

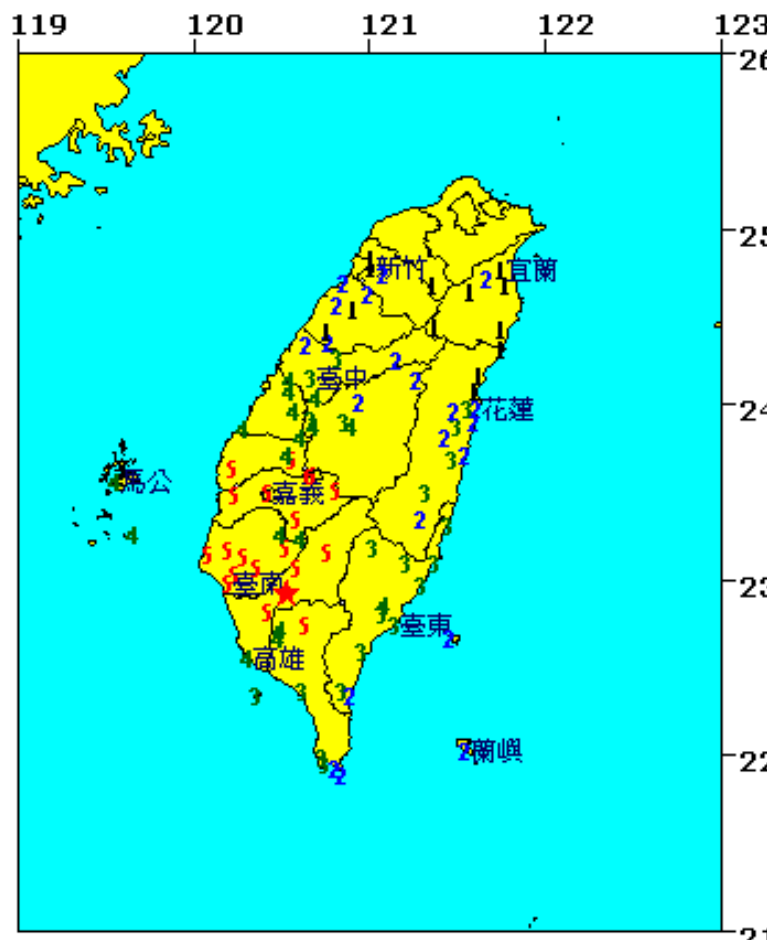
Reconnaissance Report

2016/02/06 Meinong Earthquake, Kaohsiung, Taiwan
Main damage area: Tainan

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2016/02/07

Earthquake information

- Epicenter:
22.93N, 120.54E
- Depth: 16.7 km
- Richter magnitude
scale: 6.4



圖說：★表震央位置，阿拉伯數字表示該測站震度

中央氣象局地震報告

編號：第105006號

日期：105年2月6日

時間：3時57分27.2秒

位置：北緯22.93度，東經120.54度

即在屏東縣政府北偏東方27.4公里

位於高雄市美濃區

地震深度：16.7公里

芮氏規模：6.4

各地最大震度

雲林縣草嶺	6級	彰化縣彰化市	4級
高雄市旗山	5級	臺東縣臺東市	3級
屏東縣三地門	5級	花蓮縣紅葉	3級
臺南市楠西	5級	屏東縣南灣	3級
臺南市	5級	南投縣南投市	3級
嘉義縣草山	5級	臺中市	3級
嘉義市	5級	花蓮縣花蓮市	2級
屏東縣屏東市	4級	苗栗縣鯉魚潭	2級
高雄市	4級	苗栗縣苗栗市	2級
臺東縣初鹿	4級	新竹縣竹東	2級
雲林縣斗六市	4級	宜蘭縣內城	2級
澎湖縣東吉島	4級	桃園市三光	1級
彰化縣二水	4級	新竹市	1級
南投縣名間	4級	新竹縣竹北市	1級
澎湖縣馬公市	4級	宜蘭縣宜蘭市	1級
臺中市霧峰	4級		

本報告係中央氣象局地震觀測網即時地震資料
地震通報之結果。

(Courtesy of CWB, Taiwan)

