Japan Society of Civil Engineers
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http://www.jsce.or.jp/

The January 13, 2001 Off the Coast of El Salvador Earthquake

Investigation of Damage to Civil Engineering Structures, Buildings and Dwellings

August 2001

Earthquake Engineering Committee, JSCE

PREFACE

El Salvador, one of the smallest and most crowded nations in Central America, extends about 240 kilometers westward from the Gulf of Fonseca to the border with Guatemala. This country was struck by two devastating earthquakes within a month. The first quake of Jan. 13, 2001, which was centered off El Salvador's southern coast, damaged and/or destroyed nearly 108,000 houses, and killed at least 944 people, including hundreds of residents buried in a huge amount of soil slipped down Las Colinas mountainside in the city of Neuva San Salvador (Santa Tecla). While authorities were trying to gauge the scope of the tragedy, the second quake of magnitude 6.6 hit several central provinces on Tuesday, Feb. 13. The second quake, killing at least 322 people and destroying more than 34,500 homes, was also substantially big in terms of damage.

On Jan. 19, Japan Society of Civil Engineers (JSCE) decided that it would dispatch an investigation team to El Salvador. Though JSCE covers a quite vast area of interest, the reconnaissance team, which was a small party of 8 professionals had little chance to cover up every specialty of civil engineering during their short stay (Feb. 1-6) in El Salvador. The preliminary strategy of JSCE team was thus to make a first reconnaissance laying stress on the landslide-inflicted damage to dwellings as well as the damage to civil infrastructures, and to discuss with Salvadorian specialists about possible future collaborations lucrative for both El Salvadoran and Japanese sides.

On February 1, the team was fully briefed on the entire scope of the earthquake-related damage by Mr. Jose Antonio Rodrigez, General Manager, Geothermal of El Salvador. Mr. Rodrigez, together with Mr. Salvador Handel, Geothermal of El Salvador, kindly made every arrangement for the team's reconnaissance trip, coordinating the schedules of specialists and officials in charge in such authorities as the Ministry of Environment, Ministry of Public Works, Ministry of Housing and other organizations including PRIMSA, CIG, UCA etc.

With necessary pieces of information provided, JSCE team members could investigate efficiently the areas affected by the first earthquake of Jan. 13. The areas included (a) Las Colinas, Los Choros (Landslide group), (b) Rio Lempa, San Agustin, Berlin and Santiago de Maria (Strong-Ground-Motion and Civil-infrastructure groups). The landslide group surveyed 3D configurations of landslides (scars, slid soil masses and etc) using a laser rangefinder. They also took soil samples for ring-shear tests. The Strong-Ground-Motion and Civil-infrastructure groups measured microtremors to evaluate local site conditions and to find predominant periods of a variety of structures.

Mr. Saburo YUZAWA, Ambassador, Japanese Embassy in El Salvador, kindly took all the trouble of negotiating with ministers concerned over every possible convenience that the Salvadorian counterparts could provide, and the El Salvador military gave the team members a lift in a helicopter, allowing a wide coverage of extensive areas affected by the earthquake. Mr. Yuzawa also took the trouble of coordinating an assembly of Salvadorian specialists and officials in charge for discussing with the JSCE team members the findings that the JSCE team members obtained through their reconnaissance. The assembly was held at Radisson Hotel, San Salvador, on Feb.6.

This report outlines the findings obtained through the reconnaissance and geotechnical tests on the soil samples. Some descriptions in this report are not fully evidenced yet, and therefore, some comments are not yet the conclusions reached after a thorough discussions among the members. However, providing both Japan and Salvadorian specialists and persons in charge with a rough-an-ready overview would be important for taking measures for the disaster relief and precautions against possible secondary disasters.

All the members of the JSCE Reconnaissance Team would like to express hereby their sincere sympathy to those people affected by the two devastating earthquakes, and they wish to further

collaborate with Salvadorian specialists for possible countermeasures, e.g., reconstruction of damaged structures, retrofitting of existing structures and reducing landslide hazards.

