

GUATEMALA EARTHQUAKE OF FEBRUARY 4, 1976

PRELIMINARY NOTES OF DON MORAN

Friday, February 6, 1976

The team arrived at Guatemala City about 5 PM on Friday, February 6, 1976. Alvaro Espinosa of USGS located Roberto Monterroso at the airport and he arranged for our lodging and transportation. That evening we met with Monterroso at our hotel and discussed the general situation. Monterroso asked if we could assist the Ministry of Public Works in determining the safety of critical public buildings. We agreed to help and meet him on Saturday at the Ministry.

Karl Steinbrugge, USGS Consultant, agreed to work with our team on the inspections.

Monterroso informed us that there is a building code but it covers general planning only. Design criteria is left up to the engineers. There are about 30 structural engineers in the country.

There is only one company in the country which manufactures cement and ready mixed concrete.

The population of the country is about 6.0 million and Guatemala City has 1 to 1.5 million, depending on which suburbs are included.

Saturday, February 7, 1976

The entire team plus Karl Steinbrugge met Monterroso at the Public Works Ministry. There were several Mexican engineers present and many local engineers. We offered a building department inspection form which was developed as part of the "Learning from Earthquakes" project and this was immediately accepted, reproduced and used. Seven inspection teams were organized each with one American or one Mexican engineer in charge, plus two or three local engineers or architects.

Moran and three Mexican highway engineers did not join the building inspection teams but went to the highway department where it was reported that one large bridge at Agua Caliente, some 30 km NE of the city, had collapsed. Many roads were blocked by landslides in cuts and fills. Many streets were blocked with debris from old adobe buildings. We arranged to make a trip to the Aqua Caliente bridge on Monday, February 9, 1976.

Later, Moran and Rice toured the north and northwest areas of the town. One new freeway bridge, (Incienso) some 1,000' long in the NW part of town, was not damaged except for pounding at expansion joints and 2 to 4" settlements at abutments. We saw many other smaller freeway overpass structures which apparently were not damaged. There were many

landslides in the north portion of the city, particularly in the steep barrancas(canyons). We estimated about 5% of the adobe buildings had suffered collapsed roofs. Perhaps 25 percent of the adobes suffered collapsed walls with corner buildings being the most severely damaged. Party walls are used extensively. Some all wood dwellings were not damaged. In the Florida area, NW of the city, there was about the same degree of damage.

One modern reinforced brick church (Divine Redeemer) in the west part of the city, suffered a roof collapse. Steel roof trusses were on top of the concrete roof slab. It is likely that the trusses buckled. Preece and Smith have more on this.

Dave Schwartz flew over fault area with Plafker of USGS and located the fault break in the Motogua Valley. Schwartz has more on this.

Sunday, February 8, 1976

Moran and Weichert joined Bill Smith's inspection team and looked at Guatel Old Guard and IGSS Headquarters (See Smith's report). We also inspected the Catholic university (Landivia) east of the city where four similar, one story, classroom buildings suffered varying degrees of damage to brick cross walls and columns. The reasons for the variations in damage were not readily apparent. Other team members subsequently looked at these buildings. This facility warrants more study.

Monday, February 9, 1976

Moran and Weichert went with Guatemala bridge engineers to the Agua Caliente bridge. There were many landslides on the way. Some 100 ft. cuts, with almost vertical banks, had collapsed with debris filling the cuts up to 50 ft. deep. Many fills had settled and damaged the roadbed. A pole type electrical transmission line was damaged by slides, about 10 km. northeast of the city.

A small (50 ft.) bridge with a concrete deck and steel beam girders, was not damaged. This bridge is located about 20 km. northwest of the city.

The Agua Caliente bridge is curved in plan, about 650 ft. long with 5 spans. A composite concrete deck is supported on riveted plate girders. Support piers are reinforced concrete on spread footings. We obtained a set of construction drawings on this bridge. Design was by Tippetts-Abbett-McCarthy -Stratton of New York. Constructed in 1956-57. Girder supports are steel fixed and expansion bearings.

The three center spans collapsed. Some steel shear keys in the bearings were torn out when welds failed. End spans had moved laterally on bearings at the first piers and also stretched anchor bolts in fixed supports at abutments.

In my opinion, this bridge collapse warrants further study because its design is typical, for its day of many in this country.

A railway truss bridge downstream several hundred yards appeared to be undamaged.

