



# Special Session on 2023 Turkey Earthquake Sequence

## Field Observations on Structural Performance of Public Buildings in Turkey

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# The earthquakes



Elbistan,  $M_w$  7.7  
 February 6, 2023 1:24 pm

Pazarcık,  $M_w$  7.8  
 February 6, 2023 04:17 am

# Field Trip Highlights: - Poor Material Quality





# Field Trip Highlights:

- Lack of proper concrete work and formwork construction





# School Buildings

## Adiyaman



- Spalling of exterior cladding
- Cracks in infill walls and plasters
- Damage in stairways
- Nonstructural damage

Source: ITU Kahramanmaraş Earthquakes Report, March 2023.

# School Buildings

Antakya, Hatay



Columns – longitudinal bar buckling



Pancake-style complete collapse



- Collapse of infill walls
- Ceiling damage
- Nonstructural damage

Source: ITU Kahramanmaraş Earthquakes Report, March 2023.



# Hospital Buildings

## Kahramanmaras, Public Hospital



- Spalling of exterior cladding
- Nonstructural damage
- Cracks in infill walls
- No structural damage

Source: ITU Kahramanmaras Earthquakes Report, March 2023

# Hospital Buildings

## Iskenderun, Hatay



**Private Dialysis Center**  
Damaged but standing!



**Public Hospital**  
Damage only in exterior cladding.



# Hospital Buildings

## Hatay, Public Hospital



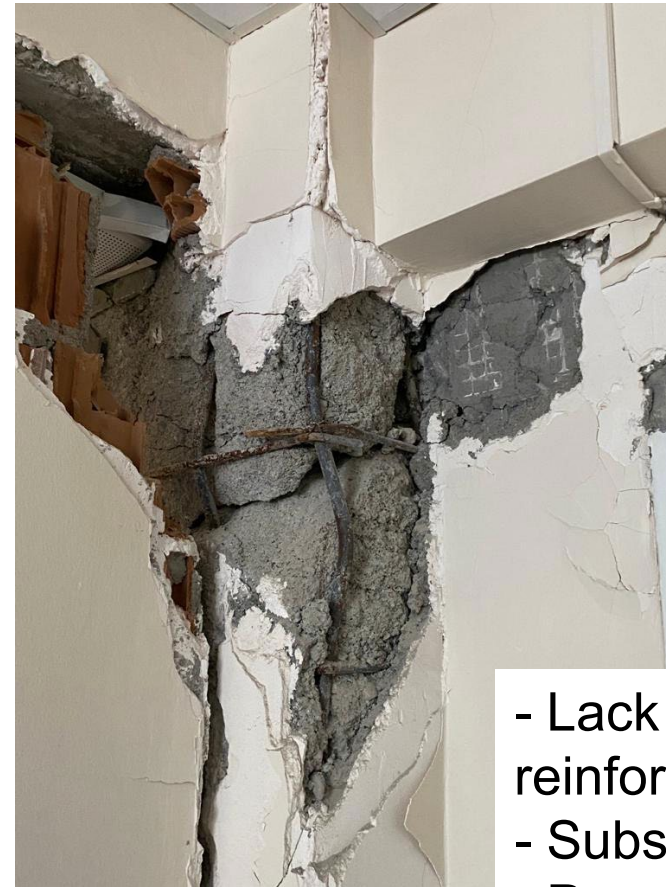
**Completely collapsed!**

- Substandard reinforcement
- Poor concrete quality



# Hospital Buildings

## Adiyaman, Public Hospital



- Lack of sufficient transverse reinforcement
- Substandard reinforcement
- Poor concrete quality



# Hospital Buildings

## Adiyaman, Private Hospital



Exterior - next building is collapsed



Shear wall damage – exterior view



Ventilation system  
passing through the shear wall!!!

# Hospital Buildings

## Hatay, Private University Dialysis Center

Designed as residential,  
used as medical center.

**Completely collapsed!**

- Substandard reinforcement
- Poor concrete quality
- Weak column-strong beam





# Government Buildings

## Adiyaman – City Center



Adiyaman Ministry Building

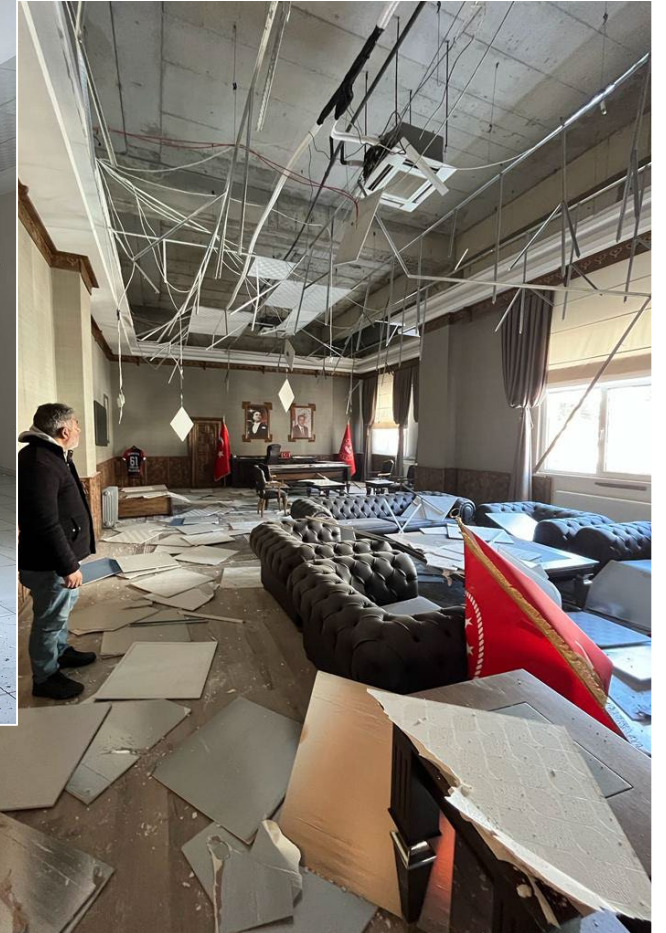
Çelikhan City Hall





# Government Buildings

## Adiyaman – Çelikhan district



District Governor Building



# Government Buildings

## Hatay, Police Academy



### Heavy Damage

- Inadequate clear cover
- Lack of boundary detailing
- Inadequate lap length
- Lack of transverse reinforcement
- Infill wall damage



Source: ITU Kahramanmaraş Earthquakes Report, March 2023.

# Government Buildings

## Hatay – Antakya Fire Station



**Collapsed!**

- Higher first story height
- Soft story collapse
- Weak column-strong beam



# Conclusions

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- ITU teams inspected public buildings in the affected area.
  - Schools, hospitals, government buildings, police stations
- Public buildings in Hatay were affected the worst. Most are collapsed.
- **Overall, public buildings performed much better than the others.**

## WHY?

Regulations?

Better supervision?

Economical flexibility?



**EARTHQUAKE ENGINEERING  
RESEARCH INSTITUTE**  
Learning From Earthquakes

**THANK YOU!**



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2023 EERI Annual Meeting

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