



USAID | **LEBANON**
FROM THE AMERICAN PEOPLE

ENVIRONMENTAL ASSESSMENT OF THE MUDEIREJ BRIDGE RECONSTRUCTION PROJECT

FINAL REPORT

Prepared by

ECODIT (Lebanon)



AUGUST 2007

List of Appendices

- A. Minutes of meetings
- B. Minutes of scoping session
- C. Map showing the 4 designated quarry zones in Lebanon (Source: MoE)
- D. List of supplies needed for reconstruction
- E. Agreement between MAN Enterprises and landowner for rubble disposal
- F. Safety Manuals: Table of contents for OSHA (F1) and EM 385-1-1 (F2)
- G. Agreement between Contrack and Hemlin Hospital
- H. List of References

Appendix A

Minutes of meetings

Date: June 13, 2007

Object: Entrance interview with USAID Lebanon

Participants: Mrs. Sana Saliba (USAID), Mr. Rami Wehbeh (USAID), Mr. Karim El-Jisr (ECODIT) and Ms. Soraya Mokarzel, ECODIT Liban

Issues discussed:

- USAID Reconstruction Team
- Format and date for Scoping Session
- Road diversion
- Demolition waste
- Source of construction material
- EA Work Plan

Date: June 15, 2007

Object: Site Visit # 1

Participants: Essam Guirguis (USAID reconstruction team), Mr. Rami Wehbeh (USAID), Mr. Karim El-Jisr and Ms. Soraya Moukarzel of ECODIT Liban

Issues discussed:

- Describing the role of contractors and sub-contactors
- Bridge reconstruction sequence of work
- Scoping Session format and presentation by CII
- Options for demolition/ demolition plan
- Options for the removal / handling of demolition waste
- Source of construction material

Date: June 25, 2007 (Sofar)

Object: Meeting with Ramiz Chaya (mayor of Sofar) to discuss:

- Scoping session
- Sofar steel bridge
- Role of surrounding municipalities

Date: June 26, 2007 (CDR)

Object: Meeting with Elie El Helou (CDR) to discuss:

- Sofar steel Bridge
- Rubble disposal after the war
- Program and list of participants for scoping session
- Considerations for blasting

Date: July 12, 2007

Object: Site Visit #2

Participants: Essam Guirguis (USAID reconstruction team), Mr. Said Tarabay (Contract international), Mr. Issam Abou Jaoude of ECODIT Liban

Issues discussed:

- Landslide below the bridge near Pier 3
- Location of springs close to the site
- Rubble disposal site near the bridge used at the time of building the bridge (1998)
- Water sources

Date: August 1, 2007

Object: Site Visit # 3

People met: USAID Reconstruction Team: Mr. Essam Guirguis, Contrack International: Mr. Said Torbey, Mr. Mohammed Gouda, Baker: Mr. Ghassan Ziab

Issues discussed:

- Using local resources (workforce and materials/supplies)
- Safety on the bridge
- Emergency response plans
- Life span of the bridge
- Waste disposal
- Topographic survey
- Office premises
- Options related to repairing the North bridge

Date: August 9, 2007

Object: Site Visit # 4

People met: CII: Mr. Said Torbey, Mr. Mohammed Gouda and Mr. Bassem Assaf

Issues discussed:

- Location of approved disposal site
- Blasting protocol
- Lebanese legislation/restrictions on aggregate source
- Source of aggregates used in construction
- Safety while working on the bridge deck
- Truck regulations

Date: August 14, 2007

Object: Site Visit # 5

People met: CII: Mr. Mohammed Gouda, Mr. Imad: MAN

Issues discussed:

- Site visit to the rubble disposal site

Appendix B

Minutes of scoping session

Scoping session
Sofar Municipality
July 6, 2007

ECODIT organized on July 6 a scoping session for the Mudeirej Bridge Reconstruction project. The scoping session was hosted by the municipality of Sofar, one of five municipalities located near the Mudeirej Bridge. In total, 22 participants attended the scoping session (excluding ECODIT) which was followed by a visit to the site.

The program was as follows:

<p>10:00 Arrival 10:10 – 10:15 Opening remarks (USAID Lebanon) 10:15 – 10:30 Introductions and EA purpose (ECODIT) 10:30 – 10:45 Project Description (USAID Reconstruction Team) 10:45 – 11:00 Questions & Answers regarding the Project</p> <p>11:00 – 11:15 Coffee Break</p> <p>11:15 – 11:45 Presentation on key environmental issues (ECODIT) 11:45 – 12:30 Open discussion regarding potential environmental impacts (facilitated by ECODIT)</p> <p>12:45 Site Visit (tour provided by Contrack International)</p>
--

Arrival, welcome and project description:

Mr. Ramez Chayya, the Mayor of Sofar, welcomed the participants and Ms. Sana Saliba, Program Development Specialist at USAID, gave a brief overview of the project background and the reconstruction team. She then explained that USAID was committed to purchasing up to 70% of the material used for reconstruction locally (from Lebanon). The Director of ECODIT, Mr. Karim El-Jisr, then presented the objectives of the scoping session and Mr. Essam Guirguis, Team Leader for the USAID Reconstruction Team, presented the project that will result in the total repair and reconstruction of the bridge by 2009.

Environmental impacts:

After a presentation of the project's potential impacts, the participants raised important questions and made pertinent comments, summarized next:

1. General Comments

- The project could affect groundwater by disrupting natural water infiltration and/or pollute underground water reservoirs. The EA should study the geology (and soil type in the area) and determine the location of nearby springs.

- Several municipalities (incl. Hammana and Chbaniyeh) commented on the impact of the original bridge (and associated highway) on nearby lands on both sides of the highway (the highway from Sofar to Mudeirej across the Mudeirej Bridge has no service roads or exits). Many local residents lost their lands (or were not duly compensated) at the time of building the highway and bridge.
- The municipality of Sofar complained about the temporary steel bridge that was erected after the war on the damaged Sofar Bridge (located about 2 km north of the Mudeirej Bridge). The Sofar Bridge will be repaired using an Italian grant. The temporary bridge is causing severe noise pollution and will, according to Mr. Elie El Helou, be retrofitted with rubber sheets to minimize noise.
- Several municipalities also suggested to plant trees along both sides of the highway to minimize dust and noise. Elie El Helou of CDR invited these municipalities to visit the Council to discuss proposed amendments to the Tender Documents for the Sofar highway (prior to tendering).