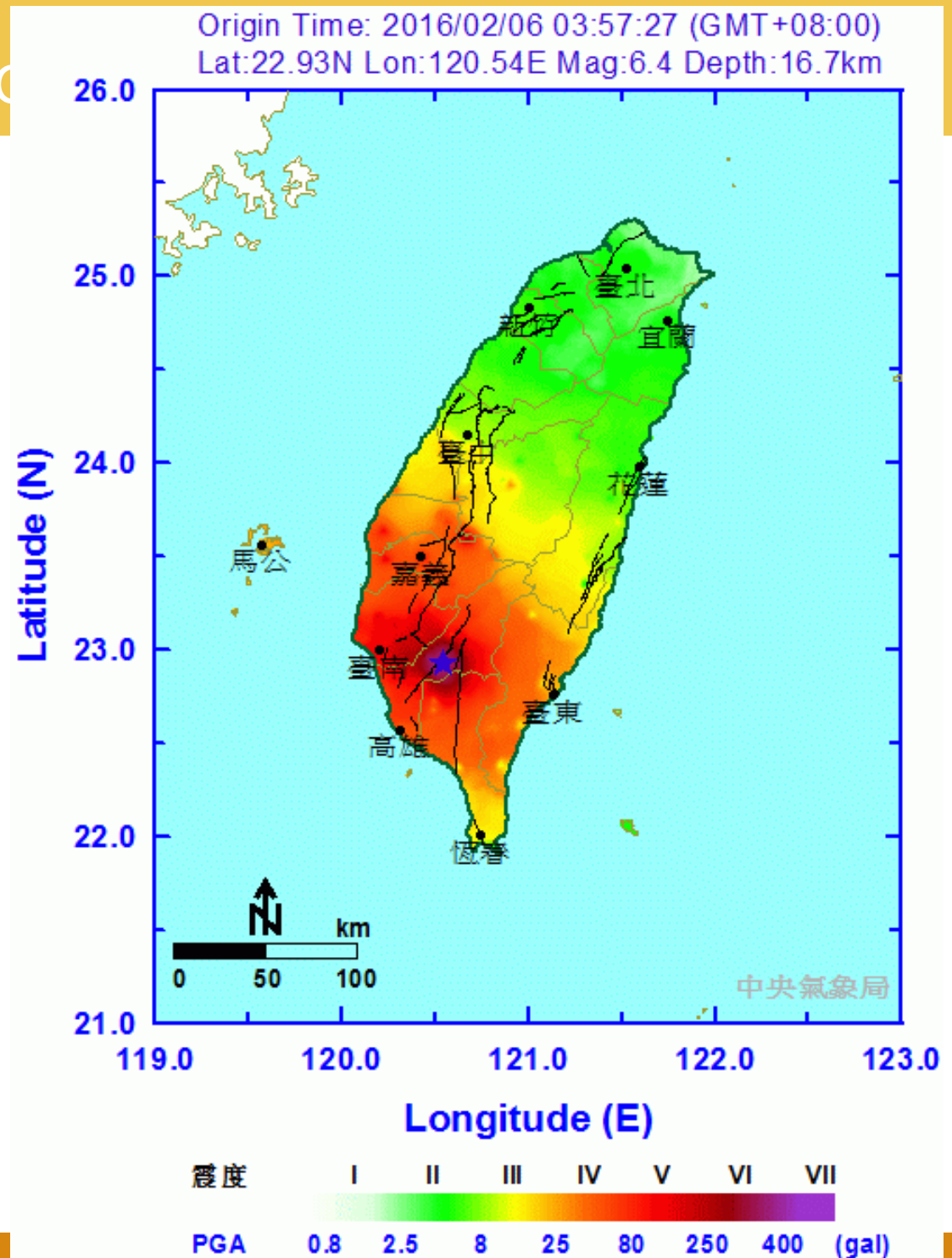
Earthquake information

■ Detailed information:

Link to

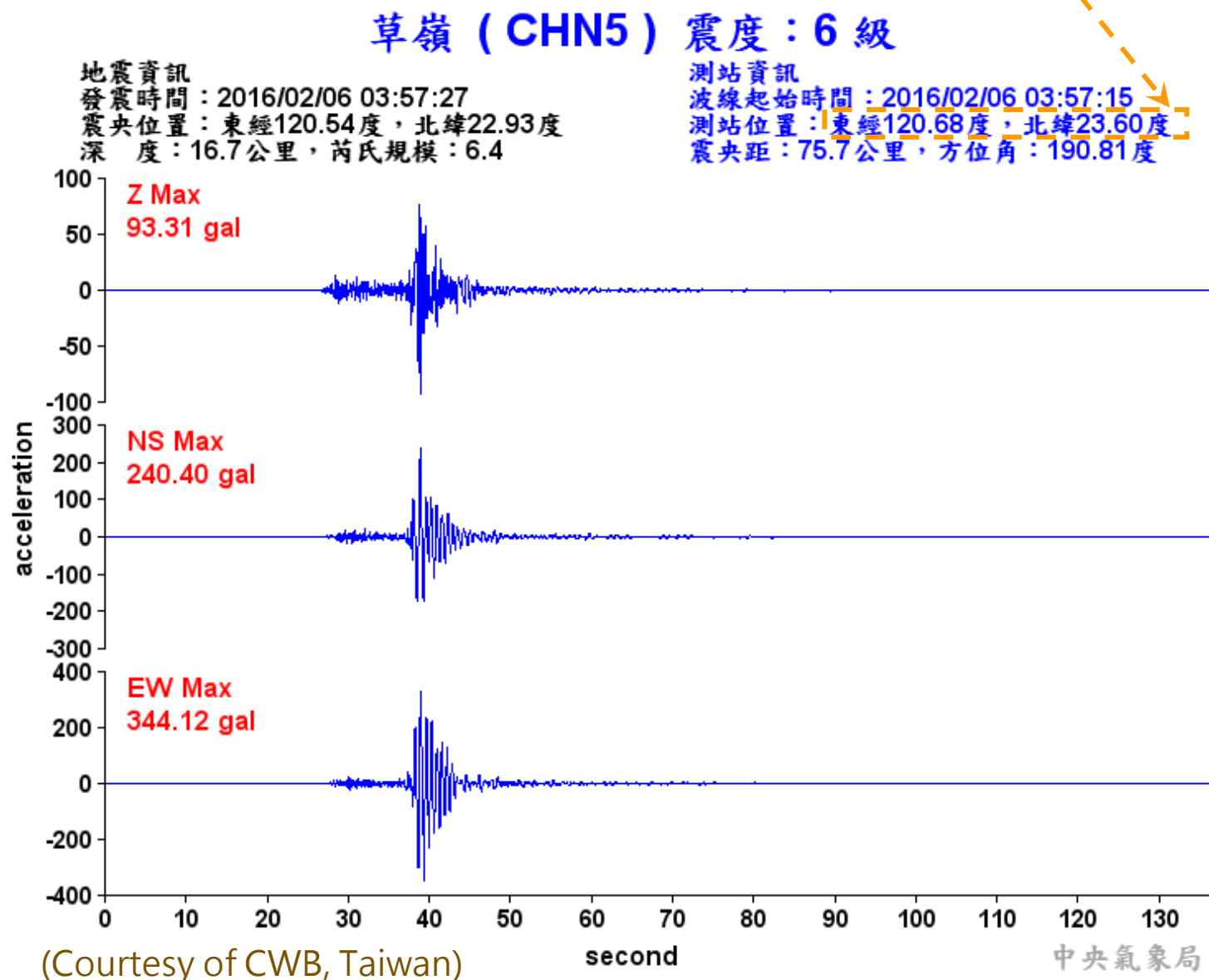
[Central Weather Bureau,
Taiwan](http://www.cwb.gov.tw/)

(Courtesy of CWB, Taiwan)



