and disaster response plan exercises, evaluation and corrective actions

Recommended evaluation methods: interview and review of documentation (including exercise plans and reports).

Evaluators should verify that the emergency/disaster response plan (including hazard-specific subplans) is tested regularly through simulations and drills and is evaluated and amended as appropriate. Exercises of the hospital emergency/disaster response plan should be held at least annually. Exercises of hazard-specific subplans should be rotated into the annual exercise programme.

Evaluators should determine what process for the management of the exercises was followed – including development, conduct and evaluation. The process should have included a way to identify corrective actions, such as a post-exercise after action review, and to address the gaps noted in the exercise, including additional preparedness measures and training needs, and the revision of the emergency response plan.

Safety ratings for item No. 123: *Low = Response plan and subplans have not been tested; Average = Response plan or subplans are tested, but are not tested at least annually; High = Response plan or subplans are tested at least annually and updated according to the exercise results.*

124. Hospital recovery plan

Recommended evaluation methods: interview and review of documentation (plan).

Evaluators should verify that the hospital has a documented, routinely reviewed and updated all-hazards hospital recovery plan that defines actions to be taken to recover normal functions of the hospital after an emergency or disaster. In some response plans, elements of recovery may be included. The recovery plan should provide continuity of recovery and rehabilitation of patient services, the recovery needs of personnel, the replenishment of supplies and replacement of equipment, and procedures for determining priorities for assessment and rehabilitation of the hospital's structural and nonstructural elements which may have been damaged. The recovery plan, as well as the response plan, should also be linked to the business continuity plan for the hospital.

Safety ratings for item No. 124: *Low = Recovery plan is not documented; Average = Documented plan is complete but not easily accessible, not up to date (more than 12 months since last review/update); High = Documented plan is complete, easily accessible, and reviewed/updated at least annually.*

4.3 Communication and information management

Submodule 4.3 consists of 4 items (125–128).

125. Emergency internal and external communication

Recommended evaluation methods: interview, observation, review of documentation (plan and records) and inspection.

Evaluators should verify that the hospital switchboard (central service responsible for routing calls) has a functional internal and external communication system (e.g. paging, telephone service) and that switchboard operators understand emergency codes and how to use them. Evaluators should also consider back-up measures, such as use of messengers, in case primary systems fail. Both equipment and procedures should also be tested on a regular basis (at least annually).

Safety ratings for item No. 125: *Low = Central internal and external communication system functions inconsistently or incompletely; operators are not trained in emergency communication; Average = System functions appropriately, operators have received some training in emergency communication, tests are not conducted at least annually; High = System functions completely and operators are fully trained in emergency use, and tests of the system are conducted at least annually.*

126. External stakeholder directory

Recommended evaluation methods: interview, review of documentation, and inspection.

Evaluators should verify that an up-to-date directory with contact information of external stakeholders and emergency support services is available to the Hospital Emergency/Disaster Committee, EOC staff and other key hospital administration and emergency staff, including switchboard operators. An assigned staff person should be identified as responsible for maintaining and regularly updating the directory. Evaluators should check a random set of telephone numbers, focusing on external stakeholders.

Safety ratings for item No. 126: *Low = Directory of external stakeholders does not exist; Average = Directory exists but is not current (more than 3 months since it was updated); High = Directory is available, is up to date and is held by key emergency response staff.*

127. Procedures for communicating with the public and media

Recommended evaluation methods: interview and review of documentation (including procedures and reports).

Evaluators should verify that procedures are in place for communicating with the public and media in case of an emergency or disaster, and that a spokesperson(s) has been nominated for this role. Evaluators should determine if spokespersons have received specific media training and if exercises have tested this skill.

Safety ratings for item No. 127: *Low = Procedures do not exist, no spokesperson nominated; Average = Procedures exist and nominated spokespersons have been trained; High = Procedures exist, nominated spokespersons have been trained, and procedures have been tested at least annually.*

128. Management of patient information

Recommended evaluation methods: interview and review of documentation (including procedures and records).

Evaluators should check how the hospital and the response plans deal with safe storage and movement of medical and other critical patient records and should verify that procedures are in place to ensure continuity of medical record-keeping, timely access to patient data, and secure storage of confidential information. Particular attention should be paid to the security of electronic data from unauthorized access. Medical records usually have legal status and may be used in legal matters. Back-up procedures of electronic systems should be in place in case of emergencies and disasters.

Safety ratings for item No. 128: *Low = Procedures for emergency situations do not exist; Average = Procedures for emergency situations exist and personnel have been trained but no resources are available; High = Procedures for emergency situations exist, personnel have been trained, and resources are in place for implementation.*

4.4 Human resources

Submodule 4.4 consists of 5 items (129–133).

129. Staff contact list

Recommended evaluation methods: interview, review of documentation and inspection.

Evaluators should verify that an up-to-date contact list of all hospital personnel is available and is accessible to EOC staff and hospital administrators. Evaluators should check a random set of telephone numbers for accuracy.

Safety ratings for item No. 129: *Low = Contact list does not exist; Average = List exists, but is not current (more than 3 months since it was updated); High = List is available and up to date.*

130. Staff availability

Recommended evaluation methods: interview, review of documentation and inspection.

The actual staffing levels of hospitals during normal functioning may be lower than the planned staffing levels for a wide range of reasons – including funding shortages, security concerns, staff absenteeism etc. The availability of staff will have a significant bearing on the capacity of the hospital to deliver services in response to an emergency or disaster. Evaluators should determine the current workforce availability compared to service delivery requirements of all major departments (e.g. emergency medicine, surgery, internal medicine, orthopaedics, support services, security) during normal functioning (non-emergency). For example, if a department should have a staffing level of 10 staff and only 4 staff are available, the staff availability is 40%.

Safety ratings for item No. 130: *Low = Less than 50% of staff are available to run each department adequately; Average = 50–80% of staff are available; High = 80–100% of staff are available.*

131. Mobilization and recruitment of personnel during an emergency or disaster

Recommended evaluation methods: interview and review of documentation (including procedures).

Evaluators should verify that procedures are in place for the mobilization of existing on-duty and off-duty staff and recruitment and training of employable personnel and volunteers to meet surge capacity needs of high-demand clinical and support services (e.g. emergency department, surgery, intensive care units, security, managerial and administrative support). Evaluators should verify if staff emergency rosters exist and are maintained. These rosters should identify staff who are on call at all times for key roles for the immediate response to emergencies and disasters, and other staff who will be mobilized in accordance with the scale of the response. Strategies to address evening, weekend and holiday coverage, as well as necessary incentives (e.g. overtime pay), should be considered.

Safety ratings for item No. 131: *Low = Procedures do not exist or exist only in a document; Average = Procedures exist and personnel have been trained, but the human resources for an emergency situation are not available; High = Procedures exist, personnel have been trained, and the human resources are available to meet anticipated needs in an emergency.*

132. Duties assigned to personnel for emergency or disaster response and recovery

Recommended evaluation methods: interview and review of documentation (including procedures).

The emergency/disaster response plan includes specific instructions for assigning duties to existing staff and to personnel external to the hospital who are mobilized during the emergency. Evaluators should verify that all staff have, or will receive, written instructions (e.g. action card, job action sheet) and training and/or exercises on duties to be performed during an emergency.

As the turnover of staff in hospitals is rapid, a plan should also be in place to train hospital personnel continually on the emergency/disaster response plan and on their roles when it is activated. Training of staff for emergencies and disasters should also be a regular part of orientation for new staff.

Safety ratings for item No. 132: *Low = Emergency assignments do not exist or are not documented; Average = Duties are identified, some (but not all) personnel receive written assignments or training; High = Written duties are assigned, and training or an exercise is conducted for all personnel at least annually.*

133. Well-being of hospital personnel during an emergency or disaster

Recommended evaluation methods: interview, review of documentation and inspection.

Evaluators should verify if space has been designated and measures are available so hospital personnel can rest, sleep, eat, drink, observe faith-based practices and meet personal needs during an emergency.

In large-scale emergencies in which family members of staff are affected, plans should also consider what support (e.g. child care or elder care) the hospital can provide for immediate family members to encourage staff to continue working. If the hospital does not have resources for this, it should have arrangements with local social welfare groups which could consider giving priority to supporting family members of hospital staff.

Safety ratings for item No. 133: *Low = A designated space and measures do not exist; Average = Space has been designated, but measures cover less than 72 hours; High = Measures are ensured for at least 72 hours.*

4.5 Logistics and finance

Submodule 4.5 consists of 4 items (134–137).

134. Agreements with local suppliers and vendors for emergencies and disasters

Recommended evaluation methods: interview, review of documentation (including agreements and procedures) and inspection.

Evaluators should verify that agreements (e.g. memoranda of understanding, mutual aid agreements) with local suppliers, vendors and utility companies/agencies are in place to ensure procurement and delivery of essential medications, equipment and supplies during times of shortage or increased demand, as in the case of emergencies and disasters. Evaluators should ask the hospital staff if there is a list of suppliers and vendors, and if they have checked whether suppliers and vendors have arrangements in place to be operational in times of emergency. Evaluators may consider an average score if there are doubts about the operational capability of major vendors or suppliers in an emergency situation.

Safety ratings for item No. 134: *Low = No arrangements exist; Average = Arrangements exist, but are not fully operational; High = Arrangements exist and are fully operational.*

135. Transportation during an emergency

Recommended evaluation methods: observation, review of documentation (including procedures) and inspection.

Evaluators should verify that procedures are in place to ensure availability and access to ambulances and other vehicles and necessary modes of transportation for the movement of patients, staff, equipment and supplies during an emergency or disaster. Procedures should address the communications between hospitals, vehicles and personnel at the scene of the emergency, as well as coordination of patient distribution and referral. Safety and security procedures should apply to the use, storage and maintenance of vehicles. Evaluators should note that transport may be provided via land, water and air.

Safety ratings for item No. 135: *Low = Ambulances and other vehicles and modes of transportation are not available; Average = Some vehicles are available, but not in sufficient numbers for a major emergency or disaster; High = Appropriate vehicles in sufficient numbers are available during emergencies/disasters.*

136. Food and drinking-water during an emergency

Recommended evaluation methods: interview and review of documentation (including procedures).

Evaluators should verify that procedures are in place to ensure provision of food and water to patients and personnel during an emergency. Evaluators should confirm that there are measures for supplying and storing food and drinking-water during the emergency and that funds for food are included in the budget. They should consider the extra food and water requirements of hospital and ambulance staff, patients and volunteers who are mobilized for the emergency or disaster.

Safety ratings for item No. 136: *Low = Procedures for food and drinking-water for emergencies are non-existent; Average = Procedures exist, food and drinking-water is guaranteed for less than 72 hours; High = Food and drinking-water for emergencies is guaranteed for at least 72 hours.*

137. Financial resources for emergencies and disasters

Recommended evaluation methods: interview and review of documentation.

Evaluators should verify that the hospital has a specific budget and access to funds for use in the response to emergency and disaster situations, as well as for recovery.

Evaluators should confirm that:

- the budget is sufficient to implement measures outlined in the plan;
- cash is available for immediate purchases, and there is a list of suppliers that will extend credit to the hospital;
- the quantity and availability of medical equipment and supplies are known.

Hospitals should also have additional financial resources calculated annually for the overall emergency and disaster risk management programme, including preparedness measures.

Safety ratings for item No. 137: *Low = Emergency budget or mechanism to access emergency funds is not in place; Average = Funds are budgeted and mechanisms are available but cover less than 72 hours; High = Sufficient funds are guaranteed for 72 hours or more.*

4.6 Patient care and support services

Submodule 4.6 consists of 9 items (138–146).

138. Continuity of emergency and critical care services

Recommended evaluation methods: interview and review of documentation (including procedures and reports).

Evaluators should verify whether procedures exist to ensure operational continuity of emergency and critical care services on evenings, weekends and holidays (e.g. emergency room, intensive care unit, operating theatre and services) for emergency and disaster situations. Evaluators should determine whether staff have been trained in these procedures and whether resources can be mobilized at all times. Hospitals should identify in advance non-essential hospital services that can be suspended in order to maximize resources (e.g. staff, clinical support, financial) for critical services during emergencies and disasters.

Safety ratings for item No. 138: *Low = Procedures do not exist or exist only as a document; Average = Procedures exist, personnel have been trained but would not be available at all times; High = Procedures exist, personnel have been trained, and resources are available to implement procedures at maximum hospital capacity for emergency and disaster situations at all times.*

139. Continuity of essential clinical support services

Recommended evaluation methods: interview and review of documentation (including procedures and reports).

Evaluators should verify that procedures exist to ensure operational continuity of essential clinical support or ancillary services (e.g. laboratory, radiology, pharmacy) during an emergency. Evaluators should determine whether staff have been trained in these procedures and resources can be mobilized at all times.