While pertinent, the comments related to the Sofar steel bridge and highway fall outside the scope of the Mudeirej Bridge Reconstruction Project and related EA.

2. Anticipated positive impacts

The Mudeirej Bridge Reconstruction Project will:

- Restore the bridge and redeem its title as the *Highest bridge in the Middle East*
- Reduce travel time
- Reduce the number of road accidents
- Create jobs and economic activities during reconstruction

3. Potential adverse impacts

During *demolition*, the Mudeirej Bridge Reconstruction Project may:

- Generate a lot of demolition waste and rubble; reckless disposal would seriously degrade the environment and the landscape. Consider hauling the rubble to inactive quarries and use them to rehabilitate the sites (e.g., Ain Dara)
- Release a lot of dust (and a plume of smoke during blasting)
- Cause additional landslides (especially during blasting)

It was agreed that blasting offered several advantages over jack-hammering (namely speed) and that *implosion* (currently considered by CDR and the design contractors) is less intrusive than *explosion* and probably more effective and safer.

During *reconstruction*, the Mudeirej Bridge Reconstruction Project may:

- Cause noise pollution, traffic jams and air quality deterioration (due to dust)
- Lead to occupational accidents
- Increase pressure on natural resources if the source of aggregates is not controlled
- Affect roadside commerce in/around Sofar
- Require road diversions.

The participants made the following recommendations:

- Hire local workers (skilled and unskilled)
- Communicate the time of blasting in advance
- Make sure that local springs are not affected by the project
- Monitor and regulate the flow of trucks to/from the site (carrying construction materials and demolition waste)
- Verify the source of aggregates to minimize pressure on local resources (for example, by using a ticketing system to certify the origin of the aggregates)

مشروع إعادة بناء جسر المديرع
جلسة لتحديد نطاق تقييم الأثر البيئي
بلدية صوفر في ٦ تموز ٢٠٠٧

المشاركون

بريد الكتروني	رقم الفاكس	رقم الهاتف	الجهة	الاسم
hisham shayya@hotmail.com		٠٣/٤.٤٥٢٢	اتحاد بلديات البرراندطى بجندوب	١. هشام شيا
lebadil@hotmail.com		٠٣/٤٧٢٧٤٤	الجيش اللبناني	٢. اراء البرندى وليد أيضا
fatyasse essam.guirguis@lebanonq.net		03/482619	USAID	٣. فاطم جرحس
mgouda@comtrack.com		03 498747	كوتوال انترناشيونال	٤. محمد حورده
		011301689		٥. الهجره الهادي حدي بشار هادي هادي الهادي سام موري الاقفا الهادي سك - صليبا
salilam@state.gov		04-543 600	USAID	٧.

بريد الالكتروني	رقم الفاكس	رقم الهاتف	الجهة	الاسم
		٥٠٣٥٣٣٣٣٣٥	USAID	٣٠. اميليا وودج
		٧٠١٦١٢١٧	CONTRACT	٣١. سحر عيسى
		٧٥٠١٦٠١٢٠١٣	CONTRACT	٣٢. عيسى عيسى
		٧٠١٦٨٦٥٧	CONTRACT	٣٣. هادي روتلاز
basraf@comtrack.com		٥٣/١٩٤١٢٧	CONTRACT	٣٤. جعفر عيسى
Socotec@cyberia.net.lb.	٥١/٢١٨٣١٥	٥٣/٢٣٢٢٤١	SOCOTEC LIBAN	٣٥. دانيال عيسى
Phmahedih@cyberia.net.lb.	٥٧/٥٥١٥٨٥	٥٣/٨٣٥٨٦٥	لوجيستيا مستشارية	٣٦. محمد لاخوري
	٥١/٢٧٧٧٦٢	٥٣/١١٥٢٤٩	بلدية البقاع	٣٧. وليد سنان ابيك
	٥٠/٥٣٠١٠٩	٥٣/٣٣٤٤٧٧	بلدية طانا	٣٨. حبيب رزيق
	—	٥٣/٥٧٠٠٩٥	البلدية	٣٩. هليل حورس
عائشة عيسى	٥٠٣٠٣٦٧٤٥		البلدية	٤٠. عائشة رطل

Appendix C

Map showing the four (4) designated quarry zones in Lebanon

Source: The Ministry of Environment, Service of Conservation of Nature, Department of Protection of Natural Resources. Ref.: Decree#16456 dated 27/2/2006

تعميم رقم ١٩ / ٢٠٠٦

٢٠٠٦ / ١٠ / ٤

١٦٥١

عدد
١٦٥١

الى جميع الادارات العامة والمؤسسات العامة والبلديات التي تقوم بتزويد مشاريع انشائية
بضرورة الزام المقاولين والمتعهدين العاملين في المشاريع العائدة للقطاع العام بالتزود بمواد
البحص والرمل والصخور من المصادر المرخصة وفقاً للاسول

بموجب المرسوم رقم ٨٨٠٣ تاريخ ٢٠٠٢/١٠/٤ تم تنظيم المقالع والكسرات ، وقد تم
تعديله بموجب المرسوم رقم ١٦٤٥٦ تاريخ ٢٠٠٦/٢/٢٧ وحدد تاريخ بدء العمل به بتاريخ
٢٠٠٦/٦/٩ .