Earthquake information

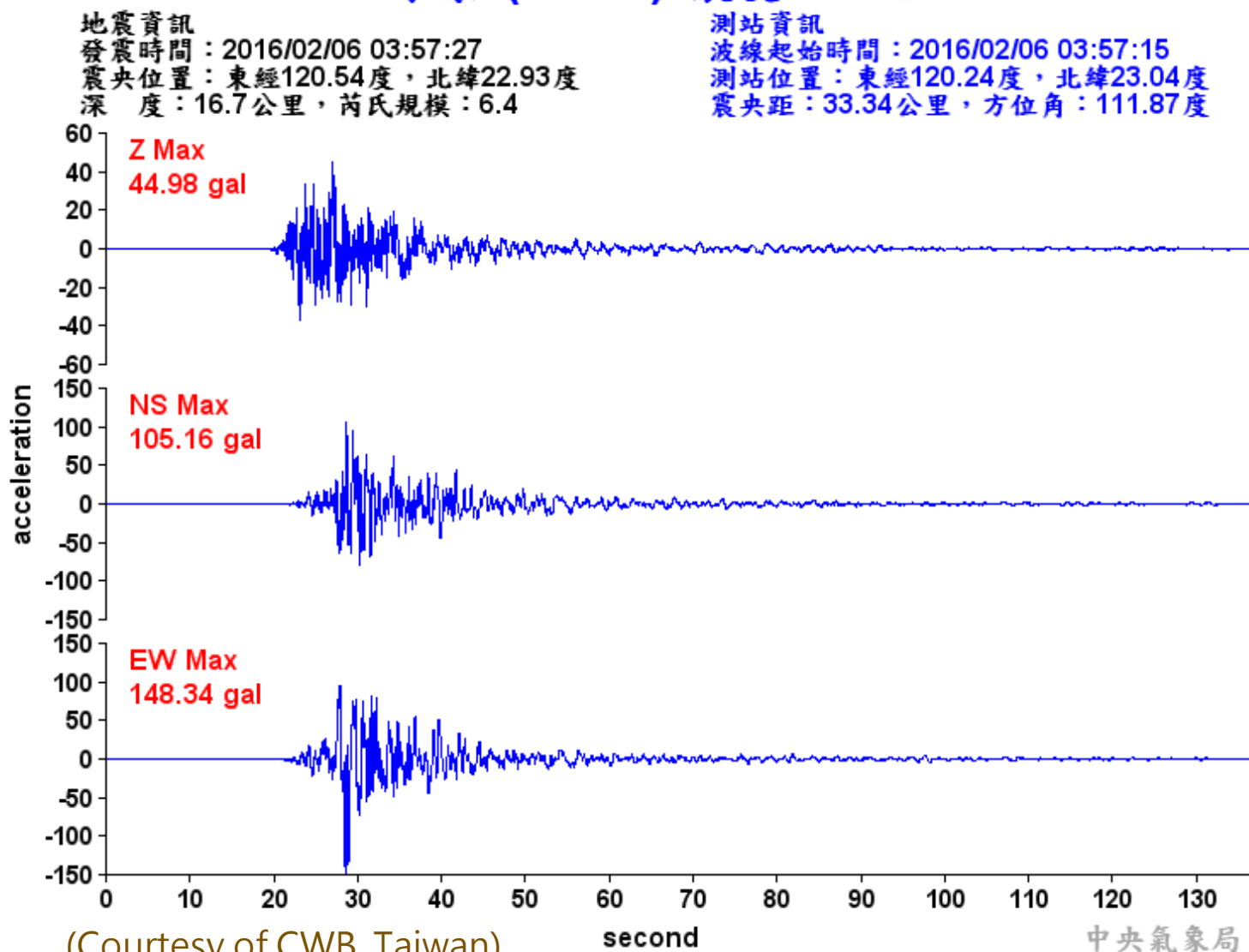
- Maximum PGA at Caoling, Yunlin (120.68E, 23.60N)



Earthquake information

- Yongkang dist., Tainan (area with the collapsed residential building)