Safety ratings for item No. 139: *Low = Procedures do not exist or exist only as a document; Average = Procedures exist and personnel have been trained but would not be available at all times; High = Procedures exist, personnel have been trained, and resources are available to implement procedures at maximum hospital capacity for emergency and disaster situations at all times.*

140. Expansion of usable space for mass casualty incidents

Recommended evaluation methods: interview, review of documentation (including procedures) and inspection.

Evaluators should verify that procedures are in place to expand space and provide access to extra beds for mass casualty incidents – i.e. when the number of patients exceeds normal capacity. Expansion areas should be identified before the event and these areas should be clearly signed. Evaluators should verify that staff have been trained, the procedures for expanding space have been tested and that adequate resources are available for implementation. Procedures for expansion of capacity should be part of hospital exercises.

Safety ratings for item No. 140: *Low = Space for expansion has not been identified; Average = Space has been identified; equipment, supplies and procedures are available to carry out the expansion and staff have been trained, but testing has not been conducted; High = Procedures exist and have been tested, personnel have been trained, and equipment, supplies and other resources are available to carry out the expansion of space.*

141. Triage for major emergencies and disasters

Recommended evaluation methods: interview, review of documentation (including procedures and reports) and inspection.

Evaluators should verify that space has been designated and personnel have been trained to carry out triage in a major emergency/disaster situation. The triage procedures for a major emergency or disaster should have been tested and there should be resources (e.g. staff, materials) available to conduct triage. In the event that chemical or radioactive materials may be present, triage should take place outside the hospital and before patients enter the emergency department.

Safety ratings for item No. 141: *Low = Designated triage location or procedures do not exist; Average = Triage location and procedures exist and personnel have been trained, but procedures have not been tested for emergency and disaster situations; High = Location and procedures exist and have been tested, personnel have been trained, and resources are in place to implement at maximum hospital capacity in emergency and disaster situations.*

142. Triage tags and other logistical supplies for mass casualty incidents

Recommended evaluation methods: interview and inspection.

A hospital emergency department requires a wide range of supplies to manage a mass casualty incident. These include triage tags, charts, vests and marking tape for triage areas. Evaluators should verify that the emergency department distributes and uses triage tags in case of mass casualties. Evaluators should

verify the level of the demand for these supplies at the maximum capacity of the hospital, taking into account the types of services provided by the hospital and the additional capacity required to respond to emergencies and disasters. Evaluators should check that the availability of these supplies will cover the planned maximum capacity for at least 72 hours to ensure that the hospital can sustain the provision of services in an emergency or disaster situation.

Safety ratings for item No. 142: *Low = Nonexistent; Average = Supply covers less than 72 hours of maximum hospital capacity; High = Supply guaranteed for at least 72 hours of maximum hospital capacity.*

143. System for referral, transfer and reception of patients

Recommended evaluation methods: interview and review of documentation (including procedures and reports).

Evaluators should verify that the hospital has documented criteria for receiving and referring patients during an emergency or disaster. The plan includes specific procedures for the transfer and reception of patients to and from other health facilities within and outside the geographical area where the hospital is located.

Safety ratings for item No. 143: *Low = Procedures do not exist or exist only as a document; Average = Procedures exist and personnel have been trained, but procedures have not been tested for emergency or disaster situations; High = Procedures exist and have been tested, personnel have been trained, and resources are available to implement measures at maximum hospital capacity in emergency or disaster situations.*

144. Infection surveillance, prevention and control procedures

Recommended evaluation methods: interview, review of documentation (including procedures and reports) and inspection.

Evaluators should verify that an infection prevention and control programme – including related policies, procedures and measures – is in place. The programme should address standard precautions, hospital-based surveillance and measures for highly infectious diseases. There should be an active programme of staff training in infection prevention and control procedures. Additional resources should include the availability of supplies for emergency situations, including epidemics and pandemics, and extra cleaning staff.

Safety ratings for item No. 144: *Low = Policies and procedures do not exist; standard precautions for infection prevention and control are not followed routinely; Average = Policies and procedures exist, standard precautions are routinely followed, personnel have been trained, but the level of resources required for emergency and disaster situations, including epidemics, is not available; High = Policies and procedures exist, infection prevention and control measures are in place, personnel have been trained, and resources are available to implement measures at maximum hospital capacity in emergency and disaster situations.*

145. Psychosocial services

Recommended evaluation methods: interview and review of documentation (including procedures).

Evaluators should verify that procedures are in place for delivery of psychosocial support, assessment and treatment services to patients, families and staff during emergency and disaster situations. Evaluators should review the corresponding plan and determine if staff have received training and if the hospital has the necessary resources to implement the plan.

Safety ratings for item No. 145: *Low = Procedures do not exist or exist only as a document; Average = Procedures exist and personnel have been trained, but the level of resources required for emergency and disaster situations is not available; High = Procedures exist, personnel have been trained, and resources are available for implementation of procedures at maximum hospital capacity in emergency and disaster situations.*

146. Post-mortem procedures in a mass fatality incident

Recommended evaluation methods: interview, review of documentation (including procedures) and inspection.

Evaluators should verify that procedures are in place for appropriate management of dead bodies, including temporary storage of cadavers, during a mass fatality incident. The procedures may include on-site or off-site arrangements to increase mortuary capacity, cold storage facilities and levels of staffing and expertise (e.g. disaster victim identification). Efforts should be made to ensure appropriate handling of the dead with particular regard for religious and cultural expectations. Mortuary staff should be trained in applying these procedures.

Safety ratings for item No. 146: *Low = Procedures for a mass fatality incident do not exist or exist only as a document; Average = Procedures exist and personnel have been trained, but the level of resources required for emergency and disaster situations is not available; High = Procedures exist, personnel have been trained, and resources are available for implementation of procedures at maximum hospital capacity in emergency and disaster situations.*

4.7 Evacuation, decontamination and security

Submodule 4.7 consists of 5 items (147–151).

147. Evacuation plan

Recommended evaluation methods: interview, review of documentation (plan) and inspection.

Evaluators should verify criteria and procedures for vertical, horizontal and partial evacuation of patients, visitors and staff to a safe location with the necessary medical, logistical and administrative support. The criteria should enable triage for evacuation of patients. Training of staff and the regularity of evacuation drills should be evaluated.

Safety ratings for item No. 147: *Low = Plan does not exist or exists only as a document; Average = Plan exists and personnel have been trained in procedures, but tests are not conducted regularly; High = Plan exists, personnel have been trained, and evacuation drills are held at least annually.*

148. Decontamination for chemical and radiological hazards

Recommended evaluation methods: interview, review of documentation and inspection.

Evaluators should verify that the hospital has the capacity for chemical and radioactive decontamination. Evaluators should check whether decontamination areas are established. Decontamination facilities enable the decontamination of patients before they enter the hospital. Hospitals that conduct decontamination inside the hospital increase the risk of contaminating the facility and hindering its operation.

Personal protective equipment should be available for immediate use by staff in emergencies involving unintentional or intentional release of chemical or radiological materials. The hospital should also identify in advance other resources that can augment hazardous material (Hazmat) decontamination and the isolation of suspected victims, such as the environmental protection agency, poison control centre, specialized Hazmat teams etc. Staff should be trained regularly (e.g. through courses or exercises) to maintain and update skills in applying personal protection and conducting decontamination of casualties.

Safety ratings for item No. 148: *Low = No personal protective equipment is available for immediate use by hospital staff, or no decontamination area exists; Average = Personal protective equipment is available for immediate use, decontamination areas are established, staff training and drills are not conducted annually; High = Personal protective equipment is available for immediate use, decontamination areas are established and personnel are trained and tested at least annually.*

149. Personal protection equipment and isolation for infectious diseases and epidemics

Recommended evaluation methods: interview, review of documentation and inspection.

Evaluators should verify the availability of personal protection equipment for staff working in areas at high risk of exposure to infectious diseases. Evaluators should check whether isolation areas are established. Evaluators should verify the level of the demand for personal protective equipment at the maximum capacity of the hospital, taking into account the types of services provided by the hospital and the additional capacity required to respond to emergencies and disasters. Evaluators should check that the availability of personal protective equipment is sufficient for this maximum demand for at least 72 hours to ensure that the hospital can sustain the provision of services in an emergency or disaster. Evaluators should check arrangements and timing for the resupply of personal protective equipment. Staff should be trained regularly to maintain and update skills in applying personal protection and procedures for conducting isolation of patients.

Safety ratings for item No. 149: *Low = No personal protective equipment is available for immediate use by hospital staff, or no isolation area exists; Average = Supply is available for immediate use, but is sufficient for less than 72 hours of maximum hospital capacity, isolation areas are established, staff training and testing of procedures are not conducted annually; High = Supply is guaranteed for at least 72 hours of maximum hospital capacity and alternate sources are in place for resupply, isolation areas are established, staff training and testing of procedures are conducted at least annually.*

150. Emergency security procedures

Recommended evaluation methods: interview and review of documentation (including procedures and reports).

Evaluators should verify that emergency procedures are in place to ensure security of patients, personnel and the facility (e.g. early control of access points, triage site(s), other areas of patient flow, traffic, parking, emergency/disaster coordination centre) in an emergency, and to sound alerts and respond to security threats. These would include threats of violence or attacks directed at the hospital or community unrest in the vicinity which may affect the hospital facility, staff, patient access and hospital functioning.

Evaluators should determine whether security personnel and staff in key areas are trained in the emergency procedures and how often the procedures are tested.

Safety ratings for item No. 150: *Low = Emergency security procedures do not exist or exist only as a document; Average = Documented procedures exist and personnel have been trained in emergency security procedures but testing is not conducted at least annually; High = Personnel are trained and tests of the documented procedures are held at least annually.*

151. Computer system network security

Recommended evaluation methods: interview and review of documentation (including procedures and reports).

Evaluators should verify that systems and procedures are in place to secure the hospital computer network against malicious programmes and against both internal and external attacks. The focus should be on protecting the data, including patient records, and equipment that are vital to the normal functioning of the hospital. The responsible person from information technology services should ensure that regular monitoring of current cyber threats and activities is in place to minimize risks and respond to any threats.

Evaluators should verify that the hospital has a plan to respond to and recover from cyber attacks or computer system failures. The plan should include data back-up procedures, arrangements for restoration or replacement of computing hardware and software, and an information technology recovery plan.

There have been reported incidents of medical equipment connected to networks providing wrong readings after being infected by malicious programs. It can be life-threatening for patients if the equipment generates wrong information.

Safety ratings for item No. 151: *Low = The hospital does not have a computer security system plan and procedures in place; Average = The hospital has a basic cyber security plan in place but it is not monitored and updated regularly; High = The hospital has a cyber security plan in place and it is updated regularly.*

References for Module 4: Emergency and disaster management

Note: Although not specifically listed here, it is recommended that evaluators always refer to applicable national and local standards and codes related to Module 4: Emergency and disaster management when evaluating a facility.

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Glossary[1] 11

Adverse event

Alteration in people, the economy, social systems and the environment, caused by natural phenomena, generated by human activity or by the combination of both, that demands the immediate response of the affected community. It can be an emergency or a disaster depending on the magnitude of damage and the response capacity.

Adverse events cycle:

Prevention: risk = 0
Mitigation: risk = lowered
Preparedness: response and recovery capacity strengthened
Response: emergency services and public assistance
Rehabilitation: provisional or temporary recovery
Reconstruction: complete restoration.

Capacity

The combination of all the strengths, attributes and resources available within a community, society or organization that can be used to achieve agreed goals.

Capacity development

The process by which people, organizations and society systematically stimulate and develop their capacities over time to achieve social and economic goals, including through improvement of knowledge, skills, systems and institutions.

Critical facilities

The primary physical structures, technical facilities and systems which are socially, economically or operationally essential to the functioning of a society or community, both in routine circumstances and in the extreme circumstances of an emergency.

Critical systems (in hospitals)

Within a hospital, critical systems include the electrical, telecommunications, water supply, fire protection, waste management, fuel storage, and medical gasses, and heating, ventilation, and air conditioning (HVAC) systems. The failure or disruption of critical systems can stop or impede the functioning of the hospitals.

Development

The cumulative and durable increase in quantity and quality of goods, services and resources of a community, along with social changes aimed at maintaining or improving the safety and quality of human life without compromising the resources of the future generations.

1 The terminology in the glossary has been compiled from several sources, including terminology on disaster risk reduction from the United Nations International Strategy for Disaster Reduction (UNISDR) and the original Hospital Safety Index of PAHO/WHO, and has been adapted for the purpose of this *Guide for evaluators.*

Disaster
A serious disruption of the functioning of a community or society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.

Disaster risk management
The systematic process of using administrative directives, organizations, operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster.