Kazuo KONAGAI, Team Leader
Aug. 17, 2001

	
Briefing at Geothermal of El Salvador: JSCE team members were fully briefed on the entire scope of the earthquake-related damage by Mr. Jose Antonio Rodrigez (left), General Manager, and Mr. Salvador Handel (right of the map), Geothermal of El Salvador. (**Feb. 1**)	**Assembly of Salvadorian specialists:** JSCE team members and Salvadorian experts are discussing the cause of damage to dwellings, engineered and non-engineered structures and possible remedial measures. (**Feb. 6, Radisson Hotel**)

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RECONNAISSANCE TRIP RECORD

<table>
<tr><th></th><th>Leader</th><th>Landslide</th><th>Strong ground motion</th><th>Civil infrastructures, Lifelines, Adobe & masonry structures</th></tr>
<tr><td rowspan="2">Feb. 2</td><td colspan="4">Briefing at Geothermal, San Salvador
Jose Antonio Rodrigez, Director General, Salvador Handel, Javier Rivas and Jose Antonio Rivas</td></tr>
<tr><td>Call at Japan Embassy
Saburo Yuzawa, Ambassador
Tetsuo Iwasaki</td><td>Call at Ministry of Environment
Ernesto Lopez Zepada</td><td colspan="2">Call at Ministry of Environment
Carlos Pullinger
Call at ASIA</td></tr>
<tr><td>Feb. 3</td><td>Survey: Las Colinas
Refugee camp
Mario Jvarez, Local government, Neuva San Salvador</td><td>Survey:
from Helicopter</td><td colspan="2">Survey: Las Colinas</td></tr>
<tr><td>Feb. 4</td><td>Survey: San Vicente
Berlin (Geo-thermal)
Santiago de Maria
San Agustin
Railway bridge, Rio Lempa</td><td>Survey: Las Colinas
Los Choros</td><td colspan="2">Survey: (Strong ground motion, micro tremors, civil infrastructures, adobe houses) RC bridge at Rio Lempa, San Agustin, Berlin, Geo-thermal, Santiago de Maria</td></tr>
<tr><td rowspan="3">Feb. 5</td><td>Call at JICA
Atsushi Kamisawa
Takahiro Shinchi
Takayoshi J. Yamagiwa</td><td rowspan="2">Call on Mr. Daniel Hernandez
CIG
Survey: Las Colinas</td><td rowspan="2">UCA</td><td>Call on Carlos Duque, Vice ministry of Public Works,
Survey: San Julian</td></tr>
<tr><td>Call at
Ministry of Housing
Martha Eugenia Roldan, Yolanda Vicharra</td><td>Call at
Ministry of Housing
Martha Eugenia Roldan, Yolanda Vicharra</td></tr>
<tr><td colspan="4">Dinner with French Mission: Dr. Richard Guillande</td></tr>
<tr><td rowspan="2">Feb. 6</td><td>Call at PRISMA
Herman Rosa, Director
Jose Roberto Duarte Saldana</td><td>Call at CIG
Survey: Las Colinas</td><td></td><td>Call at PRISMA
Call at UCA
Patricia de Hazbun
Ricardo Castellanos
Call at CIG
Jorge Alberto Rodriguez Deras</td></tr>
<tr><td colspan="4">Meeting at Ilopango, Radisson
Ministry of Environment
Ana Maria Majano, Minister of Environment, Scott Baxter (Seismologist), Ernesto Lopez Zepeda and Rina de Jarquin
Ministry of Public Works
Carlos Duque, Vice minister, Rene Gomez, executive director
JICA
Atsushi Kamisawa, Director, Tsukamoto, Takayoshi Jose Yamagiwa, and Shinchi
Japan Embassy
Saburo Yuzawa, Ambassador, and Tetsuo Iwasaki
UCA
Patricia de Hazbun
PRISMA
Herman Rosa</td></tr>
</table>