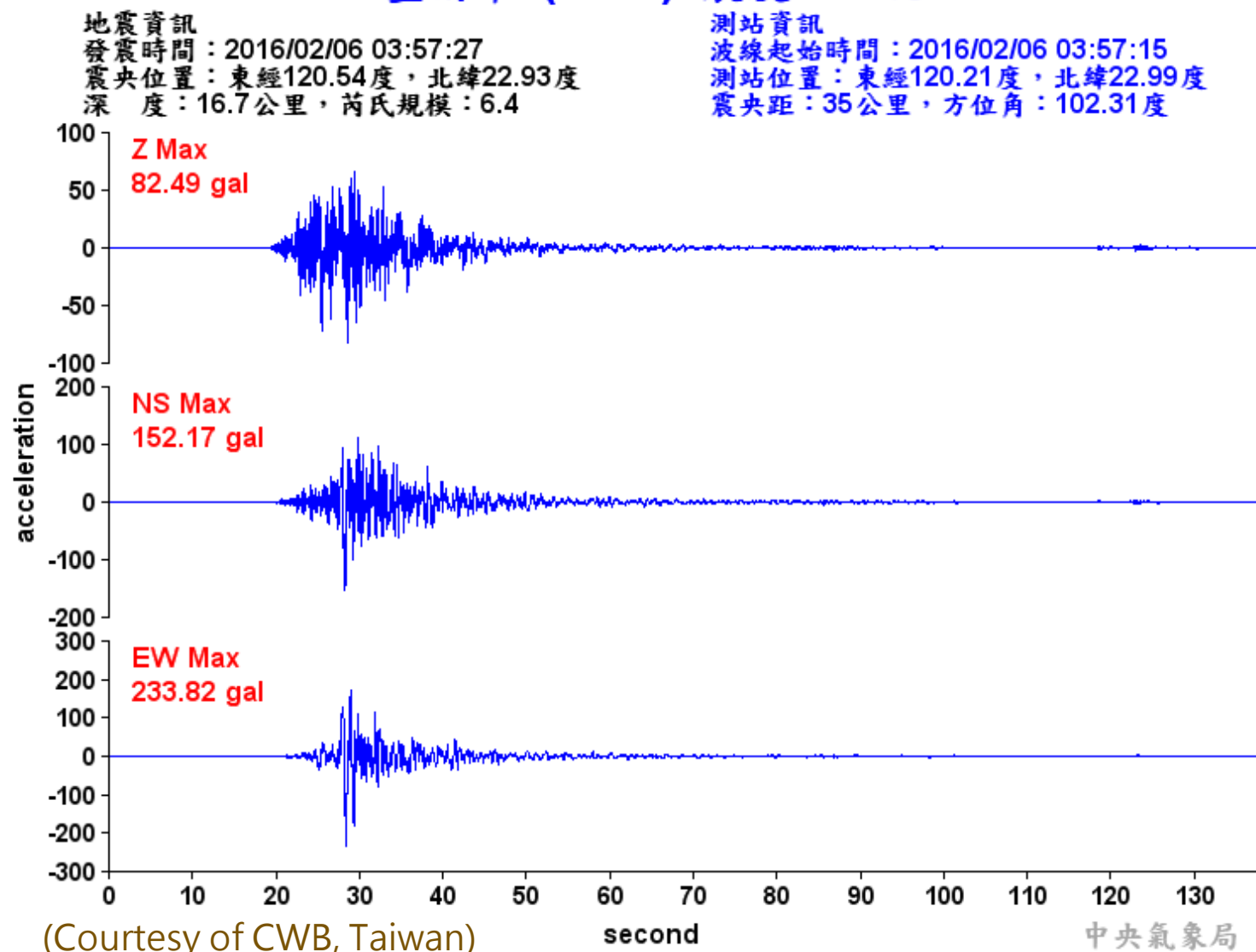
永康 (TAI1) 震度：5 級



Earthquake information

■ Downtown area, Tainan City

臺南市 (TAI) 震度：5 級

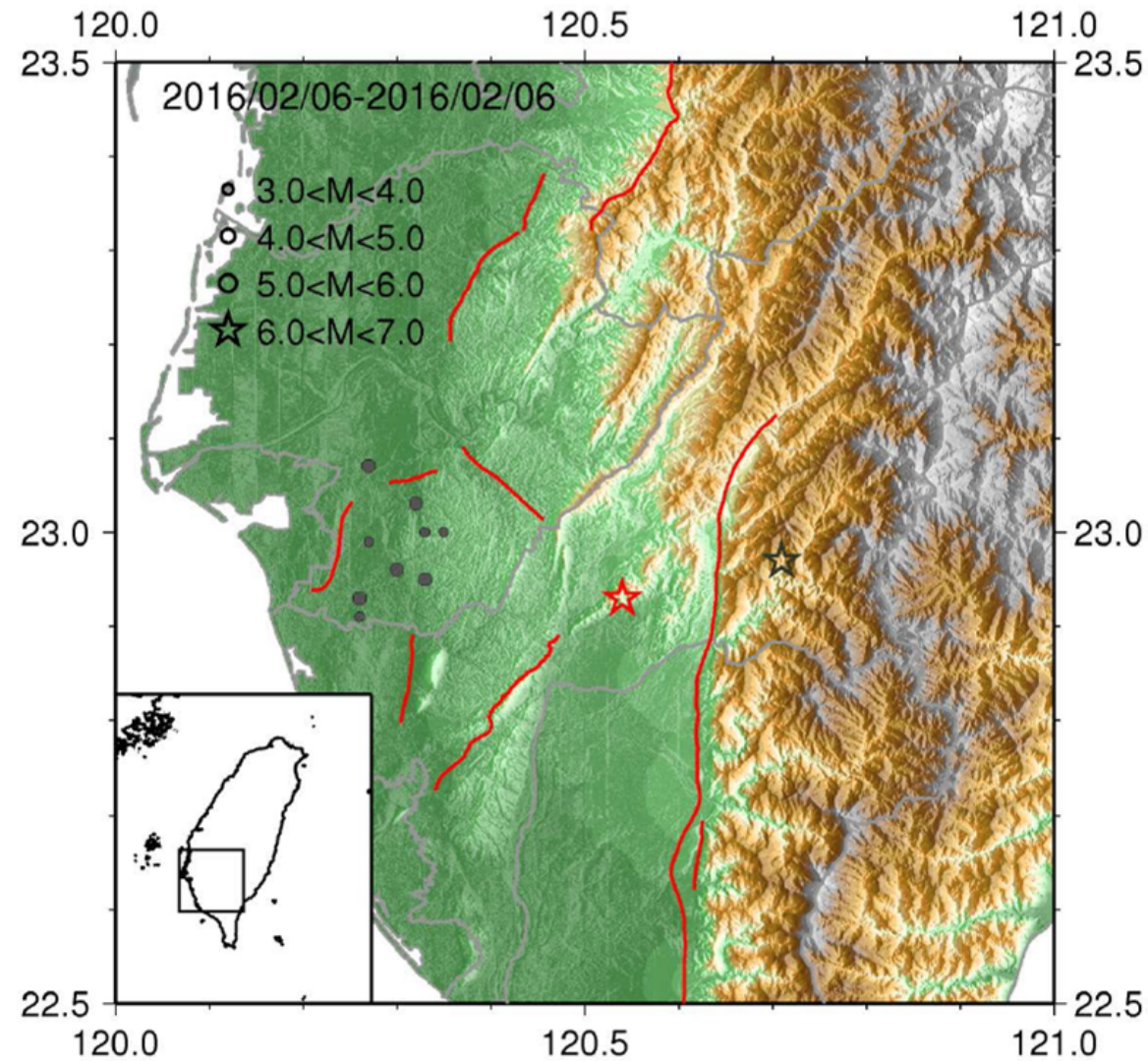


Earthquake information

★ : Main shock

● : Aftershocks

☆ : Main shock of Jiasian
EQ, 2010/03/04



Courtesy of [NCREE Taiwan](#) (link to pdf file)

General damage situation (preliminary)

■ Buildings

Collapse: not more than 10 RC buildings, several URM buildings

Inclined due to soil liquefaction: several RC buildings close to Yansuei River

Moderate damage: no accurate number yet but not many

- Most of the buildings look intact. The damaged buildings scatter in the east area of Tainan (Yongkang, Sinhua, Rende, Gueiren, Guanmiao, Yujing, Shanshang)

■ Casualties (2016/02/07)

24 deaths (22 in the collapse residential building)

121 missing

About 400 injuries

Collapsed Buildings

■ King's Town Bank

Hsinhua (23.036588, 120.300981)

10 stories with 1-story
basement

About 20 years old

1F-3F collapsed and
inclined to the street side

1F-3F: Bank and office

Above 4F: rental suites

(not occupied so no
casualties reported)



Collapsed Buildings

■ King's Town Bank



Collapsed Buildings

■ King's Town Bank

Before
earthquake
from Google
street view



Collapsed Buildings

■ King's Town Bank

Before earthquake from Google street view



Collapsed Buildings

■ King's Town Bank



Collapsed Buildings

■ Weiguan building - Yongkang (23.005026, 120.261198)



Collapsed Buildings

■ Weiguan building

16 stories with 1-story basement

About 16 years old

Collapsed and overturned to the street side

1F-2F: commercial
(big electronic store)