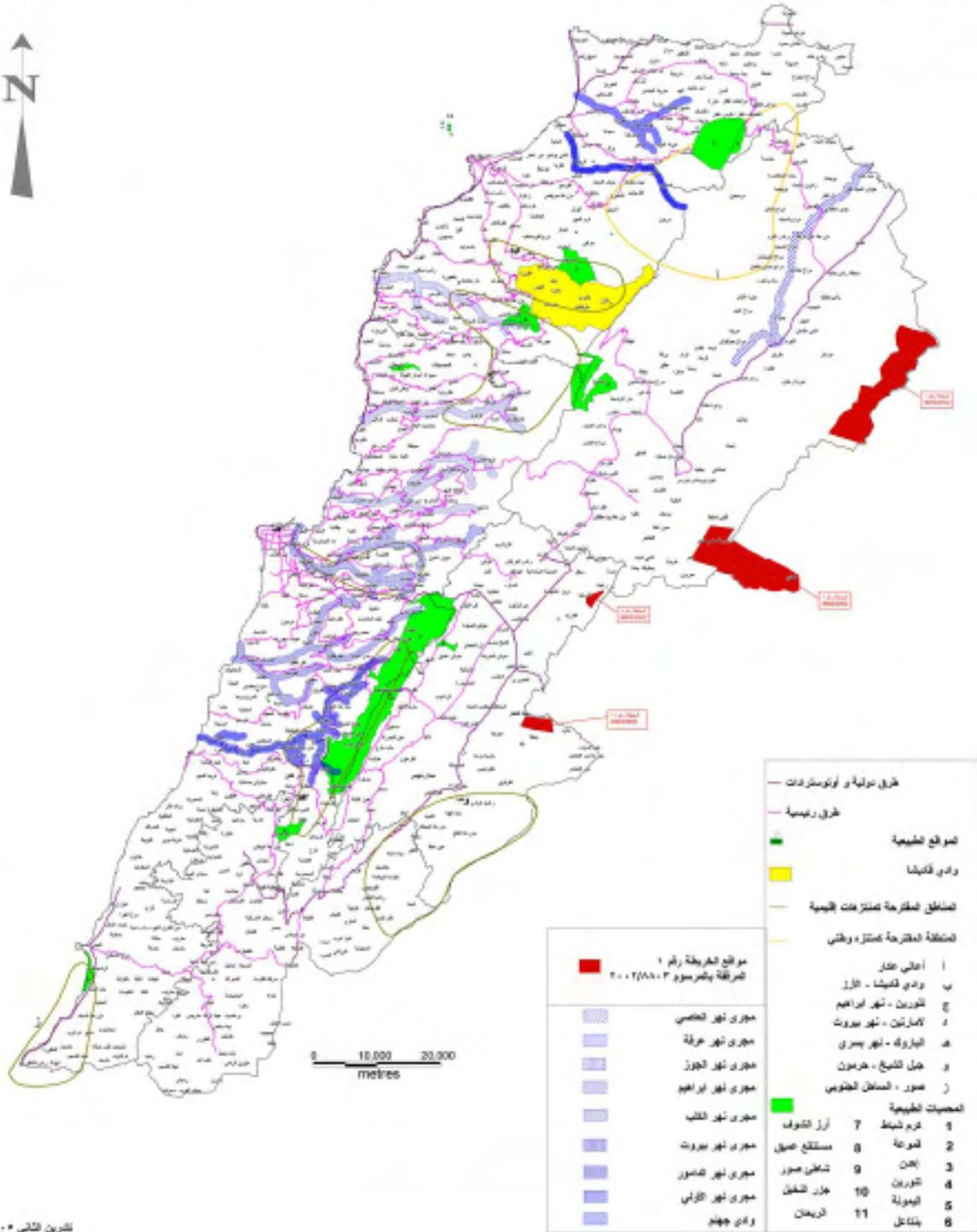
وحيث ان معظم الادارات العامة هي المستهلك الاكبر لمواد البحص والرمل والصخور .

وبما ان الطريقة الفضلى لتنظيم هذا السوق هي تطبيق الانظمة التي ترعاها عبر قيام
الادارات العامة التي تقوم بتزويد مشاريع انشائية بالزام المقاولين والمتعهدين العاملين في المشاريع
العائدة للقطاع العام بالتزود بمواد البحص والرمل والصخور من المصادر المرخصة وفقاً للقوانين
والانظمة النافذة .

لذلك ، يطالب الى جميع الادارات والمؤسسات العامة والبلديات التي تقوم بتزويد مشاريع انشائية
الزام المقاولين والمتعهدين العاملين في المشاريع العائدة للقطاع العام بالتزود بمواد البحص والرمل
والصخور من المصادر المرخصة وفقاً لما نصت عليه القوانين والانظمة النافذة ولا سيما المرسوم
رقم ٨٨٠٣ تاريخ ٢٠٠٢/١٠/٤ وتعديلاته .

رئيس مجلس الوزراء
شمار السويدي

مديرية ٢٠ / ٢٠٠٦



Appendix D

List of supplies needed for reconstruction

Description	Qty.	Unit	Source
<u>STEEL REINFORCEMENT</u>			
Steel reinforcement all diameters.	1,565	Tons	Demco/Yared
<u>Bearings</u>			
Pot bearing sliding in one direction.	21	No.	Fressynet
Pot bearing sliding in two directions.	21	No.	Fressynet
Transverse elastic restraint.	26	No.	Fressynet
Shock transmission unit.	4	No.	Fressynet
<u>Propping</u>			
Paint to concrete surfaces (cement colour).	1,500	Galon	CTC,A-Built, Intertectra, Tonaco, T BM
Expansion joints between abutments and deck slab.	33	m	Fressynet
<u>Fences</u>			
External fence to deck.	475	m	Tecman Industries
Internal fence to deck.	475	m	Tecman Industries
<u>Water prrofig</u>			
Two Layers of Waterproofing Membrane, Complete with Protection Layer as Approved by Engineer over bridge deck.	7,925	m2	TBM,Intertectra,A-Built
Two coats of bituminous coating to surfaces of concrete below ground.	350	m2	TBM,Intertectra,A-Built
Cementitious integral crystalline waterproofing compound to abutment seats and abutments diaphragm.	500	m2	TBM,Intertectra,A-Built