Disaster risk reduction
The concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.

Emergency
An actual or imminent event or threatening condition that requires urgent action.

Emergency and disaster management
The organization and management of resources and responsibilities for addressing all aspects of emergencies and disasters, including prevention, preparedness, response and recovery.

Hazard
A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Mitigation
The lessening or limitation of the adverse impacts of hazards and related disasters.
Nonstructural components
Elements that are not part of the load-bearing system of the building. They include architectural elements and the equipment and systems needed for operating the facility. Among the most important nonstructural components are architectural elements such as facades, interior partitions, roofing structures and appendages. Nonstructural systems and components include lifelines; industrial, medical and laboratory equipment; furnishings; electrical distribution systems; heating, ventilation and air conditioning (HVAC) systems; and elevator/escalator systems.

Nonstructural detailing
A set of measures, based on the theoretical, empirical and experimental experience of various disciplines, aimed at protecting and improving the performance of nonstructural components.

Preparedness
The knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to anticipate effectively, respond to and recover from the impacts of likely, imminent or current hazard events or conditions.

Prevention
The outright avoidance of adverse impacts of hazards and related disasters.

Reconstruction
The process of complete restoration of the physical, social and economic damage aimed at a level of protection higher than that existing before the event. Reconstruction is achieved by incorporating disaster risk reduction measures when restoring damaged infrastructure, systems and services.

Recovery
The restoration, and improvement where appropriate, of facilities, livelihoods and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors.

Rehabilitation
Provisional or temporary restoration of the essential services of the community. Rehabilitation is achieved by providing services at pre-disaster levels.

Resilience
The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.

Response
The provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected.

Risk (related to probability and negative consequences)
The combination of the probability of an event and its negative consequences. This includes the potential losses in lives, health status, livelihoods, assets and services, which could occur over some specified future time period. (Note: The International Organization for Standardization's standard on risk management (ISO 31000:2009) defines risk as the "effect of uncertainty on objectives" where "an effect is a deviation from the expected — positive and/or negative").

Risk (related to hazard, vulnerability and capacity)
Risk is the result of the interaction between hazard, vulnerability and capacities. This is a dynamic and complex interaction that is modified over time according to the changes in the probability that a certain phenomenon may occur in a given time and place with an identified intensity, magnitude and duration and the exposure and susceptibility of people, infrastructure, services and goods that can be affected by that phenomenon. The capacities available to reduce hazards and vulnerabilities and respond to residual risks (with potential to cause adverse events such emergencies and disasters) contribute to risk. The simplification of the relation among these three factors is expressed in the following formula:

$$\text{Risk is proportional to } \frac{\text{Hazard x Vulnerability}}{\text{Capacity}}$$

Risk management
The systematic approach and practice of managing uncertainty to minimize potential harm and loss.

Safe Hospital
A health facility whose services remain accessible and functioning at maximum capacity and with the same infrastructure, before, during and after the impact of emergencies and disasters.

Structural components
Elements that are part of the resistant system of the structure, such as columns, beams, walls, foundations and slabs.

Vulnerability
The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard.

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63. *The interagency emergency health kit 2011: medicines and medical devices for 10 000 people for approximately three months.* Geneva: World Health Organization; 2011.

64. Rodgers J, Cedillos V, Kumar H, Tobin LT, Yawitz K. *Reducing earthquake risk in hospitals – from equipment, contents, architectural elements and building utility systems.* New Delhi: GeoHazards International and GeoHazards Society; 2009.

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67. ACI 318. *Building code requirements for reinforced concrete.* Detroit (MI): American Concrete Institute; 2002.

68. *EQ Tips: How architectural features affect buildings during earthquakes?* Indian Institute of Technology Kanpur and Building Materials and Technology Promotion Council (website) (http://www.iitk.ac.in/nicee/EQTips/EQTip06.pdf, accessed 22 August 2014).

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70. NFPA 221: Standard for high challenge fire walls, fire walls and fire barrier walls. Quincy (MA): National Fire Protection Association; 2012.

Annex 1

Form 1

General Information About the Hospital

Please note:

1 This form should be completed by the hospital, preferably by the Hospital Emergency/Disaster Management Committee before the evaluation.

2 If necessary, you may photocopy this form or print additional copies from the USB drive included in the folder, or from the website.

GENERAL INFORMATION ABOUT THE HOSPITAL

1. **Name of the hospital:**.....
2. **Address:** .....
3. **Names of hospital senior managers** (e.g. chief executive, medical director, nursing director, administration director): .....
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4. **Names and contact details of hospital emergency/disaster managers** (e.g. chair of emergency/disaster management committee, coordinator, manager of security/fire services): .....
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5. **Telephone** (include area/city code): .....
6. **Website :** .....
   E-mail: .....
7. **Total number of beds:** .....
8. **Average bed occupancy rate (in normal situations):** .....
9. **Total number of personnel:** .....
   a. **Number of clinical staff** (e.g. physicians, nurses, medical technologists) .....
   b. **Number of nonclinical staff** (e.g. executive management, administration, engineers, information technology) .....
10. **General description of the hospital:** e.g. institution to which it belongs (e.g. ministry, private entity, university), type of establishment (e.g. tertiary referral hospital, specialized services), role in the network of health services, role in emergencies and disasters, type of structure, total population served, catchment area (routine services/emergencies and disasters) etc.....
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11. **Physical distribution:**

List and briefly describe the main buildings in the hospital. Provide maps and diagrams of the hospital site and the local setting, including the physical distribution of the services, in the box below. Use additional pages, if necessary.

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12. **Hospital treatment and operating capacity:** Indicate the total number of beds and staff for daily routine services, and additional capacities to expand services in emergencies and disasters to obtain the maximum hospital capacity, according to the hospital's organization (by department or specialized services). The number of staff available can be used for responding to Item 132: Staff availability.

a. Internal medicine

Department or service	Routine capacity (number of beds)	Maximum hospital capacity for emergencies/disasters (number of beds)	Planned number of staff	Actual number of available staff	Observations
General medicine					
Paediatrics					
Cardiology					
Pulmonology					
Neurology					
Endocrinology					
Haematology					
Gastroenterology					
Dermatology					
Burns unit					
Physiology and rehabilitation					
Psychiatry/psychology					
Others, specify					
Others, specify					
Others, specify					
Total					

b. Surgery

Department or service	Routine capacity (number of beds)	Maximum hospital capacity for emergencies/disasters (number of beds)	Planned number of staff	Actual number of available staff	Observations
General surgery					
Obstetrics and gynaecology					
Orthopaedics and traumatology					
Urology					
Otolaryngology					
Ophthalmology					
Neurosurgery					
Plastic surgery					
Cardiovascular surgery					
Others, specify					
Others, specify					
Total					

c. Intensive care unit (ICU)

Department or service	Routine capacity (number of beds)	Maximum hospital capacity for emergencies/disasters (number of beds)	Planned number of staff	Actual number of available staff	Observations
General intensive care					
General intermediate care					
Cardiovascular ICU					
Paediatrics ICU					
Burns ICU					
Others, specify					
Total					

d. Operating theatres

Department or service	Number of operating theaters - routine	Maximum number of theatres of hospital (for emergencies/ disasters)	Observations
Septic surgery			
Aseptic surgery			
Paediatrics surgery			
Obstetrics and gynaecology surgery			
Emergency surgery			
Others, specify			
Total			

e. Clinical and non-clinical support services

Department, unit or service	Planned number of staff	Actual number of available staff	Observations
Diagnostic services			
Blood bank services			
Pharmacy			
Medical engineering and maintenance			
Building/critical systems engineering and maintenance			
Decontamination			
Security			
Other, specify			
Other, specify			

f. Emergency and disaster operations

Department, unit or service	Planned number of staff	Actual number of available staff	Observations
Hospital emergency/ disaster operations/ incident management (command, control, coordination)			
Logisticians			
Communications and information officers			
Administration (human resources, finance officers)			
Media spokespersons			
Ambulance staff			
Advanced medical post/hospital dispatch teams			
Others, specify			
Total			

13. **Areas likely to increase operating capacity**

Indicate the characteristics of the locations, areas and spaces that can be used to increase hospital capacity in case of emergencies or disasters. Specify square metres, available critical systems and any other information that can be used to evaluate the suitability for expanding space and capacity for hospital medical and other services in emergencies and disasters. Include access, security and critical services, such as water, power, communications, waste management, heating, ventilation and air-conditioning.

Locations/areas	Area m^2	Water		Electricity/ power		Telephone/ communications		Observations
		Yes	No	Yes	No	Yes	No	

Locations/areas	Area m^2	Waste management		Heating, ventilation and air-conditioning		Other		Observations
		Yes	No	Yes	No	Yes	No	

Note: Specify the adaptability of use in each space (hospitalization, triage, ambulatory care, observation, staff welfare areas etc.).

14. **Additional information**

(including history of prior emergencies and disasters the hospital had to cope with):

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Name/signature (Chairperson/Head, Hospital Emergency/Disaster Management Committee)

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Annex 2

Form 2

Safe Hospitals Checklist

Notice:

This form should be distributed to all members of the evaluating team. If necessary, you may photocopy this form or print additional copies from the USB drive included in the folder, or from the website.

Module 1: Hazards affecting the safety of the hospital and the role of the hospital in emergency and disaster management

1.1 Hazards	Hazard Level				Should the hospital be prepared to respond to this hazard? If yes, mark the box.	Observations (evaluator's comments)
	No hazard	Hazard level				
		LOW	AVERAGE	HIGH		
1.1.1 Geological hazards						
Earthquakes Refer to regional and local hazard maps or other hazard information, and rate the level of earthquake hazard for the hospital's location (including catchment area) in terms of geotechnical soil analyses. Determine whether the hospital should be prepared to respond to an emergency or disaster due to earthquakes (based on exposure of the catchment population or the specialized role of the hospital for the treatment of injured patients).	☐	☐	☐	☐	☐	
Volcanic activity and eruption Refer to regional and local hazard maps or other hazard information, and rate the level of volcanic hazard for the hospital's location. This should take into account proximity to volcanoes, volcanic activity, routes of lava flow, pyroclastic flow and ash fall. Determine whether the hospital should be prepared to respond to an emergency or disaster due to volcanic activity and eruption (based on exposure of the catchment population or the specialized role).	☐	☐	☐	☐	☐	
Dry mass movement – landslides Refer to regional and local hazard maps or other hazard information for the region, and rate the level of landslide hazard for the hospital's location. Note that landslides may be caused by unstable soils. Determine whether the hospital should be prepared to respond to an emergency or disaster due to landslides (based on exposure of the catchment population).	☐	☐	☐	☐	☐	
Tsunamis Refer to regional hazard maps or other hazard information, and rate the level of tsunami hazard caused by submarine seismic or volcanic activity for the hospital's location. Determine whether the hospital should be prepared to respond to an emergency or disaster due to tsunamis (based on exposure of the catchment population).	☐	☐	☐	☐	☐	
Other geological hazards (e.g. rockfalls, subsidence, debris and mudflows (specify) ..... Refer to regional and local hazard maps or other hazard information to identify other geological phenomena not listed above. Specify the hazard and rate the corresponding hazard level for the hospital. Determine whether the hospital should be prepared to respond to an emergency or disaster due to the identified geological hazards (based on exposure of the catchment population).	☐	☐	☐	☐	☐	

Continue >>

(Continued) 1.1 Hazards	Hazard Level				Should the hospital be prepared to respond to this hazard? If yes, mark the box.	Observations (evaluator's comments)
	No hazard	Hazard level				
		LOW	AVERAGE	HIGH		
1.1.2 Hydro-meteorological hazards						
1.1.2.1 Meteorological hazards						
Cyclones/hurricanes/typhoons Refer to regional hazard maps or other hazard information, and rate the hazard level for the hospital location in terms of cyclones, hurricanes and typhoons. Determine whether the hospital should be prepared to respond to an emergency or disaster due to cyclones, hurricanes or typhoons (based on exposure of the catchment population).	☐	☐	☐	☐	☐	
Tornadoes Refer to regional hazard maps or other hazard information, and rate the tornado hazard level for the hospital's location. Determine whether the hospital should be prepared to respond to an emergency or disaster due to tornadoes (based on exposure of the catchment population).	☐	☐	☐	☐	☐	
Local storms Rate the hazard level for the hospital in relation to flooding and other damage due to intensive (or torrential) rainfall from local storms based on the history of such events. Determine whether the hospital should be prepared to respond to an emergency or disaster due to local storms (based on exposure of the catchment population).	☐	☐	☐	☐	☐	
Other meteorological hazards (e.g. sand-storms, wind gusts) (specify) ..... Rate the hazard level for the hospital in relation to risk of other meteorological hazards based on the history of such events. Determine whether the hospital should be prepared to respond to an emergency or disaster due to other meteorological hazards (based on exposure of the catchment population).	☐	☐	☐	☐	☐	
1.1.2.2 Hydrological hazards						
River floods Refer to regional and local hazard maps or other hazard information, and rate the river flood hazard level of the hospital's location (including catchment area) in terms of river floods (and other watercourses, such as creeks). Determine whether the hospital should be prepared to respond to an emergency or disaster due to river floods (based on exposure of the catchment population).	☐	☐	☐	☐	☐	
Flash floods Refer to regional and local hazard map, other hazard information and past incidents, and rate the flash flood hazard level for the hospital's location. Determine whether the hospital should be prepared to respond to an emergency or disaster based on flash floods (due to exposure of the catchment population).	☐	☐	☐	☐	☐	
Storm surge Refer to regional hazard maps or other hazard information, and rate the storm surge hazard level associated with risks of cyclones, hurricanes, typhoons and other storms for the hospital's location. Determine whether the hospital should be prepared to respond to an emergency or disaster due to storm surge and related floods (based on exposure of the catchment population).	☐	☐	☐	☐	☐	