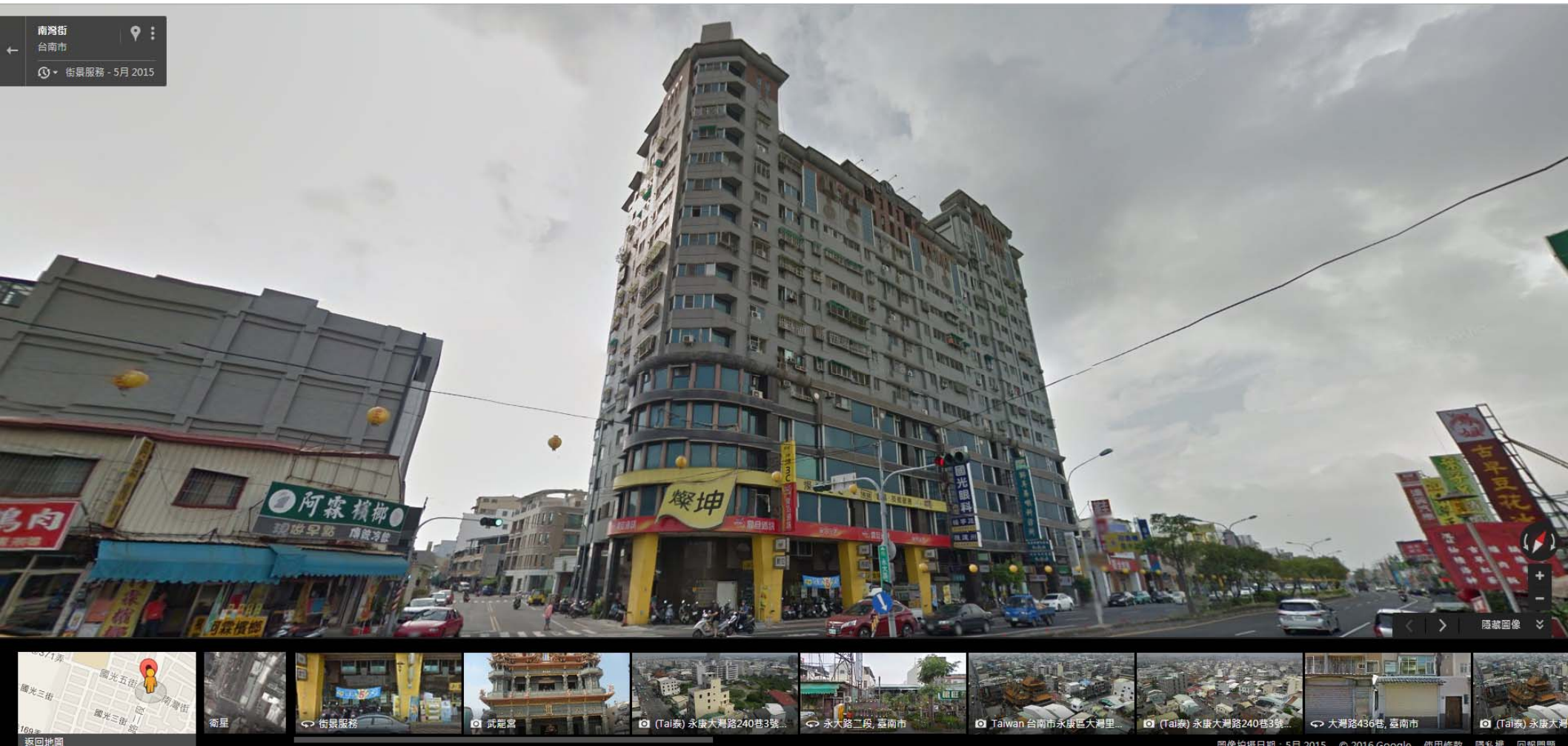
Above 3F: residential



Collapsed Buildings

■ Weiguan building

Before earthquake from Google street view



Collapsed Buildings

■ Weiguan building



Collapsed Buildings

■ Weiguan building



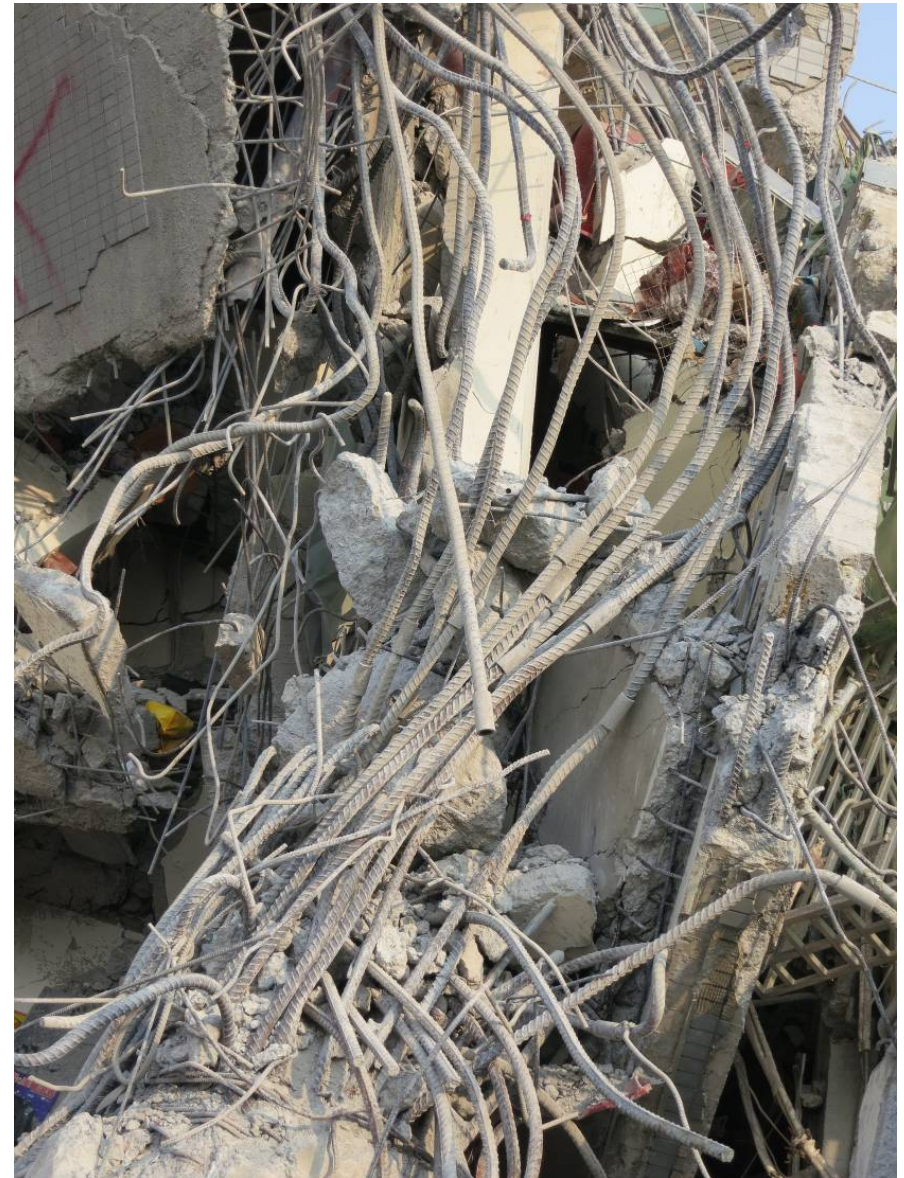
Collapsed Buildings

■ Weiguan building

- It seems there were no walls at the base floor



Collapsed Buildings



Collapsed Buildings

■ Weiguan building



Failure at the
steel coupler?

Collapsed Building

■ Weiguan building

90-degree bend hooks were allowed to use before Chi-Chi earthquake. However the hooks drew the attention of the public opinion and is blamed for the collapse.