Description	Qty.	Unit	Source
<u>Fiber Wrap (To repair North Piers 5 & 6)</u>			
Sika Wrap 100 G	6,600	m2	Sika
Sikadur 330	9,000	m2	Sika
<u>Rain Water Pipes Including Fittings and Fixing Accessories:</u>			
PVC pipes 150 mm diameter.	12	L.M.	TBD
PVC pipes 200 mm diameter.	600	L.M.	TBD
<u>Grating</u>			
300 x 300 mm steel grating.	12	No.	TBD
<u>Street Lighting</u>			
1 x 100mm diameter PVC ducts.	490	L.M	
4 x 16mm ² + E = 16mm ²	790	L.M	
4 x 6mm ²	840	L.M	
Street Lighting luminaire, housing 250W HPS lamp type A.	16	No.	Shreder,Slomia,GM TCC
Supply and install and connect a complete beacon lighting luminaire type B with 2 lamps 2x50W 12V	16	No.	Shreder,Slomia,GM TCC
12m column for single bracket luminaires.	16	No.	Shreder,Slomia,GM TCC

Description	Qty.	Unit	Source
<u>BITUMINOUS CONSTRUCTION</u>			
Bituminous prime coat.	6,700	m2	EMSB-JALKH ET FILS
Bituminous tack coat.	6,700	m2	EMSB-JALKH ET FILS
Hot mix asphalt concrete surface course.	670	m3	EMSB-JALKH ET FILS
<u>Marking</u>			
Marking paint (yellow).	220	m2	GUBELLA-VIA LIBAN
Marking paint (white).	240	m2	GUBELLA-VIA LIBAN
<u>Studs</u>			
Studs (cats eyes) fixed to floors.	166	No.	GUBELLA-VIA LIBAN
<u>CONCRETE COMPONENTS</u>			
Cement		Tons	Sabba/Chekka
Aggregate		Tons	Fattouch/Bekaa
Sand		Tons	Beirut
Water		Tons	Ain Dara
<u>PRESTRESSING CABLES</u>			
Cable tendons (1860 Mpa) guts low relaxation 13S7 wires strand.	218	Tons	TBD
Internal tendons anchorage.	444	No.	TBD
Continuity tendons anchorage.	274	No.	TBD
Prestressing bars.	0.25	Ton	TBD

Appendix E
Agreement between MAN Enterprises and landowner of the rubble

Att: Mr Municipality Chairman of Ain-Dara.

Party Name : Nasser Abi Yehya.

Subject: Permission to dump debris in Lot. 519 Ain-Dara.

Since we are in the process of an agreement with MAN Enterprise for the removal of debris resulting from the demolition of Mudeirej Bridge and after our agreement with the landlord of Lot. 519 Ain-Dara, copy attached of the agreement, to use the land above as a dump yard for the concrete debris. The above will have no environmental impact, knowing that the land and the area as a whole is a barren land with no trees or surrounding structures.

We ask for approval on this request, taking into consideration that the dumped debris above will be on temporary basis to be used later as a sub base in the pavement works executed by the municipality or the community of Ain-Dara.

Respectfully
Naser Abi yehya.

Document file number in municipality (registration number)

No: 509

Date: 2-07-2007

Stamp of the Municipality with the Chairman of the municipality signature.

Agreement Proposal

- 1- First party: Nasir Abi Yehya , Ain-Dara, Registration No. 204
- 2- Second Party: Massoud Hani Imad And Samir Hani Imad, heirs of deceased Hani Imad. Al-ozoba registration 40.

Since the first party is looking for a dump place for collection of concrete and wood debris, and the second party owns a land on Lot. 519 Ain-Dara. Both parties agreed on the following:

- The second party allows the first party to use the Lot. Noted above as a disposal area for the concrete debris resulting from the demolition of the Mudeirej Bridge.
- The first party agrees to pay an amount of Ten US Dollars for every truck trip to the above Lot.

Permissions to be granted from the municipality in the collaboration of both parties.

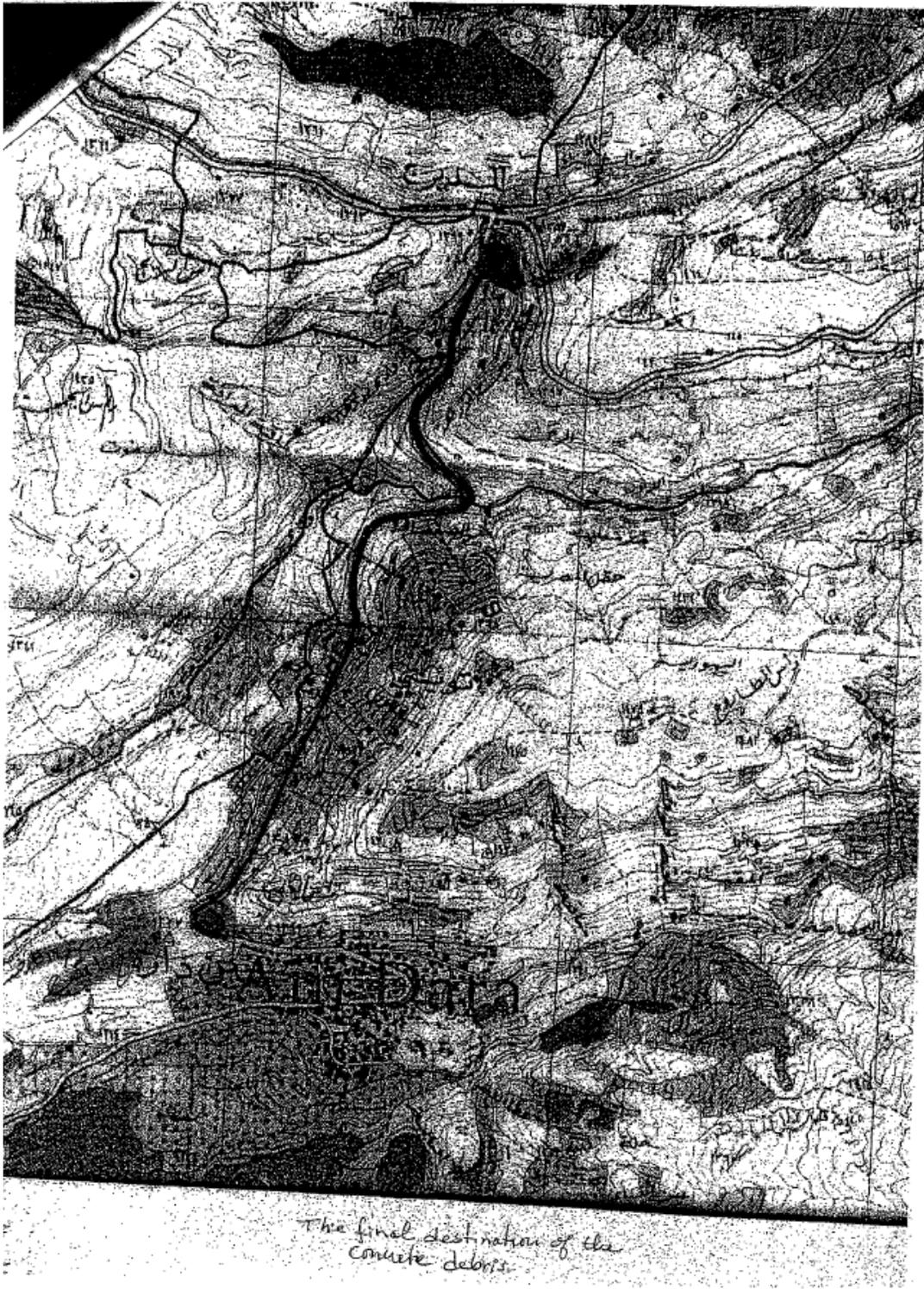
- Two Copies are made available.

