

بمناسبة إطلاق فعاليات مشروع "تخفيف مخاطر الزلازل في فلسطين" **SASPARM**،
وزيارة الممثل الخاص للأمين العام للأمم المتحدة للحد من مخاطر الكوارث
السيدة مارجريتا والاستروم

تخفيف مخاطر الكوارث في فلسطين

Disaster Risk Mitigation in Palestine”



EUCENTRE

European Centre for Training and Research in Earthquake Engineering



الجلسة الثانية: المدارس الآمنة، والمستشفيات الآمنة،

Second Session: Safer schools and Safer hospitals,

قابلية الإصابة الزلزالية للعناصر غير الإنشائية في مباني عدد من المستشفيات في فلسطين

Non Structural Seismic Vulnerability Assessment of Hospitals in Palestinian Cities

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- **Remarks:** *This study comes under the **auspices** of the USAID-funded “Flagship project” that is reforming and developing the Palestinian healthcare sector.*

PALESTINIAN HEALTH SECTOR REFORM AND DEVELOPMENT PROJECT (FLAGSHIP PROJECT)

Non Structural Seismic Vulnerability Assessment of Hospitals and Health Centers in Palestinian Cities

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General Introduction (Background)

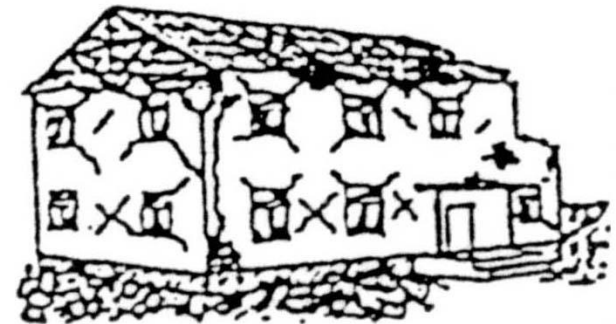
- The Concept of Disaster Risk Reduction

Objectives of Ordinary Seismic Design

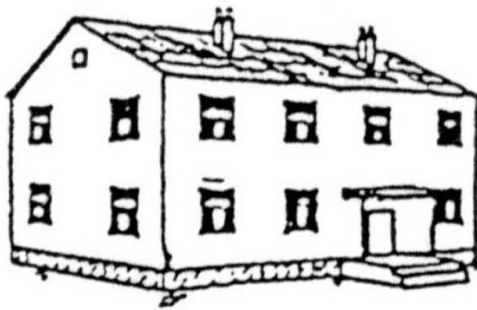
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General Introduction

Seismic Design of Important and Essential Buildings



What is a safe hospital?

ما هو المستشفى الآمن ؟

A Safe Hospital

Is a **health facility** whose services remains **functional** at its **maximum capacity** and at its **same infrastructure** immediately after a destructive natural phenomena.

Safe Hospitals Index: Calculator

1. Hazard Analysis
2. Structural safety (history of the buildings, structural systems, construction materials etc)
(Weighting – 40%)
3. Non-structural safety (critical systems, HVAC, office and medical equipment, architectural elements)
(Weighting – 20%)
4. Organization and management of the institution
(Disaster plan, operational and contingency plans etc.) (Weighting – 20%).
5. Health Workforce (Weighting - 20 %)

General Introduction

| Safety Index | Category Type | What should be done? |
|--------------|---------------|---|
| 0 – 0.35 | Category C | Urgent intervention measures are needed. The hospital's current safety levels are inadequate to protect the lives of patients and staff during and after a disaster. |
| 0.36 – 0.65 | Category B | Intervention measures are needed. The hospital's current safety levels are such that patients, hospital staff and its ability to function during and after a disaster are potentially at risk. |
| 0.66 – 1 | Category A | It is likely the hospital will function in the case of a disaster. It is recommended however, to continue with measures to improve response capacity and to carry out preventive measures in the medium- and long-term to improve the safety level in case of disaster. |

SECTION II: ACTIVITIES CONDUCTED

Alia Hospital in Hebron.

مستشفى عليّة



نسبة مساحة الفراغات في المستشفى من المساحة الكلية: 0.62%

Rafidia – Nablus city

مستشفى رفيديا



نسبة مساحة الفراغات في المستشفى من المساحة الكلية: 0.54%

PMC – Ramallah City



نسبة مساحة الفراغات في المستشفى من المساحة الكلية: 0.62%

الطابق الثاني

قسم الاطفال والنسائية والحدج



الجزء الشرقي



الجزء الغربي



ملاحظات سلامة عامة:

- مخرج الطوارئ الخاص بالجزء الشرقي مغلق بشكل دائم، وهو داخل غرفة أطفال- طريقة فتح الباب بحاجة لدراسة-صورة 35

- الجدران الزجاجية في الغرفة الترفيهية صورة 36 بحاجة لدراسة، التقييم الأولي أظهر أن له مستوى خطورة في حالة التعرض للزلازل

- معظم الأجهزة معلقة على جدران من الطوب غير المرتبط أو المسلح.