Collapsed Buildings

■ Weiguan building

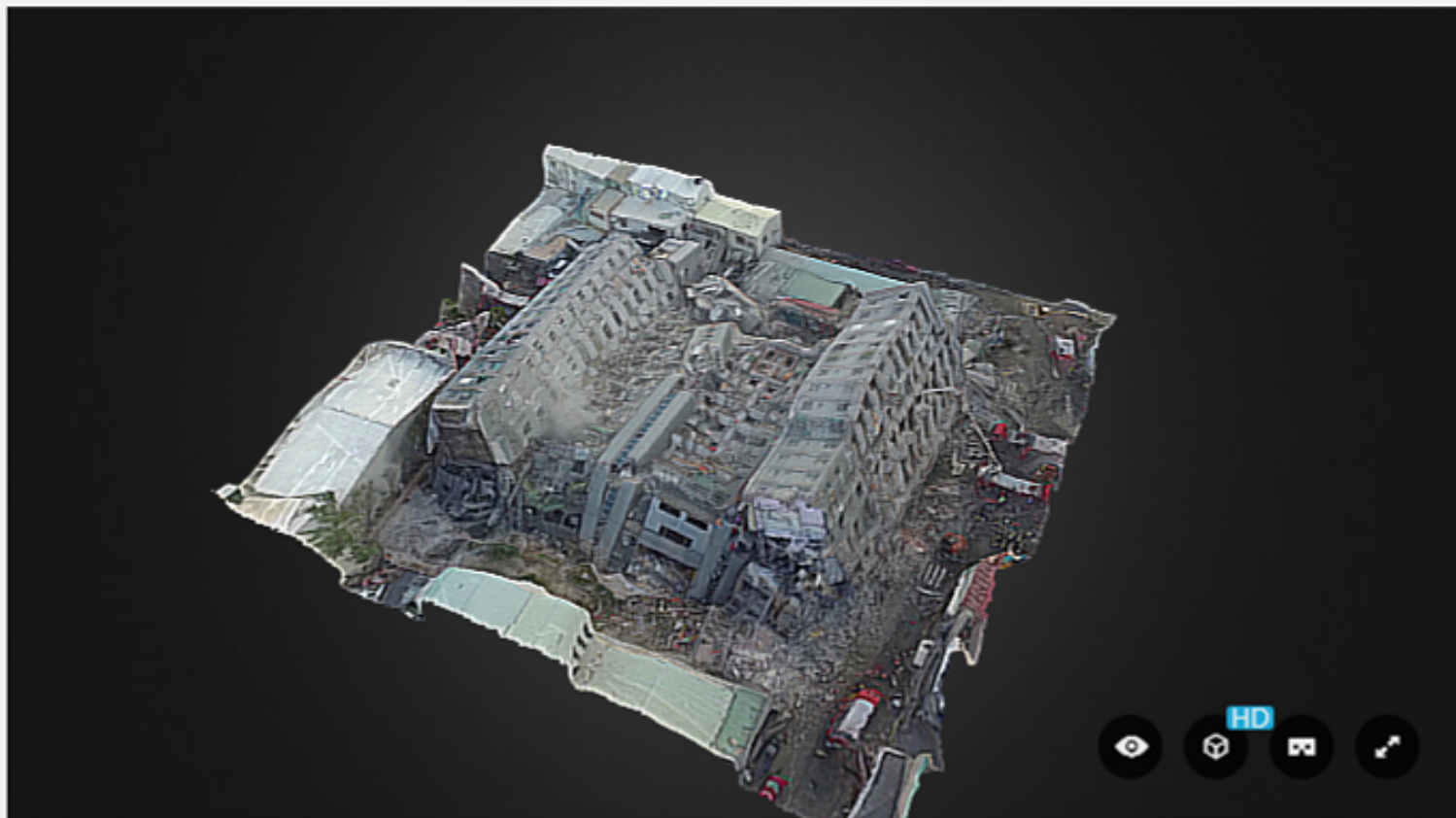
Used oil tanks cast in the concrete were used as inside formwork of non-structural façade to reduce the weight. Some local media mistook this for jerry-building.



Collapsed Buildings

■ Weiguan building

An interactive rough 3D model was built by Dept. of Geomatics, NCKU with photo taken by drones. [click here](#)



Collapsed Buildings

■ Street Building

Rende (22.989977, 120.267316)

3 stories + 1-story rooftop
additions

37 years old

Collapse at the ground
floor

The upper stories were
intact. It was demolished
for safety reason.