- Ain-Dara
- 27-06-2007

- Second party
- Massoud Imad
- Samir Imad
- Signature

-First party
Nasir Abi Yehya

signature



Appendix F

Safety Manuals: Table of contents for OSHA and EM 385-1-1

F-1: Content of OSHA Safety Manual (Construction Chapter)

<i>Chapter</i>	<i>Content</i>
Chapter 1: Demolition	<ul style="list-style-type: none"> • Preparatory operations • Special structures demolition • Safe blasting procedures • Bibliography
Chapter 2: Hazard Recognition in Trenching and Shoring	<ul style="list-style-type: none"> • Introduction • Definitions • Overview • Determination of soil type • Test equipment • Shoring types • Shielding types • Sloping and benching • Spoil • Special Health and safety considerations • Bibliography
Chapter 3: Controlling Lead Exposures in the Construction Industry: Engineering and Work Practice Controls	<ul style="list-style-type: none"> • Introduction • Engineering and work practice controls • Operations

F-2: Table of contents for the EM 385-1-1 safety manual

EM 385-1-1
3 Nov 03

TABLE OF CONTENTS

Section	Page
1. Program Management	1
A. General	1
B. Indoctrination and Training	10
C. Physical Qualification of Employees	13
D. Accident Reporting and Recordkeeping	15
E. Emergency Planning	17
F. <u>Emergency Recovery Operations</u>	18
2. Sanitation	19
A. <u>General Requirements</u>	19
B. Drinking Water	19
C. Toilets	21
D. Washing Facilities	23
E. Food Service	24
F. Waste Disposal	25
G. Vermin Control	25
3. Medical and First-Aid Requirements	27
A. General	27
B. First-Aid Kits	30
C. First-Aid Stations and Infirmarys	32
D. Personnel Requirements and Qualifications	33
4. Temporary Facilities	35
A. General	35
5. Personal Protective and Safety Equipment	39
A. General	39
B. Eye and Face Protection	42
C. Hearing Protection and Noise Control	48
D. Head Protection	52
E. Respiratory Protection	54
F. Body Belts, Harnesses, Lanyards, and Lifelines - Selection of Components	75
G. Electrical Protective Equipment	77

EM 385-1-1

3 Nov 03

H. Personal Floatation Devices	80
I. Lifesaving and Safety Skiffs.....	84
6. Hazardous Substances, Agents, and Environments	87
A. General	87
B. Hazardous Substances	89
C. Hot Substances.....	95
D. Harmful Plants, Animals, and Insects.....	97
E. Ionizing Radiation.....	98
F. Nonionizing Radiation and Magnetic and Electric Fields	108
G. Ventilation and Exhaust Systems	111
H. Abrasive Blasting	112
I. Confined Space	113
J. Inclement Weather and Environmental Hazards.....	126
K. Cumulative Trauma Prevention.....	129
L. <u>Indoor Air Quality (IAQ) Management</u>	131
7. Lighting	133
A. General	133
8. Accident Prevention Signs, Tags, Labels, Signals, <u>Piping System Identification, and Traffic Control</u>	137
A. Signs, Tags, Labels, and Piping Systems	137
B. Signal Systems, Personnel, and Procedures	145
C. <u>Traffic Control</u>	147
D. <u>Haul Roads</u>	147
9. Fire Prevention and Protection	163
A. General	163
B. Flammable and Combustible Liquids	168
C. Liquefied Petroleum Gas (LP-Gas)	174
D. Temporary Heating Devices.....	178
E. First Response Fire Protection.....	184
F. Fixed Fire Suppression Systems.....	189
G. Fire Fighting Equipment.....	190
H. Fire Detection and Employee Fire Alarm Systems.....	191
I. Fire Fighting Organizations - Training and Drilling.....	192