- عدد من حاضنات الأطفال حديثي الولادة توجد قرب النوافذ الخارجية أو أسفل جدران الطوب غير مسلحة أو مربطة

ملاحظات إنشائية:

- جدران القسامات بين الغرف من طوب سماكة 15سم وبعض الجدران المحمولة والقسامات من طوب سماكة 10سم.
- عرض الفاصل الإنشائي غير كافي.

Northern wing – floor no 2, Hebron hospital

More than one hundred thousands m² have been investigated

SECTION III:

FINDINGS, CHALLENGES, RECOMMENDATIONS, AND NEXT STEPS

النتائج والتحديات والتوصيات والخطوات المقبلة

FINDINGS


- 1- The hospitals and other health institutions that were assessed do not have the necessary safety requirements.
- 2- The walls on which medical equipment is hung are made of hollow block which is not properly reinforced or connected to the surrounding frames or the structural members and will most probably fall or collapse under moderate or strong earthquake forces.
- 3- A significant proportion of the mechanical installations and equipment will be subjected to damages under relatively strong earthquake forces

Findings



Recommendations

FINDINGS

- The assessed hospitals are located in areas with a high density of houses and suffer from a lack of an appropriate amount of open space between and around the buildings.
- The main access roads to these hospitals will be subjected to total or partial closure if subjected to a moderate or strong earthquake.  there will be a major interruption in the traffic surrounding them.
- All assessed hospitals are in need of additional external exists and entrances.
- others

The centralization of the services will result in adverse and bad consequences if subjected to natural disasters.

Challenges (تحديات)

- Lack of knowledge and experience in Contingency Planning (CP) and Disaster Management.**
- High probability of natural disaster occurrence, including earthquakes and man-made disasters.**
- Lack of the national planning policy to integrate the DRR with sustainable development.**
- Decentralization and a common language between different departments and directorates in the MoH will be faced with resistance at different administrative.**

- **Uncertainty of MoH financial resources over the next few years and an inadequate distribution of infrastructures and human resources.**
- **The fact that the main hospitals are located where there is a high density of people and buildings which impose serious obstacles in implementing a major part of the plan regarding upgrading the hospitals and the surrounding areas to achieve the standards.**
- **Other challenges**

RECOMMENDATIONS

- **Within the next month:**
- **Within the next six months:**
- **Within the next year:**

Recommendations

- 1- Carry out an assessment of the different types of risks at all the hospitals, health centers, clinics, and the different institutions that are a part of the Palestinian MoH within the year.**

Recommendations

2. Carry out the rehabilitation of hospitals, health centers, and MoH buildings according to safety requirements and conditions that can be addressed in the short and medium term:
 - Providing buildings, other structures, and corridors with safety signage and escape routes.

Recommendations

- Upgrading the main and emergency exit doors; including modifying the way these doors open (i.e. modifying them so that they open outward instead of inward). This will make any escape process faster and safer.



- Rehabilitating the interior doors that connect wings and corridors such that they are capable of opening in either direction.
- Others...



Placing the furniture, equipment, and tools on the walls

- **Placing the furniture, equipment, and tools on the walls in accordance with their size and shape and in a way that corresponds to the walls' composition and type.**
- **Removing heavy pieces of furniture or equipment from partition walls which are vulnerable to collapse if they are subject to an earthquake.**



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- Rehabilitating the edges of shelves so that materials (especially chemical materials) and tools placed on them do not fall down.



Feedback



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Seismic Building Code and Non-structural Elements





Nonstructural Damages

3- Reducing the possibility of nonstructural damages occurring in the event that the region is subject to a moderate or strong earthquake:

3.1. Stop increasing the risk for new health buildings

.....by using partition walls in a suitable way or by isolating them from structural elements.

Examples:

From Investigated Hospitals

الطابق الأرضي- المبنى الجديد



ملاحظات سلامة عامة:

- مخرج طوارئ مغلق بشكل دائم ويفتح إلى الداخل
- صورة 6، ويوجد أمامه عوائق.
- أنابيب الأكسجين غير مربطة- صورة 7
- بعض التمديدات الصحية تمر من خلال الجدران بدون فاصل بينهما
- صورة 10 و 11.