Collapsed Buildings

- Street Building



Collapsed Buildings

■ Street Building

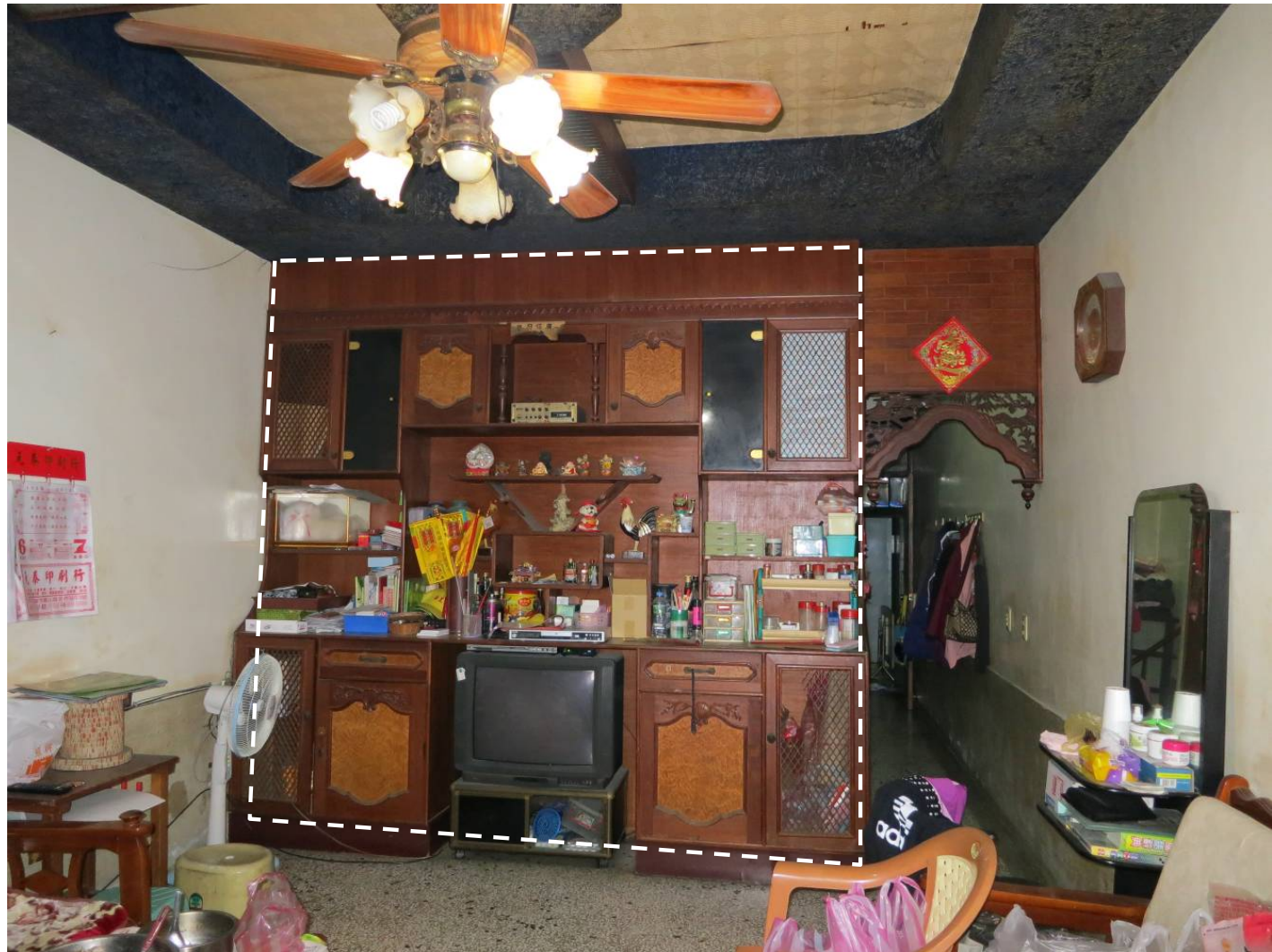
The 2+1F buildings at the left side were built at the same time and they are intact.



Collapsed Buildings

■ Street Building

The intact neighbor buildings are lower and have partially confined masonry panels (behind the closet and adjacent to the stairs) at the base floor.



Collapsed Buildings

■ Tachi Market

Tainan City (22.962476, 120.229978)