Continue >>

(Continued) 1.1 Hazards	Hazard Level				Should the hospital be prepared to respond to this hazard? If yes, mark the box.	Observations (evaluator's comments)
	No hazard	Hazard level				
		LOW	AVERAGE	HIGH		
Wet mass movements – landslides Refer to regional and local hazard maps or other hazard information, and rate the level of hazard due to landslides caused by saturated soils for the hospital's location. Determine whether the hospital should be prepared to respond to an emergency or disaster due to landslides caused by saturated soils (based on exposure of the catchment population).	☐	☐	☐	☐	☐	
Other hydrological hazards (e.g. high tides, avalanches, coastal floods) (specify) ..... Refer to regional and local hazard maps or other hazard information to identify other hydro-meteorological hazards not listed above. Specify the hazard and rate the corresponding hazard level for the hospital's location. Determine whether the hospital should be prepared to respond to an emergency or disaster due to other hydrological hazard (based on exposure of the catchment population).	☐	☐	☐	☐	☐	
1.1.2.3 Climatological hazards						
Extreme temperature (e.g. heat wave, cold wave, extreme winter conditions – dzud) Refer to regional and local hazard maps or other hazard information, and rate the level of hazard due to extreme temperature or weather condition. Specify the hazard and rate the corresponding hazard level for the hospital's location. Determine whether the hospital should be prepared to respond to an emergency or disaster due to extreme temperatures (based on exposure of the catchment population).	☐	☐	☐	☐	☐	
Wildfires (e.g. forests, croplands, populated areas) Refer to regional and local hazard maps or other hazard information, and rate the wildfire hazard level for the hospital's location. Determine whether the hospital should be prepared to respond to an emergency or disaster due to wildfires (based on exposure of the catchment population or the specialized role of the hospital for the treatment of burns patients).	☐	☐	☐	☐	☐	
Drought Refer to regional and local hazard maps or other hazard information, and rate the drought hazard level for the hospital's location. Determine whether the hospital should be prepared to respond to an emergency or disaster due to drought (based on exposure of the catchment population or the specialized role of the hospital for the treatment of malnutrition).	☐	☐	☐	☐	☐	
Other climatological hazards including those attributable to climate change (e.g. sea-level rise) (specify) ..... Rate the hazard level for the hospital in relation to the risk of other climatological hazards based on hazard maps, the history of such events and hazard modelling. Determine whether the hospital should be prepared to respond to an emergency or disaster due to other climatological hazards (based on exposure of the catchment population).	☐	☐	☐	☐	☐	

Continue >>

(Continued) 1.1 Hazards	Hazard Level				Should the hospital be prepared to respond to this hazard? If yes, mark the box.	Observations (evaluator's comments)
	No hazard	Hazard level				
		LOW	AVERAGE	HIGH		
1.1.3 Biological hazards						
Epidemics, pandemics and emerging diseases With reference to any risk assessments, past incidents at the hospital and specific pathogens, rate the hazard level of the hospital related to epidemics, pandemics and emerging diseases. Determine whether the hospital should be prepared to respond to an emergency or disaster due to epidemics, pandemics and emerging diseases (based on exposure of the catchment population or the specialized role of the hospital for the treatment of patients with infectious diseases).	☐	☐	☐	☐	☐	
Foodborne outbreaks With reference to any risk assessments and past incidents at the hospital location (including catchment area), rate the hazard level of the hospital related to foodborne outbreaks. Determine whether the hospital should be prepared to respond to an emergency or disaster due to food-borne outbreaks (based on exposure of the catchment population).	☐	☐	☐	☐	☐	
Pest attacks (e.g. infestations) With reference to any risk assessments and past incidents at the hospital, rate the hospital's exposure to hazards from pest attacks or infestations (flies, fleas, rodents, etc.). Determine whether the hospital should be prepared to respond to an emergency or disaster due to pest attacks or infestations (based on exposure of the catchment population).	☐	☐	☐	☐	☐	
Other biological hazards (specify) ..... With reference to any risk assessments, rate the hazard level for the hospital in relation other biological hazards. Determine whether the hospital should be prepared to respond to an emergency or disaster due to other biological hazards (based on exposure of the catchment population or the specialized role of the hospital for the treatment of patients exposed to biological hazards).	☐	☐	☐	☐	☐	
Human-made hazards						
1.1.4 Technological hazards						
Industrial hazards (e.g. chemical, radiological) Refer to regional and local hazard maps of industrial facilities or other hazard information and any past incidents involving industrial hazards, and rate the industrial hazard level for the hospital's location and potential contamination of the hospital's systems. Determine whether the hospital should be prepared to respond to an emergency or disaster due to industrial hazards (based on exposure of the catchment population or the specialized role of the hospital for the treatment of patients exposed to industrial hazards).	☐	☐	☐	☐	☐	
Fires (e.g. building) Refer to local hazard maps or other hazard information on building fires inside and outside the hospital and any past incidents involving building fires, and rate the fire hazard level for the hospital. Determine whether the hospital should be prepared to respond to an emergency or disaster due to building fires (based on exposure of the catchment population or the specialized role of the hospital for the treatment of burns patients).	☐	☐	☐	☐	☐	

Continue >>

(Continued) 1.1 Hazards		Hazard Level				Should the hospital be prepared to respond to this hazard? If yes, mark the box.	Observations (evaluator's comments)
		No hazard	Hazard level				
			LOW	AVERAGE	HIGH		
Hazardous materials (chemical, biological, radiological) Refer to local hazard maps or other hazard information on hazardous materials (incidents and spills) inside and outside the hospital and any past incidents involving hazardous material spills or leaks, and rate the hazardous material hazard for the hospital and the potential contamination of its systems. Determine whether the hospital should be prepared to respond to an emergency or disaster due to hazardous materials (based on exposure of the catchment population or the specialized role of the hospital for the treatment of patients exposed to hazardous materials).	**Chemical**	☐	☐	☐	☐	☐	
	Biological	☐	☐	☐	☐	☐	
	Radiological	☐	☐	☐	☐	☐	
Power outages Refer to any past incidents involving power outages for the hospital location, and rate the power outage hazard for the hospital. Determine whether the hospital should be prepared to respond to an emergency or disaster due to power outages.		☐	☐	☐	☐	☐	
Water supply disruption Refer to any past incidents involving the disruption of the water supply for the hospital location, and rate the hazard for the hospital. Determine whether the hospital should be prepared to respond to an emergency or disaster due to disruption of the water supply.		☐	☐	☐	☐	☐	
Transportation incidents (e.g. air, road, rail, water transport) Refer to records of past major transport incidents, and determine whether the hospital should be prepared to respond to an emergency or disaster due to transport incidents (based on exposure of the catchment population).		☐	☐	☐	☐	☐	
Other technological hazards (e.g. air pollution, structural collapses, food/water contamination, nuclear) (specify) ..... Refer to regional and local hazard maps, or other hazard information and past incidents to identify other technological hazards for the hospital. Specify the hazard and rate the corresponding hazard level for the hospital's location. Determine whether the hospital should be prepared to respond to an emergency or disaster due to other technological hazards (based on exposure of the catchment population or any specialized role of the hospital for the treatment of patients exposed to other technological hazards).		☐	☐	☐	☐	☐	
1.1.5 Societal hazards							
Security threat to hospital building and staff Refer to risk/threat assessments and past security incidents affecting the hospital and staff, and rate the security hazard level to the hospital and staff. Determine whether the hospital should be prepared to respond to an emergency or disaster due to security threats to the hospital building and staff.		☐	☐	☐	☐	☐	

Continue >>

Module 1: Hazards affecting the safety of the hospital and the role of the hospital in emergency and disaster management

(Continued) 1.1 Hazards	Hazard Level				Should the hospital be prepared to respond to this hazard? If yes, mark the box.	Observations (evaluator's comments)
	No hazard	Hazard level				
		LOW	AVERAGE	HIGH		
Armed conflicts Refer to risk assessments of armed conflicts and past incidents that have affected the hospital, and rate the hospital's hazard level in relation to armed conflicts. Determine whether the hospital should be prepared to respond to an emergency or disaster due to armed conflicts (based on exposure of the catchment population).	☐	☐	☐	☐	☐	
Civil unrest (including demonstrations) Refer to risk assessments and past incidents of civil unrest that have affected the hospital, and rate the hospital's hazard level in relation to demonstrations and civil unrest. Determine whether the hospital should be prepared to respond to an emergency or disaster due to demonstrations and civil unrest (based on exposure of the catchment population).	☐	☐	☐	☐	☐	
Mass gathering events Determine whether the hospital should be prepared to respond to an emergency or disaster due to mass gatherings (based on exposure of the catchment population).	☐	☐	☐	☐	☐	
Displaced populations Refer to risk assessments and rate the hospital's hazard level in terms of people who have been displaced as a result of conflict, community unrest and other sociopolitical circumstances, or due to high levels of immigration. Determine whether the hospital should be prepared to respond to an emergency or disaster due to displaced populations.	☐	☐	☐	☐	☐	
Other societal hazards (e.g. explosions, terrorism) (specify) ..... Refer to risk assessments, regional and other hazard information and past incidents to identify other societal hazards. Specify the hazard and rate the corresponding hazard level for the hospital's location. Determine whether the hospital should be prepared to respond to an emergency or disaster due to other societal hazards (based on exposure of the catchment population or any specialized role of the hospital in treatment of patients exposed to societal hazards).	☐	☐	☐	☐	☐	
1.2 Geotechnical properties of soils						
Liquefaction With reference to the geotechnical soil analysis at the hospital site, rate the level of the facility's exposure to hazards from saturated and loose subsoil.	☐	☐	☐	☐	☐	
Clay soils With reference to soil maps or other hazard information, rate the hospital's exposure to hazards from clay soil.	☐	☐	☐	☐	☐	
Unstable slopes Refer to geological maps or other hazard information and specify the hospital's exposure to hazards from the presence of slopes.	☐	☐	☐	☐	☐	

Comments on the results of Form 2, Module 1: .....

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Name/signature of evaluator(s).....