ملاحظات إنشائية:

- بعض جذران القسامات من طوب 10 سم
- جذران القسامات من الطوب غير المسلح
- تم تحميل الماتورات والأجهزة الأخرى على أرضية الطابق الأرضي فوق سقف طابق التسوية انظر الصور
- بعض الرفوف والخزائن غير مثبتة بالجدران

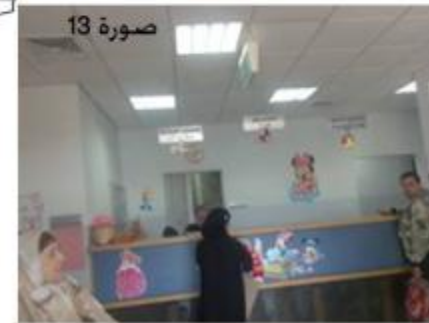
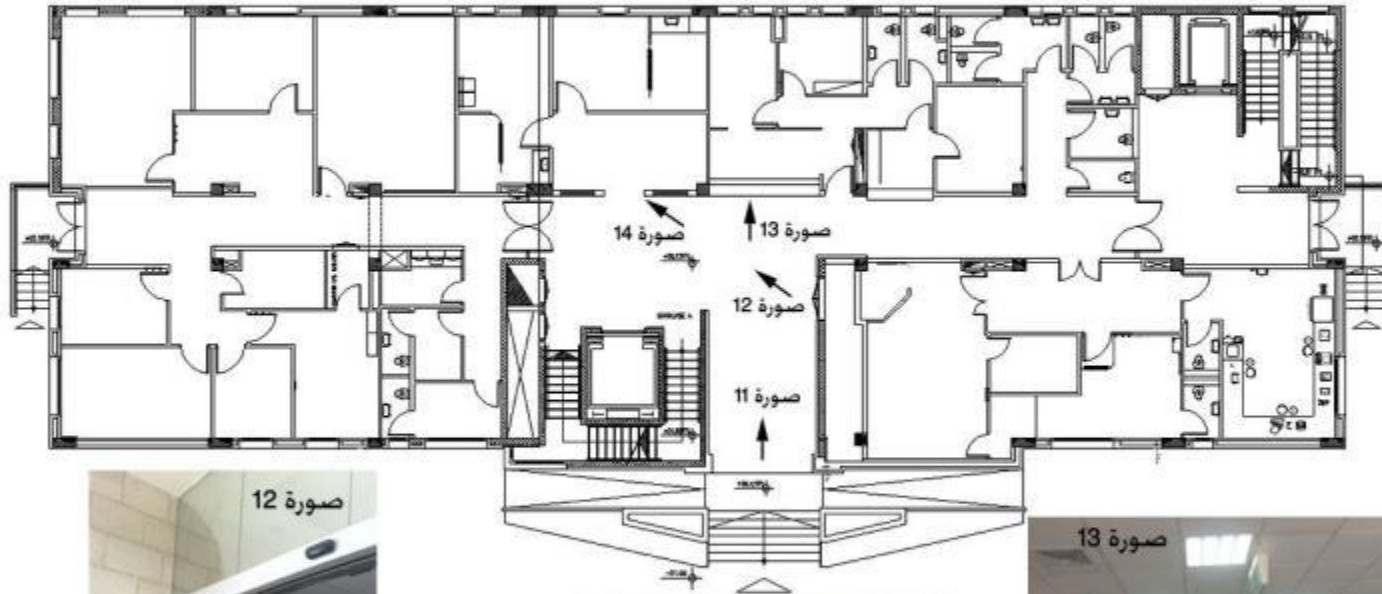
المستشفى البحريني

الطابق الأرضي

Ground Floor

ملاحظات إنشائية:

- معظم جدران الطوب (جدران القسامات) تتكون من طوب إسمنتي سماكة 10 سم
- تشكيل ظاهرة العمود القصير في عناصر خرسانية، ومن المرجح أنها غير إنشائية، صورة 14



3- Reducing the possibility of nonstructural damages.....

3.2. Start decreasing the existing risks

- **Establishing a comprehensive plan and implementing it over the medium and long term to upgrade the nonstructural elements (i.e. the seismic retrofitting of existing buildings), and thereby decreasing their risk level.**

This includes upgrading partition walls in the corridors and between rooms; priority being given to surgery and similarly equipped rooms.

Beside brick-walls, there is a need to upgrade other elements, these include:

- the stone pieces that are located at the entrances of hospitals and on the external walls,**
- marble and granite pieces that are placed on the walls,**
- decorative elements, and so on.**