J. Fire Patrols	193
K. <u>USACE Wild Land Fire Control</u>	193
10. Welding and Cutting.....	197
A. General	197
B. Respiratory Protection.....	199
C. Fire Protection.....	200
D. Oxyfuel Gas Welding and Cutting	202
E. Arc Welding and Cutting.....	204
F. Gas Metal Arc Welding	206
11. Electrical	209
A. General	209
B. Overcurrent Protection, Disconnects, and Switches ..	214
C. Grounding	215
D. Temporary Wiring and Lighting	220
E. Operations Adjacent to Overhead Lines.....	222
F. Batteries and Battery Charging	225
G. Hazardous (Classified) Locations	226
H. Power Transmission and Distribution.....	229
I. Underground Electrical Installations	244
J. Work in Energized Substations	245
K. Communication Facilities	247
12. Control of Hazardous Energy (Lockout/Tagout).....	249
A. General	249
B. Training	252
C. Periodic Inspections.....	253
D. Lockout and Tagout Devices.....	254
E. Applying and Removing Lockout and Tagout Devices.....	255
13. Hand and Power Tools	259
A. General	259
B. Grinding and Abrasive Machinery	261
C. Power Saws and Woodworking Machinery	263
D. Pneumatic Tools	265
E. Explosive-Actuated Tools	266

EM 385-1-1
3 Nov 03

F. Chain Saws	268
G. Abrasive Blasting Machinery.....	268
14. Material Handling, Storage, and Disposal.....	271
A. Material Handling	271
B. Material Storage	272
C. Housekeeping	275
D. Material Disposal	276
15. Rigging.....	279
A. General	279
B. Wire Rope	280
C. Chain.....	284
D. Fiber Rope (Natural and Synthetic).....	284
E. Slings	285
F. Rigging Hardware.....	287
16. Machinery and Mechanized Equipment.....	291
A. General	291
B. Guarding and Safety Devices.....	298
C. Cranes and Derricks - General	303
D. Crawler-, Truck-, Wheel-, and Ringer-Mounted Cranes.....	317
E. Portal, Tower, and Pillar Cranes	321
F. Floating Cranes, Floating Derricks, <u>Crane Barges,</u> <u>and Auxiliary Shipboard Mounted Cranes</u>	324
G. <u>Overhead and Gantry Cranes</u>	331
H. Monorails and Underhung Cranes	332
I. Derricks	332
J. Helicopter Cranes	334
K. Material Hoists	336
L. Pile Drivers	340
M. Drilling Equipment.....	342
17. Conveyors.....	347
A. General	347
B. Operation	353

18. Motor Vehicles and Aircraft.....	357
A. General	357
B. Operating Rules	362
C. Transportation of Personnel.....	365
D. All Terrain Vehicles (ATV).....	366
E. Aircraft.....	367
19. Floating Plant and Marine Activities	369
A. General	369
B. Access.....	382
C. Launches, Motorboats, and Skiffs	385
D. Dredging	388
E. <u>Scrows and Barges</u>	390
F. Navigation Locks and Locking	391
20. Pressurized Equipment and Systems	393
A. General	393
B. Compressed Air and Gas Systems	397
C. Boilers and Systems	401
D. Compressed Gas Cylinders	402
21. Safe Access and Fall Protection	405
A. General	405
B. Standard Guardrails and Handrails	411
C. Personal Fall Protection <u>Systems</u> and Safety Nets....	415
D. Ladders	421
E. Stairways.....	424
F. Ramps, Runways, and Trestles.....	427
G. Personnel Hoists and Elevators.....	427
22. Work Platforms	429
A. General	429
B. Scaffolds - General.....	430
C. Metal Scaffolds and Towers.....	433
D. Scaffolds - Wood Pole.....	437
E. Scaffolds - Suspended	443
F. Crane Supported Work Platforms.....	455
G. Form and Carpenter's Bracket Scaffolds	463
H. Horse Scaffolds.....	467

EM 385-1-1
3 Nov 03

I. Pump Jack Scaffolds	468
J. Elevating Work Platforms.....	470
K. Vehicle-Mounted Elevating and Rotating Work Platforms	471
L. <u>Mast Climbing Work Platform</u>	473
23. Demolition.....	477
A. General	477
B. Debris Removal.....	480
C. Wall Removal	482
D. Floor Removal.....	483
E. Steel Removal.....	484
F. Mechanical Demolition	484
24. Floor and Wall Holes and Openings	487
A. General	487
25. Excavations	489
A. General	489
B. Safe Access	493
C. Sloping and Benching	495
D. Support Systems.....	496
E. Cofferdams.....	499
26. Underground Construction (Tunnels), Shafts, and Caissons	507
A. General	507
B. Hazardous Classifications.....	516
C. Air Monitoring, Air Quality Standards, and Ventilation.....	518
D. Fire Prevention and Protection.....	524
E. Drilling	528
F. Shafts	529
G. Hoisting.....	530
H. Caissons	531
I. Compressed Air Work.....	532
J. Underground Blasting	533

27. Concrete and Masonry Construction and Steel Erection	537
A. Concrete and Masonry Construction - General	537
B. Formwork and Shoring	539
C. Precast Concrete Operations	544
D. Lift-Slab Operations	545
E. Structural Steel Assembly	546
F. <u>Systems-Engineered Metal Building</u>	566
G. Masonry Construction	570
H. Roofing	571
28. <u>Hazardous Waste Operations and Emergency Response (HAZWOPER)</u>	579
A. General	579
29. Blasting	589
A. General	589
B. Transportation of Explosive Materials	594
C. Handling of Explosive Materials	597
D. Electromagnetic Radiation	598
E. Vibration and Damage Control	598
F. Drilling and Loading	600
G. Wiring	603
H. Firing	605
I. Post-Blast Procedures	607
J. Underwater Blasting	608
30. Contract Diving Operations	611
A. General	611
B. SCUBA Diving Operations	620
C. Surface Supplied Air Operations	622
D. Mixed-Gas Diving Operations	624
E. Equipment Requirements	625
F. Advanced Diving Technology	628
G. <u>Scientific Snorkeling</u>	629
31. Tree Maintenance and Removal	631
A. General	631
B. Tree Climbing	633
C. Felling	634