TABLE OF CONTENTS

PREFACE

Kazuo KONAGAI

JSCE RECONNAISSANCE TEAM MEMBERS
CONTRIBUTORS TO THE REPORT
RECONNAISSANCE TRIP RECORD
TABLE OF CONTENTS

1. SOURCE CHARACTERISTICS AND STRONG GROUND MOTION:

Nelson E. PULIDO

1.1 TECTONIC SETTING OF CENTRAL AMERICA AND THE 2001 El SALVADOR EARTHQUAKES 1
**Tectonic setting of Central America and Recent Historical Earthquakes* 1
** The January 13 mainshock* 3
** The February 13 aftershock* 4
1.2 STRONG GROUND MOTION CHARACTERISTICS 6
** El Salvador seismic and strong motion networks* 6
** Observed Ground motion distribution from the January 13 earthquake* 7
1.3 BROADBAND STRONG GROUND MOTION SIMULATION OF THE JANUARY 13 EARTHQUAKE 10
** Ground Motion Estimation Methodology* 10
** High Frequency Ground Motion* 11
**Strong ground motion simulation of the January 13/2001 El Salvador earthquake* 12
1.4 DISCUSSION AND CONCLUSIVE REMARKS 17
ACKNOWLEDGEMENT 17
REFERENCES 18

2. LANDSLIDES:

Tetsuro YAMAMOTO, Ryosuke UZUOKA, Jorgen JOHANSSON, Kazuo KONAGAI
Kyoji SASSA, Hiroshi FUKUOKA, and Paola MAYORCA
(Edited by Kazuo KONAGAI and Ryosuke UZUOKA)

2.1 INTRODUCTION 19
2.2 GEOLOGY 19
2.3 LANDSLIDES DISTRIBUTION 20
2.4 AERIAL VIEWS OF LANDSLIDES 23
2.5 LAS COLINAS LANDSLIDE 25
**General* 25
**3D Configuration of the slope* 26
** Detailed features of the slope* 29
**Soil tests* 35
**Microtremor measurement* 45
**Summary of Las Colinas Landslide* 46
2.6 OTHER LANDSLIDES 49
** POINT A: Slope failures along El Balsamo ridge, Las Colinas* 50
** POINTS B, C and D: Slope failures at Los Chorros* 52
**Slope failures at Nuevo Cuscátlan* 52
** Slope failures at San Vicente* 53
2.7 SUMMARY AND RECOMMENDATIONS 54
REFERENCES 55

3. BUILDINGS AND DWELLINGS:

Paola MAYORCA

3.1 INTRODUCTION 57
3.2 DEVELOPMENT OF SEISMIC DESIGN CODE 61
3.3 DAMAGE DISTRIBUTION 63
** Damage Evaluation Committee* 65
3.4 DAMAGE TO THE VISITED TOWNS 67
** San Agustin* 67
** Berlin* 73
** Santiago de Maria* 75
** San Julian* 76
** Nueva San Salvador* 78
** San Salvador* 80
3.5 CONCLUSIONS AND RECOMMENDATIONS 80
REFERENCES 81

4. LIFELINES AND CRITICAL FACILITIES:

Freddy DURAN C. and Masakatsu MIYAJIMA
(Edited by Kazuo KONAGAI and Jorgen JOHANSSON)

4.1 INTRODUCTION 83
4.2 ELECTRICITY 83
**Introduction* 83
**Substations* 84
**Damage to transmission lines* 86
**Summary and recommendations* 88
4.3 WATER SUPPLY SYSTEM 89
** Overview* 89
**Damage to tanks* 90
** Damage to water treatment plants* 92
**Summary and recommendations* 93
4.4 TRANSPORTATION 93
** Damage to Main Routes* 93
** Bridges* 94
** Local roads* 96
** Summary and recommendations* 96
4.5 TELECOMMUNICATION SYSTEMS 96
4.6 CRITICAL FACILITIES 97
**Airport* 97
**Ports and harbors* 99
**Hospitals* 99

5. DAMAGED AREA ESTIMATION BASED ON DMSP/OLS NIGHTTIME IMAGERY AND AERIAL RECONNAISSANCE:

Masayuki KOHIYAMA and Ryosuke UZUOKA

5.1 INTRODUCTION 101
5.2 DAMAGED AREA ESTIMATION BASED ON DMSP/OLS NIGHTTIME IMAGERY 101
5.3 DMSP/OLS IMAGERY 101
5.4 ESTIMATION METHOD 102
5.5 ESTIMATION RESULTS 103
5.6 AERIAL RECONNAISSANCE 108
5.7 ACKNOWLEDGEMENT 110
REFERENCES 110

6. SUMMARY AND RECOMMENDATIONS 111

ACKNOWLEDGEMENT 112

to the next page