Tuesday, February 10, 1976

Moran and Weichert went to one of the two electrical power company's offices (INDE).

No damage was reported to the four or five electrical generating plants located 20 to 50 km. south of the city. There are fossil fuel steam and hydro plants in this area. No damage reported to the main transmission system.

Damage reported to a switching station about 10 km. south of the city. Large transformers on wheels resting on rails rolled by sliding the wheel chocks and broke their electrical connections. Several circuit breakers failed in their ceramic insulators. Temporary repairs were made in 10 hours.

Attended meeting at Public Works office where American engineers were released and thanked for their help. Some 120 out of 150 public facilities had been inspected.

We flew over fault area to about 30 km. east of El Progreso

Wednesday, February 11, 1976

Monterosso, Steinbrugge, and Moran inspected the Biltmore and El Camino Real Hotels. Structural damage at the El Camino Real warrants further study. We also inspected the American School, airport terminal, control tower, and Xavier Catholic Boys School (other team members also looked at these facilities).

Inspected three story concrete hotel (El Sauce) nearing completion on point of land in the north part of city. Some ground movement is evident but severe damage could also be due to focusing effect. Modern adjacent dwellings were only slightly damaged. This facility warrants further study.

Visited water department in municipal building and talked to a water engineer.

The city is supplied by several reservoirs, wells and at least one spring in the mountains to the east, west and south. No damage to dams was reported, but some damage occurred to transmission conduits.

All of the water supply to the city was cut off immediately following the shock. Fifty percent was restored in 24 hours and 60-70 percent was

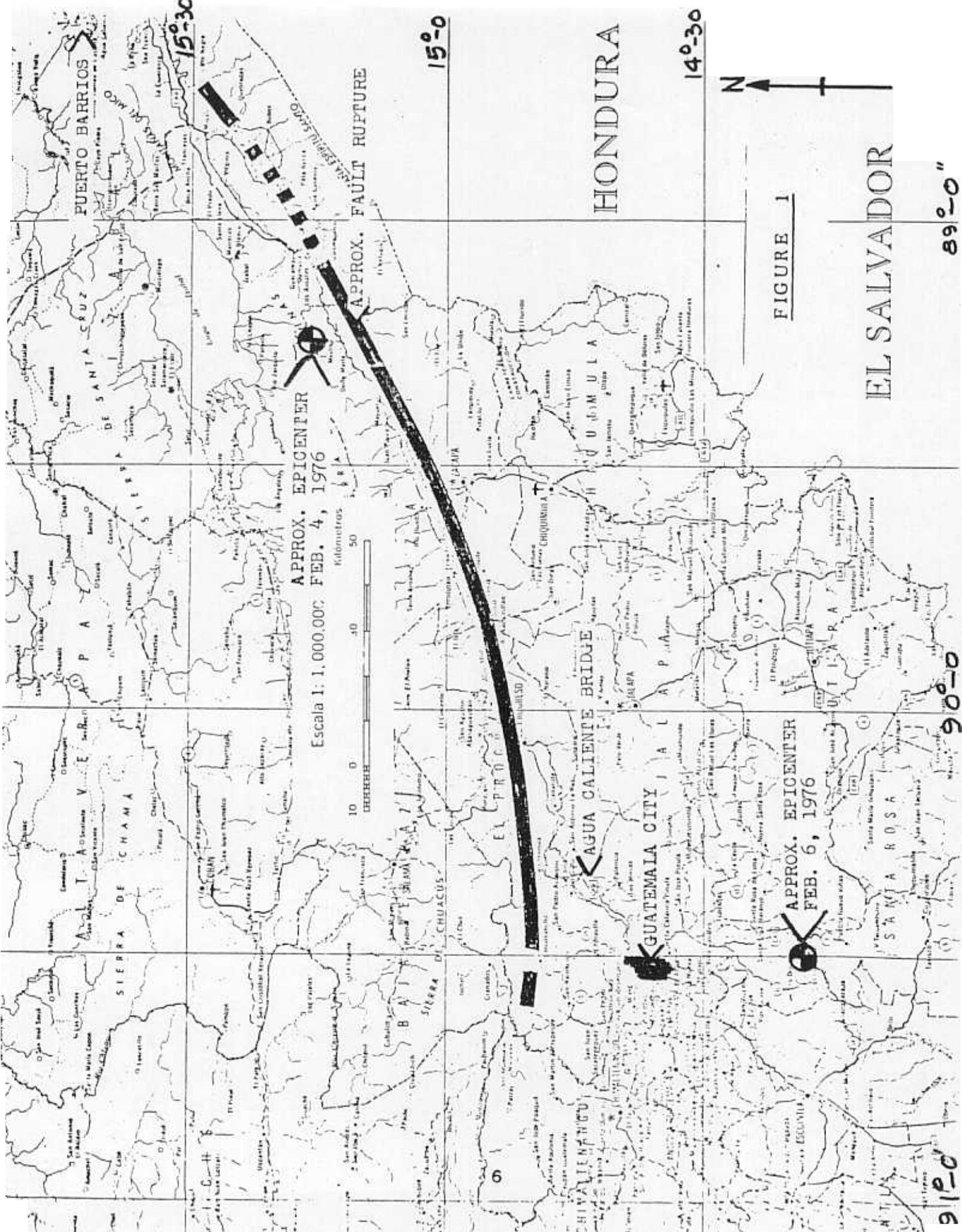
restored by February 11, 1976. Water treatment plants suffered heavy damage to piping, settlement tanks, and filtration systems. Damaged units were bypassed and chlorination was increased. Water distribution system damage was not clearly known except that they were receiving 100 to 200 reports of breaks daily. Most of the breaks are in the older galvanized pipe. Newer parts of the system have ductile cast iron, transite and PVC pipe. The water system warrants more study. There is no sewage treatment. Raw sewage is dumped into a river to the north of town. SW part of city has septic tanks. No information obtained on damage to sewers.