Module 2: Structural Safety

2.1 Prior events affecting hospital safety	**Safety level**			**Observations (evaluators' comments)**
	Low	Average	High	
1. Prior major structural damage or failure of the hospital building(s) *Safety ratings: Low = Major damage and no repairs; Average = Moderate damage and building only partially repaired; High = Minor or no damage, or building fully repaired.* *IF SUCH AN EVENT HAS NOT OCCURRED IN THE VICINITY OF THE HOSPITAL, LEAVE BOXES BLANK AND PROVIDE COMMENT.*	☐	☐	☐	
2. Hospital built and/or repaired using current safety standards *Safety ratings: Low = Current safety standards not applied; Average = Current safety standards partially applied; High = Current safety standards fully applied.*	☐	☐	☐	
3. Effect of remodelling or modification on the structural behaviour of the hospital *Safety ratings: Low = Major remodelling or modifications have been carried out with major compromising effect on the performance of the structure; Average = Moderate remodelling and/or modifications with minor effect on the performance of the structure; High = Minor remodelling and/or modifications; no modifications were carried out; or major remodelling and/or modification enhancing the structural behaviour or having no negative effect.*	☐	☐	☐	
2.2 Building integrity	**Safety level**			**Observations (evaluators' comments)**
	Low	Average	High	
4. Structural system design *Safety ratings: Low = Poor structural system design; Average = Moderate structural system design; High = Good structural system design.*	☐	☐	☐	
5. Condition of the building *Safety ratings: Low = Cracks on the ground and first floors; Major deterioration caused by weathering or normal ageing; Average = Some deterioration caused only by weathering or normal ageing; High = No deterioration or cracks observed.*	☐	☐	☐	
6. Condition of the construction materials *Safety ratings: Low = Rust with flaking; cracks larger than 3mm (concrete), excessive deformations (steel and wood); Average = Cracks between 1 and 3 mm present (concrete), moderate and visible deformations (steel and wood) or rust with no flaking; High = Cracks less than 1 mm (concrete), no visible deformations; no rust.*	☐	☐	☐	
7. Interaction of nonstructural elements with the structure *Safety ratings: Low = Partition walls rigidly attached to the structure, suspended ceilings or facades interacting with the structures, damage would have significant effect on the structure; Average = Some of the preceding nonstructural elements interacting with the structures, damage would not affect the structure; High = There are no nonstructural elements affecting the structure.*	☐	☐	☐	
8. Proximity of buildings (for earthquake-induced pounding) *Safety ratings: Low = Separation is less than 0.5% of the height of the shorter of two adjacent buildings; Average = Separation is between 0.5% and 1.5% of the height of the shorter of two adjacent buildings; High = Separation is more than 1.5% of the height of the shorter of two adjacent buildings.* *IF THE HOSPITAL IS NOT IN A HIGH/MODERATE SEISMIC ZONE, THEN LEAVE BOXES BLANK AND PROVIDE COMMENT.*	☐	☐	☐	

Continue >>

Module 2: Structural Safety

(Continued) **2.2 Building integrity**	Safety level			Observations (evaluators' comments)
	Low	Average	High	
9. Proximity of buildings (wind tunnel effect and fire) *Safety ratings: Low = Separation less than 5 m; Average = Separation between 5 m and 15 m; High = Separation more than 15 m.*	☐	☐	☐	
10. Structural redundancy *Safety ratings: Low = Fewer than three lines of resistance in each direction; Average = Three lines of resistance in each direction or lines without orthogonal orientation; High = More than three lines of resistance in each orthogonal direction of the building.*	☐	☐	☐	
11. Structural detailing, including connections *Safety ratings: Low = No evidence of engineered building records, or built according to an old design standard; Average = Built according to previous design standards and no retrofitting work to a current standard; High = Built according to a current standard.*	☐	☐	☐	
12. Ratio of column strength to beam strength *Safety ratings: Low = Strength of beams is obviously greater than strength of columns; Average = Strength of beams is similar to strength of columns; High = Strength of columns is greater than strength of beams.*	☐	☐	☐	
13. Safety of foundations *Safety ratings: Low = No evidence that foundations were designed according to standards (foundation size, soil survey) and/or there is evidence of damage; no plans are available; Average = Little evidence (drawings, soil survey) that foundations were designed according to standards; and/or there is evidence for moderate damage; High = Strong evidence that foundations were designed according to standards with strong evidence of no damage.*	☐	☐	☐	
14. Irregularities in building structure plan (rigidity, mass, resistance) *Safety ratings: Low = Shapes are irregular and structure is not uniform; Average = Shapes on plan are irregular but structure is uniform; High = Shapes on plan are regular and structure has uniform plan, and there are no elements that would cause significant torsion.*	☐	☐	☐	
15. Irregularities in elevation of buildings *Safety ratings: Low = Significant discontinuous or irregular elements, significant variation in elevation of buildings; Average = Several discontinuous or irregular elements, some variation in the elevation of buildings; High = No significant discontinuous or irregular elements, little or no variation in elevation of buildings.*	☐	☐	☐	
16. Irregularities in height of storeys *Safety ratings: Low = Height of storeys differs by more than 20%; Average = Storeys have similar heights (they differ by less than 20% but more than 5%); High = Storeys are of similar height (they differ by less than 5%).*	☐	☐	☐	
17. Structural integrity of roofs *Safety ratings: Low = Monopitch or flat light roofs, and/or large roof overhangs; Average = Pre-stressed concrete roof, gable roof with gentle slope, satisfactorily connected, no large roof overhangs; High = Reinforced cast in place on concrete roof deck or hipped light roof, satisfactory connections, no large roof overhangs.*	☐	☐	☐	
18. Structural resilience to hazards other than earthquakes and strong winds *Safety ratings: Low = Low structural resilience to hazards present at the site of the hospital; Average = Satisfactory structural resilience (taking account of structural risk reduction measures in place); High = Good structural resilience (taking account of risk reduction measures in place).*	☐	☐	☐	

Continue >>

Comments on the results of Form 2, Module 2. (Include reference to the building type(s), structural system(s) and age(s) of buildings.

Attach site plan, list all buildings and indicate those that were assessed.)

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Name/signature of evaluator(s).....

Module 3: Nonstructural safety

3.1. Architectural safety	**Safety level**			**Observations (evaluators' comments)**
	Low	Average	High	
19. Major damage and repair of nonstructural elements *Safety ratings: Low = Major damage and no repairs completed; Average = Moderate damage, building only partially repaired; High = Minor or no damage, or building fully repaired.* *IF SUCH AN EVENT HAS NOT OCCURRED IN THE VICINITY OF THE HOSPITAL, LEAVE BOXES BLANK AND PROVIDE COMMENT.*	☐	☐	☐	
20. Condition and safety of doors, exits and entrances *Safety ratings: Low = Doors, exits and entrances in poor condition, subject to damage which would impede the function of this and other elements, systems or operations; entrance width is less than 115cm; Average = In fair condition, subject to damage but damage would not impede the function of this and other elements, systems or operations; or entrance width is less than 115cm; High = In good condition, no or minor potential for damage that would impede the function of this and other elements, systems or operations; and entrance width is equal to or larger than 115cm.*	☐	☐	☐	
21. Condition and safety of windows and shutters *Safety ratings: Low = Windows and shutters in poor condition, subject to damage which would impede the function of this and other elements, systems or operations (e.g. weak protective glazing); Average = In fair condition, subject to damage but damage would not impede the function of this and other elements, systems or operations; High = In good condition, no or minor potential for damage that would impede the function of this and other elements, systems or operations; protective glass (e.g. polycarbonate glazing, blast film) has been added in critical wards.*	☐	☐	☐	
22. Condition and safety of other elements of the building envelope (e.g. outside walls, facings) *Safety ratings: Low = Building envelope in poor condition, subject to damage which would impede the function of this and other elements, systems or operations; Average = In fair condition, subject to damage but damage would not impede the function of this and other elements, systems or operations; High = In good condition, no or minor potential for damage that would impede the function of this and other elements, systems or operations.*	☐	☐	☐	
23. Condition and safety of roofing *Safety ratings: Low = Roofing in poor condition, subject to damage which would impede the function of this and other elements, systems or operations; Average = In fair condition, subject to damage but damage to element(s) would not impede the function of this and other elements, systems or operations; High = In good condition, no or minor potential for damage that would impede the function of this and other elements, systems or operations.*	☐	☐	☐	
24. Condition and safety of railings and parapets *Safety ratings: Low = Railings and parapets in poor condition, subject to damage which would impede the function of this and other elements, systems or operations; Average = Subject to damage but damage to element(s) would not impede the function of this and other elements, systems or operations; High = No or minor potential for damage that would impede the function of this and other elements, systems or operations.*	☐	☐	☐	
25. Condition and safety of perimeter walls and fencing *Safety ratings: Low = Perimeter walls and fencing in poor condition, subject to damage which would impede the function of this and other elements, systems or operations; Average = In fair condition, subject to damage but damage to element(s) would not impede the function of this and other elements, systems or operations; High = In good condition, no or minor potential for damage that would impede the function of this and other elements, systems or operations.*	☐	☐	☐	

Continue >>

(Continued) **3.1. Architectural safety**	Safety level			Observations (evaluators' comments)
	Low	Average	High	
26. Condition and safety of other architectural elements (e.g. cornices, ornaments, chimneys, signs) *Safety ratings: Low = Other architectural element(s) in poor condition, subject to damage which would impede the function of this and other elements, systems or operations; Average = In fair condition, element(s) are subject to damage but damage would not impede the function of this and other elements, systems or operations; High = In good condition, no or minor potential for damage that would impede the function of this and other elements, systems or operations.*	☐	☐	☐	
27. Safe conditions for movement outside the hospital buildings *Safety ratings: Low = Obstacles or damage to structure or road and walkways will impede vehicle and pedestrian access to buildings or endanger pedestrians; Average = Obstacles or damage to structure or road and walkways will not impede pedestrian access, but will impede vehicle access; High = No obstacles, or potential for only minor or no damage that will not impede pedestrian or vehicle access.*	☐	☐	☐	
28. Safe conditions for movement inside the building (e.g. corridors, stairs) *Safety ratings: Low = Obstacles and damage to element(s) will impede movement inside the building and endanger occupants; Average = Obstacles or damage to elements will not impede movement of people but will impede movement of stretchers, wheeled equipment; High = No obstacles, potential for no or minor damage which will not impede movement of people or wheeled equipment.*	☐	☐	☐	
29. Condition and safety of internal walls and partitions *Safety ratings: Low = Internal walls and partitions in poor condition, subject to damage which would impede the function of this and other elements, systems or operations; Average = In fair condition, element(s) are subject to damage but damage would not impede the function of this and other elements, systems or operations; High = In good condition, no or minor potential for damage that would impede the function of this and other elements, systems or operations.*	☐	☐	☐	
30. Condition and safety of false or suspended ceilings *Safety ratings: Low = False or suspended ceilings in poor condition, subject to damage which would impede the function of this and other elements, systems or operations; Average = In fair condition, element(s) subject to damage but damage would not impede the function of this and other elements, systems or operations; High = In good condition, no or minor potential for damage that would impede the function of this and other elements, systems or operations.* *IF THE HOSPITAL DOES NOT HAVE FALSE OR SUSPENDED CEILINGS, LEAVE BOXES BLANK.*	☐	☐	☐	
31. Condition and safety of the elevator system *Safety ratings: Low = Elevator system in poor condition, subject to damage which would impede the function of this and other elements, systems or operations; Average = In fair condition, element(s) subject to damage but damage would not impede the function of this and other elements, systems or operations; High = In good condition, no or minor potential for damage that would impede the function of this and other elements, systems or operations.* *IF THERE ARE NO ELEVATORS, LEAVE BOXES BLANK AND PROVIDE COMMENT.*	☐	☐	☐	
32. Condition and safety of stairways and ramps *Safety ratings: Low = In poor condition, subject to damage or there are obstacles, which would impede the function of this and other elements, systems or operations; Average = In fair condition, subject to damage but damage and obstacles would not impede the function of this and other elements, systems or operations; High = In good condition, no obstacles, potential for no or minor damage that would impede the function of this and other elements, systems or operations.* *IF THERE ARE NO STAIRS AND RAMPS, LEAVE BOXES BLANK AND PROVIDE COMMENT.*	☐	☐	☐	

Continue >>

(Continued) **3.1. Architectural safety**	Safety level			Observations (evaluators' comments)
	Low	Average	High	
33. Condition and safety of floor coverings *Safety ratings: Low = Floor coverings in poor condition, subject to damage which would impede the function of this and other elements, systems or operations; Average = In fair condition, subject to damage but damage would not impede function; High = In good condition, no or minor potential for damage that would impede the function of this and other elements, systems or operations.*	☐	☐	☐	
3.2 Infrastructure protection, access and physical security	**Safety level**			**Observations (evaluators' comments)**
	Low	Average	High	
34. Location of hospital's critical services and equipment in the hospital in relation to local hazards *Safety ratings: Low = No protection measures taken; subject to damage, failure and disruption of critical services and hospital operations in emergencies and disasters; Average = Partial measures to protect critical services from local hazards are taken; subject to damage with some disruption of critical services and hospital operations in emergencies or disasters; High = Many measures are taken to protect critical services; high probability that critical services and hospital will operate with no or limited disruption in emergencies and disasters.*	☐	☐	☐	
35. Hospital access routes *Safety ratings: Low = Access routes subject to obstacles and damage that would impede access and the function of other elements, systems or operations; Average = Access routes subject to some obstacles and damage that would not impede access and function; High = No or minor potential for obstacles or damage that would impede access and the function of other elements, systems or operations.*	☐	☐	☐	
36. Emergency exits and evacuation routes *Safety ratings: Low = Exit and evacuation routes are not clearly marked and many are blocked; Average = Some exit and evacuation routes are marked and most are clear of obstacles; High = All exit and evacuation routes are clearly marked and free of obstacles.*	☐	☐	☐	
37. Physical security of building, equipment, staff and patients *Safety ratings: Low = No measures are in place; Average = Some physical security protection is in place (e.g. locked storage for supplies and equipment, asset tracking and inventory control); High = Wide range of security measures in place (e.g. design and layout, physical barriers, access control and door security systems, locked storage for supplies and equipment).*	☐	☐	☐	
3.3 Critical systems	**Safety level**			**Observations (evaluators' comments)**
	Low	Average	High	
3.3.1 Electrical systems				
38. Capacity of alternate sources of electricity (e.g. generators) *Safety ratings: Low = Alternate source(s) is(are) missing or covers less than 30% of demand in critical areas, or can only be started manually; Average = Alternate source(s) covers 31–70% of demand in critical areas and starts automatically in less than 10 seconds in critical areas; High = Alternate source(s) start(s) automatically in less than 10 seconds and cover(s) more than 70% of demand in critical areas.*	☐	☐	☐	
39. Regular tests of alternate sources of electricity in critical areas *Safety ratings: Low = Tested at full load every 3 months or more; Average = Tested at full load every 1 to 3 months; High = Tested at full load at least monthly.*	☐	☐	☐	
40. Condition and safety of alternate source(s) of electricity *Safety ratings: Low = No alternate sources; generators are in poor condition, there are no protective measures; Average = Generators are in fair condition, some measures provide partial protection and security; High = Generators are in good condition, well-secured and in good working order for emergencies.*	☐	☐	☐	