EM 385-1-1
3 Nov 03

D. Brush Removal and Chipping	636
E. Other Operations and Equipment.....	637
32. Airfield Operations	641
A. General	641

Appendices

A – Minimum Basic Outline for Accident Prevention Plan.....	A-1
B – Emergency <u>Recovery</u> Operations.....	B-1
C – Guidelines for Control of Occupational Exposure to Crystalline Silica and Abrasive Blasting.....	C-1
D – Assured Equipment Grounding Conductor Program	D-1
E – Woodworking Machinery Guarding	E-1
F – Rigging Inspection and Removal Criteria.....	F-1
G – Procedures for the Examination and Qualification of Crane Operators	G-1
H – Crane and Derrick Inspection Criteria	H-1
I – Crane Testing Requirements for Performance Tests.....	I-1
J – Ladders, Ramps, Stairs, and Fixed Ladders	J-1
K – <u>Cranes, Derricks, and Hooks</u>	K-1
L – <u>Scaffolds, Work Stands, and Platforms</u>	L-1
M – <u>USACE Process for Requesting Interpretations</u>	M-1
N – <u>USACE Process for Requesting Waivers/Variations</u>	N-1
O – Manning Levels for Dive Teams.....	O-1
P – Recommended Safe Practices for Tree Maintenance and Removal Operations	P-1
Q – Definitions	Q-1
R – Metric Conversion Table	R-1
S – <u>References and Resources</u>	S-1

<u>Glossary</u>	Glossary -1
------------------------------	-------------

<u>Index</u>	Index-1
---------------------------	---------

Figures

1-1 – Position Hazard Analysis	4
1-2 – Activity Hazard Analysis	8
5-1 – Personal Floatation Devices	81
6-1 – <u>PRCS</u> Procedures and Decision Logic	115

<u>8-1 – Sign and Tag Signal Word Headings</u>	151
<u>8-2 – Example Tag Layout</u>	151
<u>8-3 – Example Sign Layout</u>	152
<u>8-4 – Radio Frequency Warning Symbol</u>	155
<u>8-5 – Laser Caution Sign</u>	156
<u>8-6 – Laser Warning Sign</u>	156
<u>8-7 – Radiological Warning Symbol</u>	157
<u>8-8 – Slow-Moving Vehicle Emblem</u>	157
<u>8-9 – Accident Prevention Tags</u>	158
<u>8-10 – Crane Hand Signals</u>	159
<u>8-11 – Helicopter Hand Signals</u>	161
<u>15-1 – Wire Rope Clip Spacing (Not to be used for slings)</u>	281
<u>15-2 – Wire Rope Clip Orientation (Not to be used for slings)</u>	281
<u>15-3 – Wedge Socket Fastening</u>	283
<u>15-4 – Sling Configurations</u>	286
<u>25-1 – Sloping and Benching</u>	500
<u>25-2 – Trench Shields</u>	504
<u>25-3 – Trench Jacks</u>	505
<u>29-1 – Power Firing Systems</u>	592
<u>29-2 – Recommended Installation of Shooting Station and Accessory Arrangement for Using Arcontroller</u>	592
<u>J-1 – Suggested Design for Rungs on Individual-Rung Ladders</u>	J-2
<u>J-2 – Rail Ladder with Bar Steel Rails and Round Steel Rungs</u>	J-5
<u>J-3 – Clearance for Unavoidable Obstruction at Rear of Fixed Ladder</u>	J-5
<u>J-4 – Ladder Far from Wall</u>	J-6
<u>J-5 – Deflector Plates for Head Hazards</u>	J-6
<u>J-6 – Relationship of Fixed Ladder to a Safe Access Hatch</u>	J-7
<u>J-7 – Cages for Ladders More Than 20 ft (6.1 m) High</u>	J-7
<u>J-8 – Clearance Diagram for Fixed Ladder in Well</u>	J-8
<u>J-9 – Cages - Special Applications</u>	J-9
<u>J-10 – Offset Fixed Ladder Sections</u>	J-9
<u>J-11 – Slope of Ladders, Ramps, and Stairs</u>	J-13
<u>J-12 – Slope of Wood Grain for Job Made Ladders</u>	J-13
<u>J-13 – Example of Impermissible Knot Spacing</u>	J-14
<u>J-14 – Example of Impermissible Knots at Edge</u>	J-14
<u>J-15 – Example of Impermissible Spike Knots</u>	J-12

EM 385-1-1
3 Nov 03

<u>J-16 – Cleat Attachment, Single-Cleat Ladder</u>	J-15
<u>J-17 – Cleat Attachment, Double-Cleat Ladder</u>	J-16
<u>J-18 – Ladder Splices, 2 x 4 Rail</u>	J-17
<u>J-19 – Ladder Splices, 2 x 6 Rail</u>	J-18
<u>J-20 – Ladder Pitch</u>	J-19
<u>J-21 – Methods for Securing Base</u>	J-20
<u>K-1 – Mobile and Locomotive Cranes</u>	K-1
<u>K-2 – Construction Tower Cranes</u>	K-8
<u>K-3 – Overhead and Gantry Cranes</u>	K-11
<u>K-4 – Cab-Operated Cranes</u>	K-14
<u>K-5 – Floor-Operated Cranes</u>	K-15
<u>K-6 – Floating Cranes</u>	K-16
<u>K-7 – Derricks</u>	K-18
<u>K-8 – Drop Section (Lift Section)</u>	K-22
<u>K-9 – Hooks</u>	K-23
<u>L-1 – Scaffolds</u>	L-1
<u>L-2 – Work Stands</u>	L-38
<u>L-3 – Platforms</u>	L-39