Inspected Terminal Hotel located downtown. This six story building suffered partial collapse in the third story. This hotel warrants more study.

Thursday, February 12, 1976

The Team left about 11:00AM and arrived at Los Angeles at about 3:00 PM.

Attached are: (1) a map of a portion of Guatemala from Puerto Barrios to west of Guatemala City (from K. V. Steinbrugge's paper), (2) a map of Guatemala City, (3) reconnaissance building inspection forms for several buildings, and (4) a list of team contacts.



APPROX. EPICENTER
 FEB. 4, 1976
 Escala 1: 1,000,000

Kilometros
 10 0 10 20 30 40 50

FIGURE 1

EL SALVADOR

HONDURA

91°20' 90°00' 89°20"

15°30'

15°0'

14°30'

PUERTO BARRIOS

DE SANTA CRUZ

SIERRA DE CHAMÁ

SIERRA DE BANI

SIERRA DE CHUACÚS

APPROX. FAULT RUPTURE

APPROX. EPICENTER

FEB. 4, 1976

AGUA CALIENTE BRIDGE

GUATEMALA CITY

APPROX. EPICENTER

FEB. 6, 1976

SANTA ROSA

COMAYAGUA

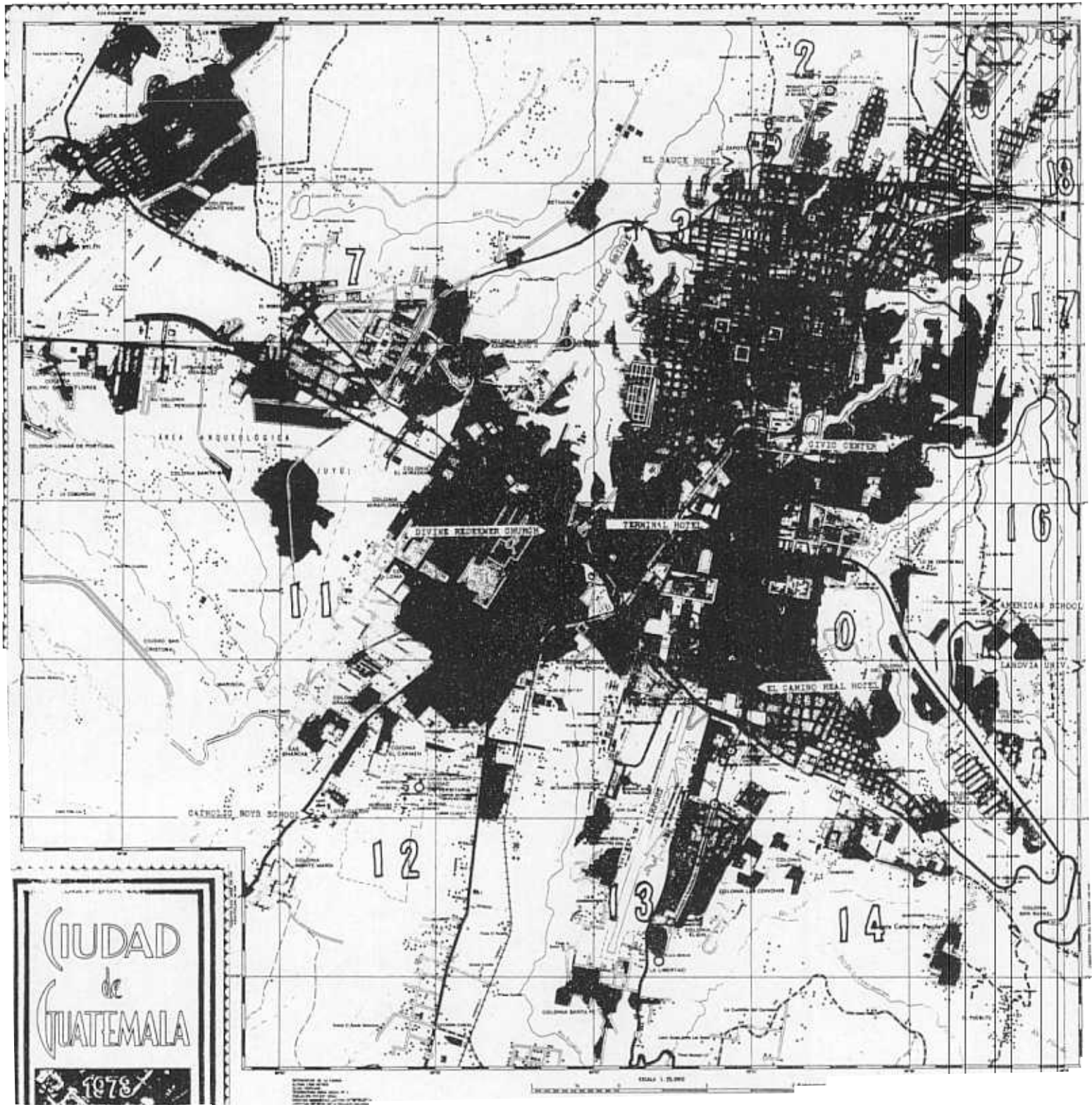
CHUQUIMULA

GUATEMALA

SIERRA DE BANI

SIERRA DE CHUACÚS

N



GUATEMALA CITY

IG

APPENDIX A

RECONNAISSANCE INSPECTION FORM - BUILDINGS