Continue >>

(Continued) 3.3 Critical systems	Safety level			Observations (evaluators' comments)
	Low	Average	High	
41. Condition and safety of electrical equipment, cables and cable ducts *Safety ratings: Low = Electrical equipment, power lines, cables and ducts are in poor condition, there are no protective measures; Average = Electrical equipment, power lines, cables and ducts are in fair condition; some measures provide partial protection and security; High = Electrical equipment, power lines, cables and ducts are in good condition, well-secured and in good working order.*	☐	☐	☐	
42. Redundant system for the local electric power supply *Safety ratings: Low = There is only one entrance for the local power supply; Average = There are two entrances for the local power supply; High = There are more than two entrances for the local power supply.*	☐	☐	☐	
43. Condition and safety of control panels, overload breaker switches and cables Safety ratings: Low = Control panels or other elements are in poor condition, there are no protective measures; Average = Control panels or other elements are in fair condition; some measures provide partial protection; High = Control panels or other elements are in good condition, well-protected and in good working order.	☐	☐	☐	
44. Lighting system for critical areas of the hospital Safety ratings: Low = Poor level of lighting, there are no protective measures; Average = Lighting is satisfactory in the critical areas; some measures provide partial protection; High = Good levels of lighting and protection measures in place.	☐	☐	☐	
45. Condition and safety of internal and external lighting systems Safety ratings: Low = Internal and external lighting systems are in poor condition, there are no protective measures; Average = In fair condition; some measures provide partial protection; High = In good condition, well-protected and in good working order.	☐	☐	☐	
46. External electrical systems installed for hospital usage Safety ratings: Low = No electrical substations installed for hospital demands; Average = Substations installed; some measures provide partial protection, but would be vulnerable to damage or disruption, do not provide enough power to the hospital; High = Electrical substations installed, well-protected, and provide enough power to the hospital in an emergency or disaster.	☐	☐	☐	
47. Emergency maintenance and restoration of electric power supply and alternate sources Safety ratings: Low = Documented procedures and maintenance/inspection records do not exist; Average = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, but resources are not available; High = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, and resources are in place for implementing emergency maintenance and restoration.	☐	☐	☐	
3.3.2 Telecommunications systems				
48. Condition and safety of antennas Safety ratings: Low = Antennas and bracing in poor condition, there are no protective measures; Average = Antennas and bracing are in fair condition, some measures provide partial protection; High = Antennas and bracing are in good condition, well-secured and protection measures are in place. IF THERE ARE NO ANTENNAS, LEAVE BOXES BLANK AND PROVIDE COMMENT.	☐	☐	☐	
49. Condition and safety of low- and extra-low-voltage systems (internet and telephone) Safety ratings: Low = Low voltage systems in poor condition, there are no protective measures; Average = Low voltage systems in fair condition, some measures provide partial protection; High = Good condition, well-secured and other protection measures in place.	☐	☐	☐	

Continue >>

(Continued) 3.3 Critical systems	Safety level			Observations (evaluators' comments)
	Low	Average	High	
50. Alternate communication systems Safety ratings: Low = Alternate communications systems do not exist, are in poor condition, or do not function; Average = Hospital-wide alternate communications system in fair condition, but is not tested on an annual basis; High = Alternate communication system in good condition and tested at least annually.	☐	☐	☐	
51. Condition and safety of telecommunications equipment and cables Safety ratings: Low = Telecommunications equipment and cables are in poor condition; there are no protective measures; Average = Equipment and cables are in fair condition; some measures provide partial protection; High = In good condition, well-secured and protected from hazards.	☐	☐	☐	
52. Effect of external telecommunications systems on hospital communications Safety ratings: Low = External telecommunications systems cause major interference with hospital communications; Average = External telecommunications system cause moderate interference with hospital communications; High = External communications cause no interference with hospital communications.	☐	☐	☐	
53. Safety of sites for telecommunication systems Safety ratings: Low = Sites for telecommunications systems are in poor condition, at high risk of failure due to hazards; there are no protective measures; Average = Sites in fair condition, some measures provide partial protection; High = Good condition, well-secured and other protective measures in place.	☐	☐	☐	
54. Condition and safety of internal communications systems Safety ratings: Low = Internal communications systems do not exist or are in poor condition; Average = Internal communications systems are in fair condition, but there are no alternate systems; High = Internal communications and back-up systems are in good working order.	☐	☐	☐	
55. Emergency maintenance and restoration of standard and alternate communications systems Safety ratings: Low = Documented procedures and maintenance/inspection records do not exist; Average = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, but resources are not available; High = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, and resources are in place for implementing emergency maintenance and restoration.	☐	☐	☐	
3.3.3 Water supply system				
56. Water reserves for hospital services and functions Safety ratings: Low = Sufficient for 24 hours or less or water tank does not exist; Average = Sufficient for more than 24 hours but less than 72 hours; High = Guaranteed to cover at least 72 hours.	☐	☐	☐	
57. Location of water storage tanks Safety ratings: Low = The site is vulnerable with high risk of failure (e.g. structural, architectural and/or system vulnerabilities); Average = The site is exposed to moderate risk of failure (e.g. structural, architectural and/or system vulnerabilities); High = The site is not exposed to visually identifiable risks (e.g. structural, architectural and/or system vulnerabilities). IF THE HOSPITAL DOES NOT HAVE A WATER STORAGE TANK, LEAVE BOXES BLANK AND PROVIDE COMMENT.	☐	☐	☐	
58. Safety of the water distribution system Safety ratings: Low = Less than 60% are in good operational condition; Average = Between 60% and 80% are in good condition; High = Above 80% are in good condition.	☐	☐	☐	

Continue >>

(Continued) 3.3 Critical systems	Safety level			Observations (evaluators' comments)
	Low	Average	High	
59. Alternate water supply to the regular water supply Safety ratings: Low = Provides less than 30% of daily demand in an emergency or disaster scenario; Average = Provides 30–80% of daily demand in an emergency or disaster scenario; High = Provides more than 80% of daily demand in an emergency or disaster scenario.	☐	☐	☐	
60. Supplementary pumping system Safety ratings: Low = There is no back-up pump and operational capacity does not meet minimum daily demand; Average = Supplementary pumps are in fair condition but would not meet the minimum daily demand for water; High = All supplementary pumps and back-up systems are operational and would meet the minimum demand for water.	☐	☐	☐	
61. Emergency maintenance and restoration of water supply systems Safety ratings: Low = Documented procedures and maintenance/inspection records do not exist; Average = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, but resources are not available; High = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, and resources are in place for implementing emergency maintenance and restoration.	☐	☐	☐	
3.3.4 Fire protection system				
62. Condition and safety of the fire protection (passive) system Safety ratings: Low = Element(s) are subject to damage, and damage would impede the function of this and other elements, systems or operations; Average = Element(s) are subject to damage but damage would not impede function; High = No or minor potential for damage that would impede the function of this and other elements, systems or operations.	☐	☐	☐	
63. Fire/smoke detection systems Safety ratings: Low = No system has been installed; Average = System is partially installed, or infrequently maintained and tested; High = System is installed and well-maintained and tested frequently.	☐	☐	☐	
64. Fire suppression systems (automatic and manual) Safety ratings: Low = No system has been installed; inspections do not occur; Average = System is partially installed, or system is installed, but no maintenance or testing; inspections are incomplete or outdated; High = System is fully installed and regularly maintained and tested frequently; inspections are complete and up to date.	☐	☐	☐	
65. Water supply for fire suppression Safety ratings: Low = A source of permanent supply which could be used for fire suppression does not exist; Average = A source of permanent supply of water is available for fire suppression; there is limited capacity available, and no maintenance and testing has been conducted; High = A source of permanent water supply with significant capacity for fire suppression is available, regularly maintained and frequently tested.				
66. Emergency maintenance and restoration of the fire protection system Safety ratings: Low = Documented procedures and maintenance/inspection records do not exist; Average = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, but resources are not available; High = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, and resources are in place for implementing emergency maintenance and restoration.	☐	☐	☐	

Continue >>

(Continued) 3.3 Critical systems	Safety level			Observations (evaluators' comments)
	Low	Average	High	
3.3.5 Waste management systems				
67. Safety of nonhazardous wastewater systems Safety ratings: Low = System for nonhazardous wastewater disposal does not exist or is in poor condition; Average = System is in fair condition, but little or no evidence of compliance and maintenance; High = Wastewater disposal system is in good condition with good capacity and evidence of compliance and maintenance.	☐	☐	☐	
68. Safety of hazardous wastewater and liquid waste Safety ratings: Low = System for hazardous wastewater disposal does not exist or is in poor condition; Average = System is in fair condition but little or no evidence of compliance and maintenance; High = Disposal system has good capacity and evidence of compliance and maintenance.	☐	☐	☐	
69. Safety of nonhazardous solid waste system Safety ratings: Low = System for solid waste disposal does not exist or is in poor condition; Average = System is in fair condition, but little or no evidence of compliance and maintenance; High = Disposal system is in good condition with good capacity and evidence of compliance and maintenance.	☐	☐	☐	
70. Safety of hazardous solid waste system Safety ratings: Low = System for hazardous waste disposal does not exist or is in poor condition; Average = System is in fair condition but little or no evidence of compliance and maintenance; High = Disposal system is in good condition with good capacity and evidence of compliance and maintenance.	☐	☐	☐	
71. Emergency maintenance and restoration of all types of hospital waste management systems Safety ratings: Low = Documented procedures and maintenance/inspection records do not exist; Average = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, but resources are not available; High = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, and resources are in place for implementing emergency maintenance and restoration.	☐	☐	☐	
3.3.6 Fuel storage systems (e.g. gas, gasoline and diesel)				
72. Fuel reserves Safety ratings: Low = Sufficient for 24 hours or less, or fuel tank does not exist; Average = Sufficient for more than 24 hours but less than 72 hours; High = Guaranteed to cover at least 72 hours.	☐	☐	☐	
73. Condition and safety of above-ground fuel tanks and/or cylinders Safety ratings: Low = Tanks are in poor condition; there are no anchors or tank enclosure; tanks are not safely located with respect to hazards; Average = Tanks are in fair condition, anchors and bracing are inadequate for major hazards; tank enclosure has some safety and security measures; High = Tanks are in good condition; anchors and bracing are in good condition for major hazards; the tank enclosure has adequate safety and security. IF THE HOSPITAL DOES NOT HAVE THESE SERVICES, LEAVE BOXES BLANK AND PROVIDE COMMENT.	☐	☐	☐	
74. Safe location of fuel storage away from hospital buildings Safety ratings: Low = Fuel storage is not accessible and is not located in a secure site; Average = Site in fair condition and in fair location in relation to hazards; some measures provide partial protection; High = In good condition and good location, well-secured and other protection measures in place; fuel tanks are accessible. IF THERE IS NO FUEL TANK, LEAVE BOXES BLANK AND PROVIDE COMMENT.	☐	☐	☐	