4 stories

About 31 years old

Collapse at the
ground floor

1F: market

Above 2F: residence



Collapsed Buildings

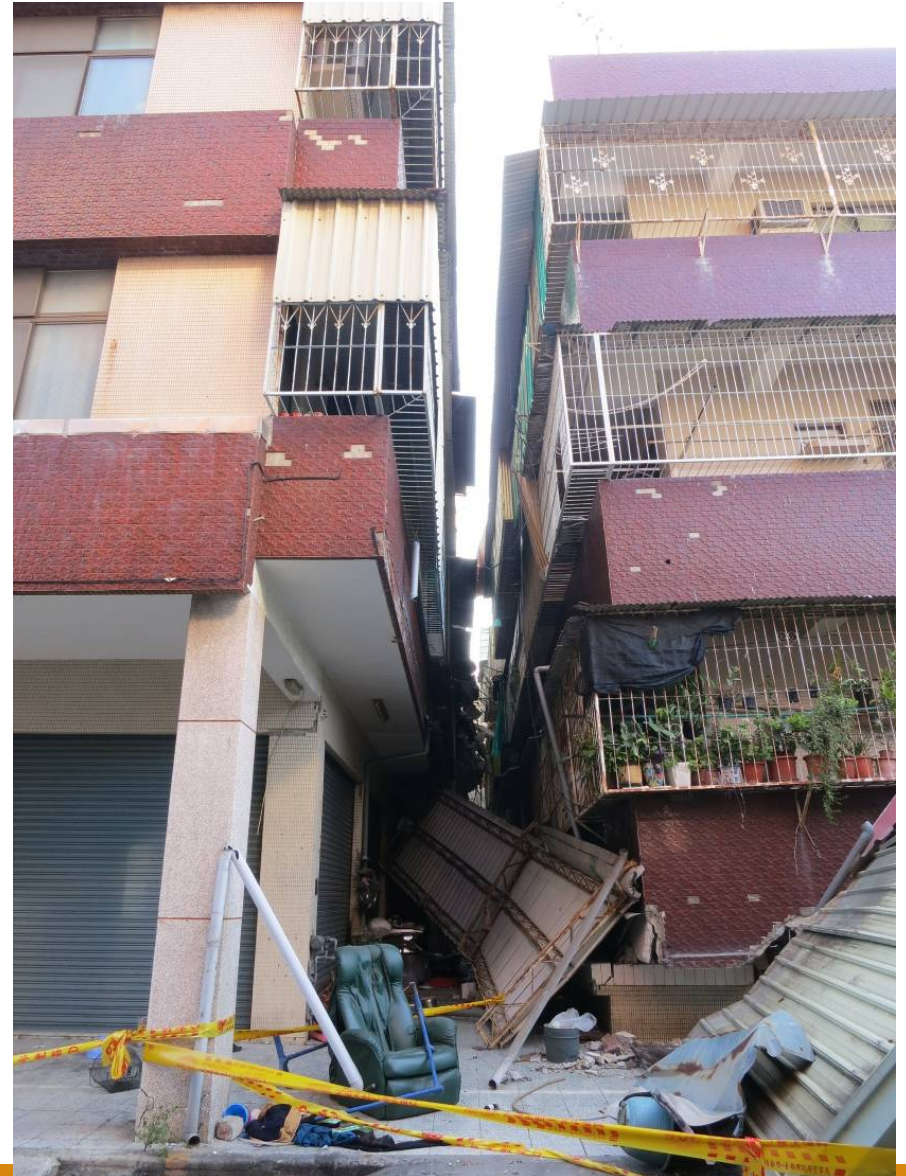
■ Tachi Market - Soft ground floor



Collapsed Buildings

■ Tachi Market

- The building (left) next to the market was mildly damaged.



Collapsed Buildings

- Tachi Market - The building arcade was originally cantilevered. Columns were added at the corner at 2013.



Cantilever
arcade

Collapsed Buildings

■ Tachi Market

- The column bases and the original cantilever beam ends were damaged.



Collapsed Buildings

■ Shanshang Market

Shanshang (23.102771, 120.354864)

2 stories

About 30 years old

Collapse at the
ground floor

1F: market

2F: residence



Collapsed Buildings

■ Shanshang Market



Collapsed Buildings

■ Shanshang Market



Damaged Buildings

■ Shanshang District Office

Shanshang (23.103282, 120.352408) (close to the Shanshang market)

3 stories

About 30 years old

Moderate damage

- Shear cracks appeared on almost every column at 1F and some at 2F
- Ceilings and shelves damaged



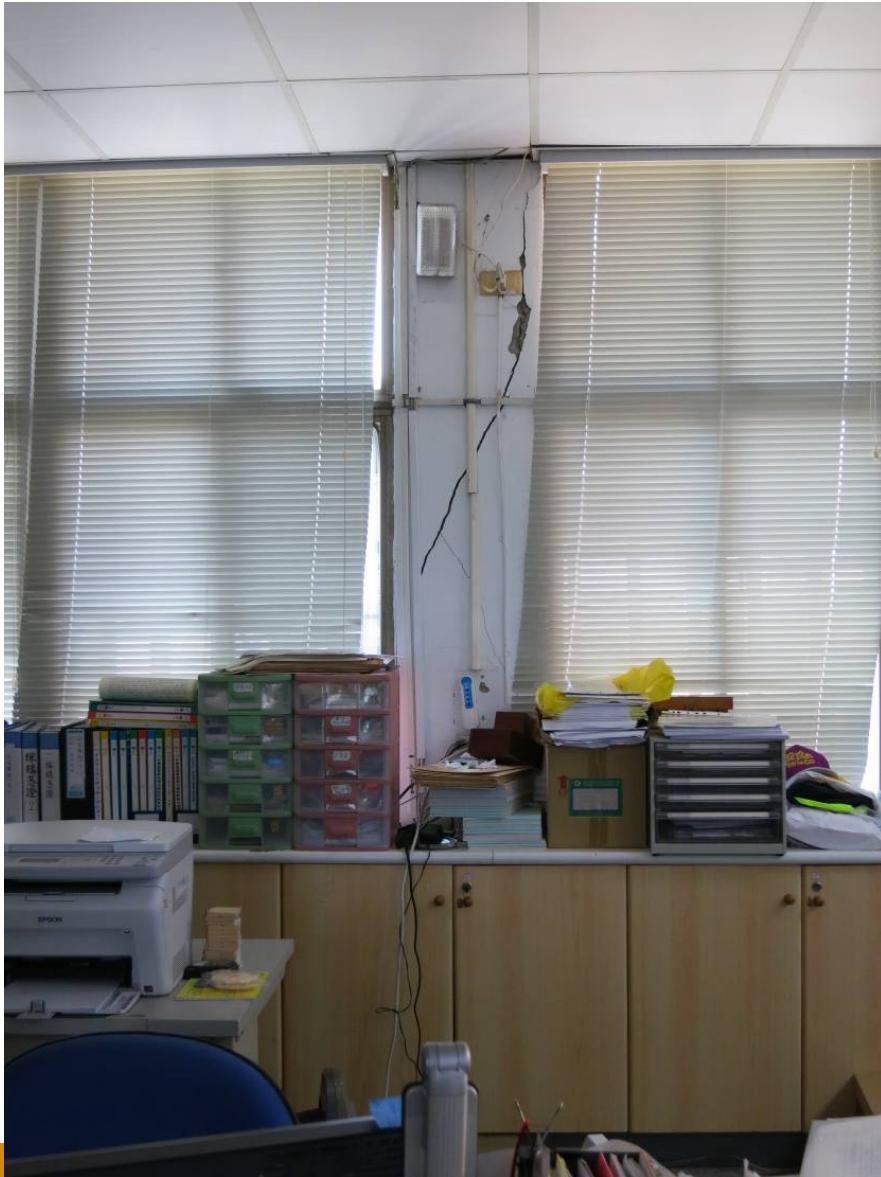
Damaged Buildings

■ Shanshang District Office



Damaged Buildings

■ Shanshang District Office



Intact Buildings

■ Shanshang Junior High School

Shanshang (23.103836, 120.357748) (close to the Shanshang market)

3 stories

30-50 years old

(built in several
periods)

no damage



Intact Buildings

■ Shanshang Junior High School

Standard plan with cantilever corridor and larger span. Similar buildings have been found severely damaged or collapsed in Chi-Chi earthquake, but....



Intact Buildings

■ Shanshang Junior High School

The building has partially confined masonry wing-walls in the back frame. This is also the reason that it rated a high score in the preliminary seismic evaluation and has not been put in the waiting list for retrofit.