Investigator: Don MORAN Date: 2-7-76

Building or Facility Data:

Name Tivoli Plaza

Address (or Location) SE Corner of 6 Calle and 6 Ave, Zone 9

Stories 9 Basement(s) No

Vertical load system R/C frame

Lateral load system " " Moment Resist probably

Walls Brick - very little if any reinf (Exterior cols about 10' outside of walls)

Foundations Unknown

Soils "

Site: Sloping % Level ✓

Earthquake Damage:

General Brick wall piers have heavy cracks below each floor. X cracks in interior brick partitions

Estimated total losses Less than 10% ✓ 10-50%
Over 50%

Is building functional? Yes No Why not? Under Constr. - being completed

Status of Utilities Unknown

Does building warrant further investigation? Yes No ✓

Why? No evidence of structural damage.

Estimated Modified Mercalli Intensity ~~VII~~ VII

Miscellaneous Data: Unknown.

Architect Engineer

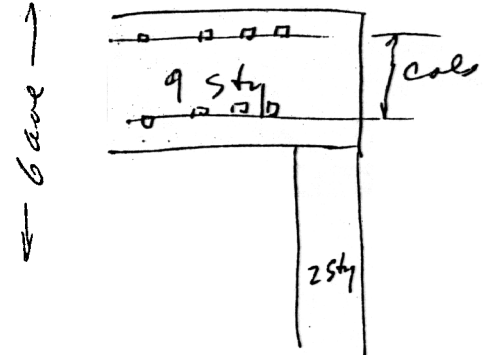
Are Plans available? Yes No Where?

Photos Roll Frame

(Use back for sketches and additional notes.)

TIVOLI PLAZA

Scale →



PLAN ↑ N

Sample Inspection Form - others not reproduced. DJL