Tables

<u>2-1 – Minimum Toilet Facilities (Construction Sites)</u>	22
<u>2-2 – Minimum Toilet Facilities (Other than Construction Sites)</u> ..	23
<u>3-1 – Minimum Quantity Requirements for Basic Unit Packages</u> ..	31
<u>5-1 – Eye and Face Protector Selection Guide</u>	43
<u>5-2 – Required Shades for Filter Lenses and Glasses in Welding, Cutting, Brazing, and Soldering</u>	49
<u>5-3 – Permissible Non-DOD Noise Exposures</u>	50
<u>5-4 – Standards for Electrical Protective Equipment</u>	78
<u>6-1 – Occupational Dose Rates</u>	101
<u>6-2 – Laser Safety Goggle Optical Density Requirements</u>	109
<u>6-3 – PRCS Program Elements</u>	120
<u>6-4 – PRCS Training</u>	123
<u>6-5 – Wind Chill Temperature Table</u>	130
<u>6-6 – Time to Occurrence of Frostbit in Minutes or Hours</u>	130
<u>7-1 – Minimum Lighting Requirements</u>	135
<u>8-1 – Accident Prevention Sign Requirements</u>	153
<u>8-2 – Accident Prevention Color Coding</u>	154
<u>8-3 – Identification of Piping Systems</u>	154

<u>9-1 – Maximum Allowable Size of Containers and Tanks for Flammable and Combustible Liquids</u>	171
<u>9-2 – LP-Gas Container and Cylinder Outside Storage Minimum Distances</u>	177
<u>9-3 – Temporary Heating Device Clearances</u>	180
<u>9-4 – Fire Extinguisher Distribution</u>	185
<u>11-1 – Minimum Clearance from Energized Overhead Electric Lines</u>	223
<u>11-2 – Hazardous (Classified) Locations</u>	227
<u>11-3 – Alternating Current – Minimum Distances</u>	230
<u>15-1 – Number of Clips and the Proper Torque Necessary to Assemble Wire Rope Eye Loop Connections with a Probable Efficiency Not More Than 80%</u>	282
<u>15-2 – Safe Working Loads for Shackles</u>	288
<u>16-1 – Crane Design and Construction Standards</u>	309
<u>19-1 – Fire Extinguisher Requirements for Launches/ Motorboats</u>	386
<u>21-1 – Selection Criteria for Planking and Platforms</u>	407
<u>21-2 – Maximum Intended Load</u>	407
<u>21-3 – Wood Plank Selection</u>	408
<u>21-4 – Safety Net Distances</u>	419
<u>22-1 – Wood Pole Scaffold Height and Level Limits</u>	439
<u>22-2 – Ladder-Type Platforms</u>	450
<u>22-3 – Form Scaffolds</u>	464
<u>22-4 – Minimum Dimensions for Horse Scaffold Members</u>	467
<u>27-1 – Erection Bridging for Short Span Joists</u>	560
<u>27-2 – Erection Bridging for Long Span Joists</u>	562
<u>29-1 – Energy Ratio and Peak Particle Velocity Formulae</u>	599
<u>C-1 – U.S. Guidelines and Limits for Occupational Exposure to Crystalline Silica</u>	C-2
<u>F-1 – Inspecting Wire Rope for Broken Wires</u>	F-1
<u>F-2 – Allowable Chain Wear</u>	F-4
<u>H-1 – Crane and Derrick Inspection Frequency</u>	H-2
<u>I-1 – Crane Performance Testing Requirements - No-Load Tests</u>	I-2
<u>I-2 – Crane Performance Testing Requirements - At-Load Tests</u>	I-6

EM 385-1-1
3 Nov 03

O-1 – <u>Dive Team Composition</u> , SCUBA, Untethered, 0 to 100 ft (0 to 30.5 m).....	O-1
O-2 – <u>Dive Team Composition</u> , SCUBA, Tethered with Communications, 0 to 100 ft (0 to 30.5 m).....	O-1
O-3 – <u>Dive Team Composition</u> , Surface Supplied Air, 0 to 100 ft (0 to 30.5 m).....	O-2
O-4 – <u>Dive Team Composition</u> , Surface Supplied Air, 101 to 190 ft (31.8 to 57.9 m).....	O-3
O-5 – <u>Dive Team Composition</u> , Surface Supplied Mixed Gas Diving.....	O-3

Appendix G Agreement between Contrack and Hamlin Hospital



Hamlin Hospital
Established in 1995

التاريخ: 2007/04/25

السادة ادارة كونتراك انترناشيونال في ن س المحترمين

بعد التحية...

سررنا جدا" برسالتكم التي تدل على اعادة اعمار لبنان.

فلكم كامل التوفيق في مشروعكم و نحن على أمل أن لا تواجهوا أية حوادث أو اصابات.

نحن كمستشفى هملين، مستعدون لتقديم أرقى الخدمات الطبية بدءاً من نقل المريض بناءً على طلب منكم، من موقع الحادث وحتى المستشفى وذلك بسيارة اسعاف مجهزة يرافقها طبيب و ممرض مختصين يمثل هذه الحوادث.

لكن نحن الآن في فترة توقف مؤقت لصيانة المستشفى و سنعاود الافتتاح في القريب القريب و باذن الله سنعلمكم به خلال الأيام القليلة المقبلة.

لكم منا كل التعاون و كما عوتنا للجميع على تقديم أرقى الخدمات الطبية

أملين النجاح دوماً"



د. دوفاء الأصيل

Appendix H

List of References

- Dubertret, L. 1955. Carte Geologique du Liban au 1/200 000, avec notice explicative. Ministère des Travaux Publics, Beirut.
- Harajli, M., Tabet, C., Sadek, S., Mabsout, M., Moukaddam, S., and Abdo, M., *Seismic Hazard Assessment of Lebanon: Zonation Maps and Structural Seismic Design, Design Regulations*. Technical Report submitted to the Directorate of Urbanism, Ministry of Public Works, Beirut, Lebanon, 1994.
- Khair, K., Karakaisis, G., and Papadimitriou, E., Seismic Zonation of the Dead Sea Transform Fault Area. *Anali di Geofisica*, Vol. 43 (1), pp. 61- 79, 2000.
- The Ministry of Environment, Service of Conservation of Nature, Department of Protection of Natural Resources. Ref.: Decree#16456 dated 27/2/2006
- Geo Projects (2002), Librairie des Cartes du Monde, Liban, 1 : 200 000
- http://www.osha.gov/dts/osta/otm/otm_toc.html
- <http://www.usace.army.mil/publications/eng-manuals/em385-1-1/toc.htm>