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(Continued) 3.3 Critical systems	Safety level			Observations (evaluators' comments)
	Low	Average	High	
75. Condition and safety of the fuel distribution system (valves, hoses, connections) Safety ratings: Low = Less than 60% of the system is in safe operational condition; Average = between 60% and 90% of the system is in good operational condition and has automatic shut-off valves; High = More than 90% of the system is in good operational condition and has automatic shut-off valves. IF THERE IS NO FUEL DISTRIBUTION TANK, LEAVE BOXES BLANK AND PROVIDE COMMENT.	☐	☐	☐	
76. Emergency maintenance and restoration of fuel reserves Safety ratings: Low = Documented procedures and maintenance/inspection records do not exist; Average = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, but resources are not available; High = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, and resources are in place for implementing emergency maintenance and restoration.	☐	☐	☐	
3.3.7 Medical gases systems				
77. Location of storage areas for medical gases Safety ratings: Low = No sites reserved for medical gases, or sites for medical gases are at high risk of failure due to hazards; there are no protective measures, and storage is not accessible; Average = Reserved areas in fair condition and fair location; some measures provide partial protection; High = In good condition, well-secured and other protective measures in place; storage is accessible.	☐	☐	☐	
78. Safety of storage areas for medical gas tanks and/or cylinders Safety ratings: Low = Medical gas tanks and cylinders in storage areas are poor condition; no protection measures, not secured; personnel are not trained to operate medical gas and fire extinguishing equipment; Average = Medical gas tanks and cylinders in storage areas are in fair condition, some measures provide partial protection; the quality of anchors and braces is inadequate; personnel are trained to operate equipment; High = Good condition, well-secured and protected, anchors are of good quality for major hazards; medical gas and fire extinguishing equipment operated by qualified personnel.	☐	☐	☐	
79. Condition and safety of medical gas distribution system (e.g. valves, pipes, connections) Safety ratings: Low = Less than 60% of the system is in good working condition; Average = Between 60% and 80% of the system is in good working condition; High = More than 80% of the system is in good working condition.	☐	☐	☐	
80. Condition and safety of medical gas cylinders and related equipment in the hospital Safety ratings: Low = Medical gas tanks and cylinders in hospital areas are in poor condition, no protective measures; not secured; Average = Medical gas tanks and cylinders are in fair condition; the quality of anchors and braces is inadequate; some measures provide partial protection; High = Good condition, well-secured and protected; anchors are of good quality for major hazards.	☐	☐	☐	
81. Availability of alternative sources of medical gases Safety ratings: Low = Alternative sources are not available; Average = Alternative sources in place but delivery of supplies takes longer than 15 days; High = Sufficient alternative sources are available at short notice (less than 15 days).	☐	☐	☐	

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(Continued) 3.3 Critical systems	Safety level			Observations (evaluators' comments)
	Low	Average	High	
82. Emergency maintenance and restoration of medical gas systems Safety ratings: Low = Documented procedures and maintenance/inspection records do not exist; Average = Documented procedures exist, maintenance/inspection records are up to date, and personnel have been trained, but resources are not available; High = Procedures exist, maintenance/inspection records are up to date, personnel have been trained, and resources are in place for implementing emergency maintenance and restoration.	☐	☐	☐	
3.3.8 Heating, ventilation, and air-conditioning (HVAC) systems				
83. Adequate location of enclosures for HVAC equipment Safety ratings: Low = HVAC enclosures are not accessible and they are not located in a safe site; there are no protective measures; Average = HVAC enclosures are accessible, located at a safe site; some measures provide partial protection from hazards; High = HVAC enclosures are accessible, in a safe location and protected from hazards.	☐	☐	☐	
84. Safety of enclosures for HVAC equipment Safety ratings: Low = HVAC equipment is not accessible; no protection measures for safe operation and maintenance; Average = HVAC is accessible; some measures provide partial protection; High = HVAC equipment is accessible, wide range of protection measures in place.	☐	☐	☐	
85. Safety and operating condition of HVAC equipment (e.g. boiler, exhaust) Safety ratings: Low = HVAC equipment in poor condition, not maintained; Average = HVAC equipment in fair condition; some measures provide partial protection, but no regular maintenance; High = Good condition, well-secured and protected from hazards (e.g. anchors are of good quality); regular maintenance and testing of controls and alarms conducted.	☐	☐	☐	
86. Adequate supports for ducts and review of flexibility of ducts and piping that cross expansion joints Safety ratings: Low = Supports are lacking and connections are rigid; Average = Supports are in fair condition or connections are flexible; High = Supports are in good condition and connections are flexible.	☐	☐	☐	
87. Condition and safety of pipes, connections and valves *Safety ratings: Low = Less than 60% of pipes are in good condition; limited protective measures against hazards; Average = Between 60% and 80% are in good condition; some measures provide partial protection against hazards; High = Above 80% are in good condition and are well-secured and protected against hazards.*	☐	☐	☐	
88. Condition and safety of air-conditioning equipment Safety ratings: Low = Air-conditioning units in poor condition, not secured; Average = Air-conditioning units are in fair condition; some measures provide partial protection (e.g. quality of anchors and braces is inadequate); High = Good condition, well-secured and protected from hazards (e.g. anchors are of good quality).	☐	☐	☐	
89. Operation of air-conditioning system (including negative pressure areas) Safety ratings: Low = Air-conditioning system has no capability for establishing zones of the hospital; Average = Air-conditioning system can establish zones, but has no capacity to separate air circulating between high-risk areas and other areas of the hospital; High = Air-conditioning system can isolate air from high-risk areas; negative pressure rooms are available.	☐	☐	☐	

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(Continued) 3.3 Critical systems	Safety level			Observations (evaluators' comments)
	Low	Average	High	
90. Emergency maintenance and restoration of HVAC systems Safety ratings: Low = Documented procedures and maintenance/inspection records do not exist; Average = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, but resources are not available; High = Documented procedures exist, maintenance/inspection records are up to date, personnel have been trained, and resources are in place for implementing emergency maintenance and restoration.	☐	☐	☐	
3.4 Equipment and supplies	**Safety level**			**Observations (evaluators' comments)**
	Low	Average	High	
3.4.1 Office and storeroom furnishings and equipment (fixed and movable)				
91. Safety of shelving and shelf contents Safety ratings: Low = Shelving is not safely located (or in seismic and wind-prone areas not attached to walls in more than 20% of cases); Average = Shelving is safely located (and attached to walls in seismic and wind-prone areas) and contents are secured in 20–80% of cases; High = More than 80% of shelving and the contents of shelves are safely located, attached to walls, and contents are secured.	☐	☐	☐	
92. Safety of computers and printers Safety ratings: Low = No measures to protect computers from hazards are in place; Average =Computers are in safe locations, some measures offer partial protection from hazards; High = Computers are in safe locations, well-secured and good protective measures in place.	☐	☐	☐	
3.4.2 Medical and laboratory equipment and supplies used for diagnosis and treatment				
93. Safety of medical equipment in operating theatres and recovery rooms Safety ratings: Low = The operating theatres are in an unsafe location, equipment is lacking or in poor condition or there are no protective measures; Average = The operating theatres are in a safe location, equipment is in fair condition, and some measures provide partial protection; High = Operating theatres are in a safe location, equipment is in good condition, is well-secured and measures provide protection.	☐	☐	☐	
94. Condition and safety of radiology and imaging equipment *Safety ratings: Low = The radiology and imaging equipment is not in a safe location, equipment is lacking or in poor condition, or there are no protective measures; Average = The equipment is in a safe location, is in fair condition, and some measures offer partial protection; High = Equipment is in a safe location, is in good condition, well-secured and measures provide good protection.*	☐	☐	☐	
95. Condition and safety of laboratory equipment and supplies Safety ratings: Low = Biosafety measures are poor, laboratory equipment is lacking or in poor condition, or there are no protective measures; Average = Biosafety measures are in place, the equipment is in fair condition, and some measures provide partial protection; High = Biosafety measures are in place, equipment is in good condition, well-secured and measures provide good protection.	☐	☐	☐	
96. Condition and safety of medical equipment in emergency care services unit Safety ratings: Low = The medical equipment is lacking or in poor condition or there are no protective measures; Average = The equipment is in fair condition and some measures provide partial protection; High = Equipment is in good condition, well-secured and measures provide good protection.	☐	☐	☐	

Continue >>

(Continued) 3.4 Equipment and supplies	Safety level			Observations (evaluators' comments)
	Low	Average	High	
97. Condition and safety of medical equipment in intensive or intermediate care unit Safety ratings: Low = The medical equipment is lacking or in poor condition, or there are no protective measures; Average = The equipment is in fair condition and some measures provide partial protection; High = Equipment is in good condition, is well-secured and measures provide good protection.	☐	☐	☐	
98. Condition and safety of equipment and furnishings in the pharmacy Safety ratings: Low = The equipment in the pharmacy is lacking or in poor condition, or there are no protective measures; Average = The equipment is in fair condition and some measures provide partial protection; High = Equipment is in good condition, is well-secured and measures provide good protection.	☐	☐	☐	
99. Condition and safety of equipment and supplies in the sterilization services Safety ratings: Low = Equipment is lacking or in poor condition, or there are no protective measures; Average = Equipment is in fair condition and some measures provide partial protection; High = Equipment is in good condition, is well-secured and measures provide good protection.	☐	☐	☐	
100. Condition and safety of medical equipment for obstetric emergencies and neonatal care Safety ratings: Low = Equipment is lacking or in poor condition, or there are no protective measures; Average = Equipment is in fair condition and some measures provide partial protection; High = Equipment is in good condition, is well-secured and measures provide good protection.	☐	☐	☐	
101. Condition and safety of medical equipment and supplies for emergency care for burns Safety ratings: Low = Equipment is lacking, is in poor condition, or there are no protective measures; Average = Equipment is in fair condition and some measures provide partial protection; High = Equipment is in good condition, is well-secured and measures provide good protection.	☐	☐	☐	
102. Condition and safety of medical equipment for nuclear medicine and radiation therapy Safety ratings: Low = Equipment is lacking, is in poor condition, or there are no protective measures; Average = Equipment is in fair condition and some measures provide partial protection; High = Equipment is in good condition, is well-secured and measures provide good protection. IF THE HOSPITAL DOES NOT HAVE THESE SERVICES, LEAVE BOXES BLANK AND PROVIDE COMMENT.	☐	☐	☐	
103. Condition and safety of medical equipment in other services Safety ratings: Low = More than 30% of equipment is at risk of material or functional failure and/or equipment puts the entire service's operation at direct or indirect risk; Average = Between 10% and 30% of equipment is at risk of loss; High = Less than 10% of equipment is at risk of loss.	☐	☐	☐	
104. Medicines and supplies Safety ratings: Low = Nonexistent; Average = Supply covers less than 72 hours at maximum capacity; High = Supply guaranteed for at least 72 hours at maximum hospital capacity.	☐	☐	☐	
105. Sterilized instruments and other materials Safety ratings: Low = Nonexistent; Average = Supply cover less than 72 hours at maximum capacity; High = Supply is guaranteed for at least 72 hours at maximum hospital capacity.	☐	☐	☐	

Continue >>

(Continued) 3.4 Equipment and supplies	Safety level			Observations (evaluators' comments)
	Low	Average	High	
106. Medical equipment specifically used in emergencies and disasters Safety ratings: Low = Nonexistent; Average = Supply covers less than 72 hours at maximum hospital capacity; High = Supply guaranteed for at least 72 hours at maximum hospital capacity.	☐	☐	☐	
107. Supply of medical gases Safety ratings: Low = Less than 10 days' supply; Average = Supply for between 10 and 15 days; High = Supply for at least 15 days.	☐	☐	☐	
108. Mechanical volume ventilators Safety ratings: Low = Nonexistent; Average = Supply covers less than 72 hours at maximum hospital capacity; High = Supply guaranteed for at least 72 hours at maximum hospital capacity.	☐	☐	☐	
109. Electromedical equipment Safety ratings: Low = Nonexistent; Average = Supply covers less than 72 hours at maximum hospital capacity; High = Supply guaranteed for at least 72 hours at maximum hospital capacity.	☐	☐	☐	
110. Life-support equipment Safety ratings: Low = Nonexistent; Average = Supply covers less than 72 hours at maximum hospital capacity; High = Supply guaranteed for at least 72 hours at maximum hospital capacity.	☐	☐	☐	
111. Supplies, equipment or crash carts for cardiopulmonary arrest Safety ratings: Low = Nonexistent; Average = Supplies and equipment for cardiopulmonary emergencies (or crash carts) in good condition but cover less than 72 hours at maximum hospital capacity; High = Supplies and equipment for cardiopulmonary emergencies (or crash carts) guaranteed in good condition and adequate supplies for at least 72 hours at maximum hospital capacity.	☐	☐	☐	

Comments on the results of Form 2, Module 3.

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Name/signature of evaluator(s).....