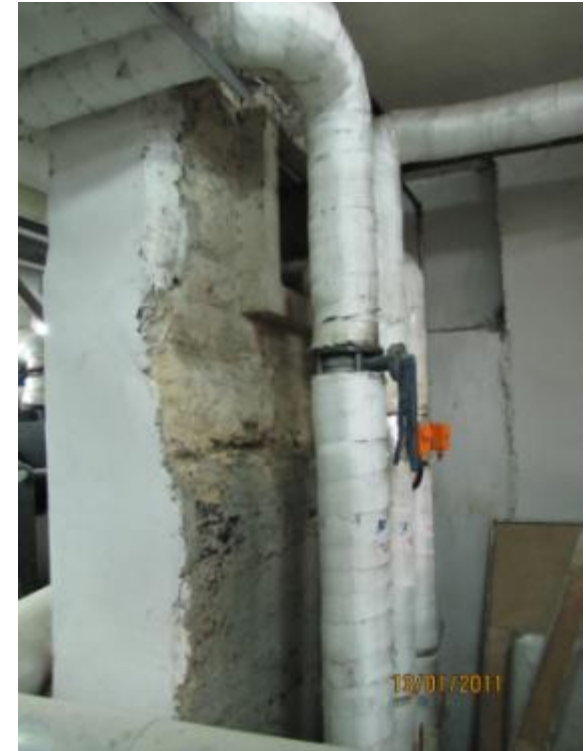


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3- Reducing the possibility of nonstructural damages.....

- Rehabilitating the mechanical pipes and extensions in the places where they intersect the walls and different elements of the buildings.



This includes placing an insulating material (rubber) between these pipes and any concrete surfaces.

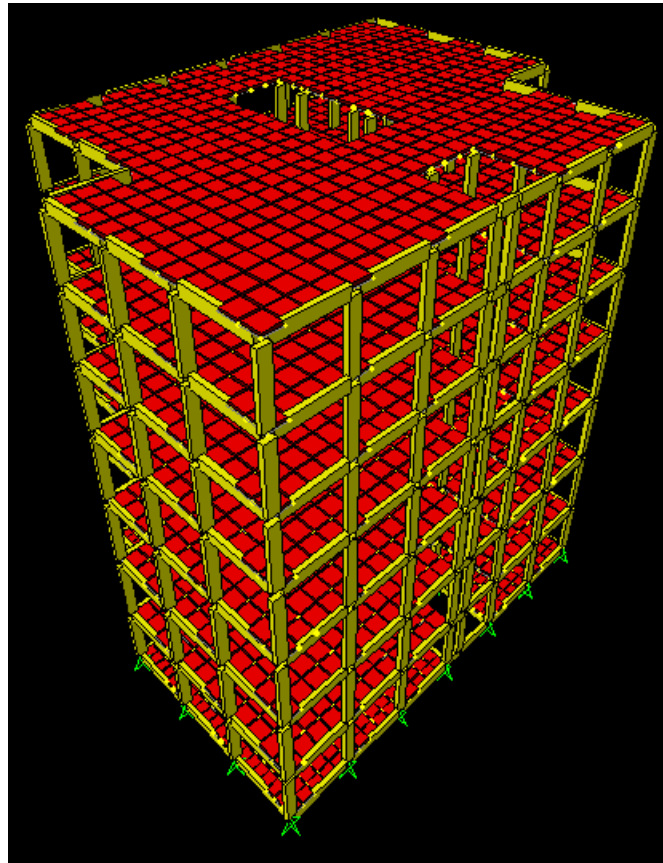


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3- Reducing the possibility of nonstructural damages.....

- Carrying out an advanced seismic assessment of MoH buildings, giving priority to old hospitals, by using dynamic seismic analysis methods based on 2 dimensional or 3 dimensional methods.



4- Capacity building:

5 – The relationship between the hospital buildings and their surrounding spaces:

العلاقة بين مباني المستشفى والفراغات المحيطة

In order to provide effective emergency management during disasters, spaces around hospitals must be incorporated and rehabilitated. Roads leading to these hospitals must also be assessed.

Rafidia – Nablus city



نسبة مساحة الفراغات في المستشفى من المساحة الكلية: 0.54%

- Preventing the addition of buildings to the present open spaces around the following hospitals: Rafidia Hospital in Nablus, the PMC in Ramallah and Aalia Hospital in Hebron.

اللون الاحمر: يتوقع حصول اغلاق كلي كأقصى حد او اغلاق جزئي للطريق.

اللون الاصفر: احتمال حصول اغلاق واعاقات متوسطة ويمكن معالجتها خلال وقت قصير باستخدام الجرافات.

اللون اخضر: طريق سالك.

تنويه: يمكن استخدام نفس المخطط في حالة حصول اكتظاظ للمركبات والاشخاص بسبب انواع اخرى من الكوارث او حالات الطوارئ.



حالة الطرق المؤدية لمستشفى عالية في مدينة الخليل في حالة تعرض المنطقة لزلازل قوي او قوي نسبياً

- Incorporating, as much as possible, more open spaces in the areas surrounding hospitals into the hospital campuses .



مخطط يظهر حاجة مستشفى رفيديا لمساحات اضافية من الارض (مقترح الاراضي المشار لها)

- Coordinating with the Palestinian Ministry of Interior (Mol) **to establish an effective traffic plan** that can be implemented during disasters or events that lead to the closure of many of roads that provide access routes to these hospitals.

THANKS



شكراً لحسن اصغائكم

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