Module 4: Emergency and disaster management

4.1 Coordination of emergency and disaster management activities	**Safety level**			**Observations (evaluators' comments)**
	Low	Average	High	
112. Hospital Emergency/Disaster Committee Safety ratings: Low = Committee does not exist, or 1–3 departments or disciplines represented; Average = Committee exists with 4–5 departments or disciplines represented, but is not fulfilling functions effectively; High = Committee exists with 6 or more departments or disciplines represented and is fulfilling functions effectively.	☐	☐	☐	
113. Committee member responsibilities and training Safety ratings: Low = Committee does not exist or members are untrained and responsibilities not assigned; Average = Members have received training and have been officially assigned; High = All members are trained and are actively fulfilling their roles and responsibilities.	☐	☐	☐	
114. Designated emergency and disaster management coordinator Safety ratings: Low = There is no staff member who has been assigned responsibilities as the emergency/disaster management coordinator; Average = Emergency/disaster management coordination tasks have been assigned to a staff member, but it is not his/her main task; High = A staff member is assigned the emergency and disaster management coordination responsibilities as his/her main task, is fulfilling the role of implementing the hospital's preparedness programme.	☐	☐	☐	
115. Preparedness programme for strengthening emergency and disaster response and recovery Safety ratings: Low = A programme for strengthening preparedness, response and recovery does not exist or, if it exists, no preparedness activities are being implemented; Average = A programme for strengthening preparedness, response and recovery exists and some activities are being implemented; High = A programme for strengthening preparedness, response and recovery is being fully implemented under the leadership of the Hospital Emergency/Disaster Committee.	☐	☐	☐	
116. Hospital incident management system Safety ratings: Low = No arrangements for hospital incident management exist; Average = Staff assigned to key hospital incident management positions but with no written procedures to operationalize its functions; High = Hospital incident management procedures exist and are fully operational with properly trained personnel to assume different coordination roles and responsibilities.	☐	☐	☐	
117. Emergency Operations Centre (EOC) Safety ratings: Low = The EOC is not designated or is in an unsafe or insecure location; Average = The designated EOC is in a safe, secure and accessible location, but would have limited operational capacity immediately in an emergency; High = The EOC is in a safe, secure, and accessible location with immediate operational capacity.	☐	☐	☐	
118. Coordination mechanisms and cooperative arrangements with local emergency/disaster management agencies Safety ratings: Low = No arrangements exist; Average = Arrangements exist but are not fully operational; High = Arrangements exist and are fully operational.	☐	☐	☐	
119. Coordination mechanisms and cooperative arrangements with the health-care network Safety ratings: Low = No arrangements exist; Average = Arrangements exist but are not fully operational; High = Arrangements exist and are fully operational.	☐	☐	☐	

4.2 Hospital emergency and disaster response and recovery planning	Safety level			Observations (evaluators' comments)
	Low	Average	High	
120. Hospital emergency or disaster response plan Safety ratings: Low = Plan is not documented; Average = Documented plan is complete, but is not easily accessible, not up to date (more than 12 months since the last update); High = Plan is complete, easily accessible, reviewed/updated at least annually, and resources are available to implement the plan.	☐	☐	☐	
121. Hospital hazard-specific subplans Safety ratings: Low = Hazard-specific response subplans are not documented; Average = Documented plans are complete but not easily accessible, not up to date (more than 12 months since last review/update); High = Documented plans are complete, reviewed/updated at least annually, and resources are available to implement the plans.	☐	☐	☐	
122. Procedures to activate and deactivate plans Safety ratings: Low = Procedures do not exist or exist only as a document; Average = Procedures exist, personnel have been trained, but procedures are not updated or tested annually; High = Up-to-date procedures exist, personnel have been trained, and procedures have been tested at least annually.	☐	☐	☐	
123. Hospital emergency and disaster response plan exercises, evaluation and corrective actions Safety ratings: Low = Response plan and subplans have not been tested; Average = Response plan or subplans are tested, but are not tested at least annually; High = Response plan or subplans are tested at least annually and updated according to the exercise results.	☐	☐	☐	
124. Hospital recovery plan Safety ratings: Low = Recovery plan is not documented; Average = Documented plan is complete, but not easily accessible, not up-to-date (more than 12 months since last review/update); High = Documented plan is complete, easily accessible, and reviewed/updated at least annually.	☐	☐	☐	
4.3 Communication and information management	**Safety level**			**Observations (evaluators' comments)**
	Low	Average	High	
125. Emergency internal and external communication Safety ratings: Low = Central internal and external communication system functions inconsistently or incompletely; operators are not trained in emergency communication; Average = System functions appropriately, operators have received some training in emergency communication, tests are not conducted at least annually; High = System functions completely and operators are fully trained in emergency use, and tests of the system are conducted at least annually.	☐	☐	☐	
126. External stakeholder directory Safety ratings: Low = Directory of external stakeholders does not exist; Average = Directory exists but is not current (more than 3 months since it was updated); High = Directory is available, is up to date and is held by key emergency response staff.	☐	☐	☐	
127. Procedures for communicating with the public and media Safety ratings: Low = Procedures do not exist, no spokesperson nominated; Average = Procedures exist and nominated spokespersons have been trained; High = Procedures exist, nominated spokespersons have been trained, and procedures have been tested at least annually.	☐	☐	☐	
128. Management of patient information Safety ratings: Low = Procedures for emergency situations do not exist; Average = Procedures for emergency situations exist and personnel have been trained but no resources are available; High = Procedures for emergency situations exist, personnel have been trained, and resources are in place for implementation.	☐	☐	☐	

4.4 Human resources	Safety level			Observations (evaluators' comments)
	Low	Average	High	
129. Staff contact list Safety ratings: Low = Contact list does not exist; Average = List exists, but is not current (more than 3 months since it was updated); High = List is available and up to date.	☐	☐	☐	
130. Staff availability Safety ratings: Low = Less than 50% of staff are available to run each department adequately; Average = 50–80% of staff are available; High = 80–100% of staff are available.	☐	☐	☐	
131. Mobilization and recruitment of personnel during an emergency or disaster Safety ratings: Low = Procedures do not exist or exist only in a document; Average = Procedures exist and personnel have been trained, but the human resources for an emergency situation are not available; High = Procedures exist, personnel have been trained, and the human resources are available to meet anticipated needs in an emergency.	☐	☐	☐	
132. Duties assigned to personnel for emergency or disaster response and recovery Safety ratings: Low = Emergency assignments do not exist or are not documented; Average = Duties are identified, some (but not all) personnel receive written assignments or training; High = Written duties are assigned, and training or an exercise is conducted for all personnel at least annually.	☐	☐	☐	
133. Well-being of hospital personnel during an emergency or disaster Safety ratings: Low = A designated space and measures do not exist; Average = Space has been designated, but measures cover less than 72 hours; High = Measures are ensured for at least 72 hours.	☐	☐	☐	
4.5 Logistics and finance	**Safety level**			**Observations (evaluators' comments)**
	Low	Average	High	
134. Agreements with local suppliers and vendors for emergencies and disasters Safety ratings: Low = No arrangements exist; Average = Arrangements exist, but are not fully operational; High = Arrangements exist and are fully operational.	☐	☐	☐	
135. Transportation during an emergency Safety ratings: Low = Ambulances and other vehicles and modes of transportation are not available; Average = Some vehicles are available, but not in sufficient numbers for a major emergency or disaster; High = Appropriate vehicles in sufficient numbers are available during emergencies/disasters.	☐	☐	☐	
136. Food and drinking-water during an emergency Safety ratings: Low = Procedures for food and drinking-water for emergencies are non-existent; Average = Procedures exist, food and drinking-water is guaranteed for less than 72 hours; High = Food and drinking-water for emergencies is guaranteed for at least 72 hours.	☐	☐	☐	
137. Financial resources for emergencies and disasters Safety ratings: Low = Emergency budget or mechanism to access emergency funds is not in place; Average = Funds are budgeted and mechanisms are available but cover less than 72 hours; High = Sufficient funds are guaranteed for 72 hours or more.	☐	☐	☐	

4.6 Patient care and support services	Safety level			Observations (evaluators' comments)
	Low	Average	High	
138. Continuity of emergency and critical care services Safety ratings: Low = Procedures do not exist or exist only as a document; Average = Procedures exist, personnel have been trained but would not be available at all times; High = Procedures exist, personnel have been trained, and resources are available to implement procedures at maximum hospital capacity for emergency and disaster situations at all times.	☐	☐	☐	
139. Continuity of essential clinical support services Safety ratings: Low = Procedures do not exist or exist only as a document; Average = Procedures exist and personnel have been trained but would not be available at all times; High = Procedures exists, personnel have been trained, and resources are available to implement procedures at maximum hospital capacity for emergency and disaster situations at all times.	☐	☐	☐	
140. Expansion of usable space for mass casualty incidents Safety ratings: Low = Space for expansion has not been identified; Average = Space has been identified; equipment, supplies and procedures are available to carry out the expansion and staff have been trained, but testing has not been conducted; High = Procedures exist and have been tested, personnel have been trained, and equipment, supplies and other resources are available to carry out the expansion of space.	☐	☐	☐	
141. Triage for major emergencies and disasters Safety ratings: Low = Designated triage location or procedures do not exist; Average = Triage location and procedures exist and personnel have been trained, but procedures have not been tested for emergency and disaster situations; High = Location and procedures exist and have been tested, personnel have been trained, and resources are in place to implement at maximum hospital capacity in emergency and disaster situations.	☐	☐	☐	
142. Triage tags and other logistical supplies for mass casualty incidents Safety ratings: Low = Nonexistent; Average = Supply covers less than 72 hours of maximum hospital capacity; High = Supply guaranteed for at least 72 hours of maximum hospital capacity.	☐	☐	☐	
143. System for referral, transfer and reception of patients Safety ratings: Low = Procedures do not exist or exist only as a document; Average = Procedures exist and personnel have been trained, but procedures have not been tested for emergency or disaster situations; High = Procedures exist and have been tested, personnel have been trained, and resources are available to implement measures at maximum hospital capacity in emergency or disaster situations.	☐	☐	☐	
144. Infection surveillance, prevention and control procedures Safety ratings: Low = Policies and procedures do not exist; standard precautions for infection prevention and control are not followed routinely; Average = Policies and procedures exist, standard precautions are routinely followed, personnel have been trained, but the level of resources required for emergency and disaster situations, including epidemics, is not available; High = Policies and procedures exist, infection prevention and control measures are in place, personnel have been trained, and resources are available to implement measures at maximum hospital capacity in emergency and disaster situations.	☐	☐	☐	
145. Psychosocial services Safety ratings: Low = Procedures do not exist or exist only as a document; Average = Procedures exist and personnel have been trained, but the level of resources required for emergency and disaster situations is not available; High = Procedures exist, personnel have been trained, and resources are available for implementation of procedures at maximum hospital capacity in emergency and disaster situations.	☐	☐	☐	

146. Post-mortem procedures in a mass fatality incident Safety ratings: Low = Procedures for a mass fatality incident do not exist or exist only as a document; Average = Procedures exist and personnel have been trained, but the level of resources required for emergency and disaster situations is not available; High = Procedures exist, personnel have been trained, and resources are available for implementation of procedures at maximum hospital capacity in emergency and disaster situations.	☐	☐	☐	
4.7 Evacuation, decontamination and security	**Safety level**			**Observations (evaluators' comments)**
	Low	Average	High	
147. Evacuation plan Safety ratings: Low = Plan does not exist or exists only as a document; Average = Plan exists and personnel have been trained in procedures, but tests are not conducted regularly; High = Plan exists, personnel have been trained, and evacuation drills are held at least annually.	☐	☐	☐	
148. Decontamination for chemical and radiological hazards Safety ratings: Low = No personal protective equipment is available for immediate use by hospital staff, or no decontamination area exists; Average = Personal protective equipment is available for immediate use, decontamination areas are established, staff training and drills are not conducted annually; High = Personal protective equipment is available for immediate use, decontamination areas are established and personnel are trained and tested at least annually.	☐	☐	☐	
149. Personal protection equipment and isolation for infectious diseases and epidemics Safety ratings: Low = No personal protective equipment is available for immediate use by hospital staff, or no isolation area exists; Average = Supply is available for immediate use, but is sufficient for less than 72 hours of maximum hospital capacity, isolation areas are established, staff training and testing of procedures are not conducted annually; High = Supply is guaranteed for at least 72 hours of maximum hospital capacity and alternate sources are in place for resupply, isolation areas are established, staff training and testing of procedures are conducted at least annually.	☐	☐	☐	
150. Emergency security procedures Safety ratings: Low = Emergency security procedures do not exist or exist only as a document; Average = Documented procedures exist and personnel have been trained in emergency security procedures but testing is not conducted at least annually; High = Personnel are trained and tests of the documented procedures are held at least annually.	☐	☐	☐	
151. Computer system network security Safety ratings: Low = The hospital does not have a computer security system plan and procedures in place; Average = The hospital has a basic cyber security plan in place but it is not monitored and updated regularly; High = The hospital has a cyber security plan in place and it is updated regularly.	☐	☐	☐	

Comments on the results of Form 2, Module 3.

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Name/signature of evaluator(s).....

World Health Organization

SAFE HOSPITALS INITIATIVE

Protecting people's health from emergencies and disasters

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