

# Seismic Design of Urban Infrastructures

## 1. Introduction

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# Greats risk which human beings are facing

- Wars & terrorism
- Global warming
- Excessive population increase
- Natural disasters
  - ✓ Earthquake
  - ✓ Tsunami
  - ✓ Tornado, Hurricane & Typhoon
  - ✓ Flooding
- Deterioration of environment
- ...

## Urban Areas

- Mega cities are resting on alluvial soft deposits where we should possibly avoid to live
- This tendency is extreme in Asian region, because alluvial fan deposit is favorable for cultivation for producing rice.
- Mega cities generally attract peoples because of 1) concentration of intelligent information, culture and business chance, 2) comfortable living condition and environment, 3) high mobility due to well constructed transportation facilities and comfortable life due to good lifeline facilities.
- However comfortable and convenient society has a high risk once such a system stops.

# Great Risk in Urban Areas due to Seismic Effects

## 1995 Kobe, Japan, earthquake

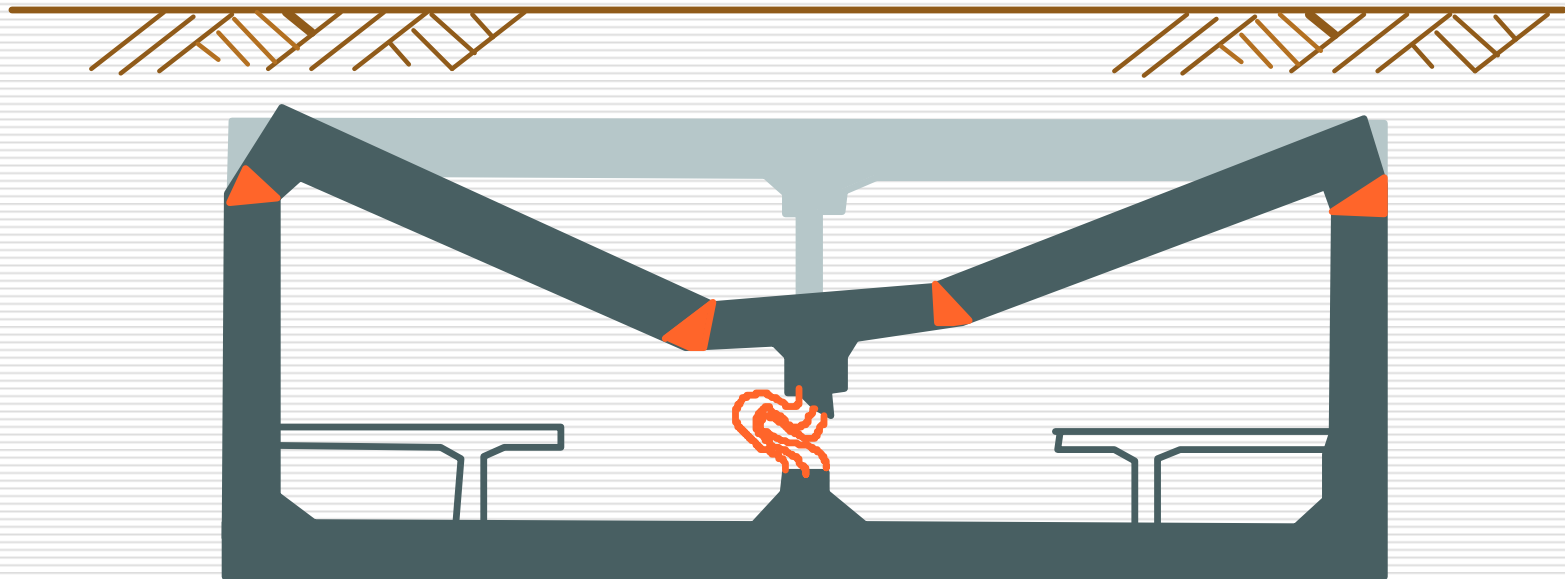




Not only buildings and bridges, but also underground structures (Subways) suffered damage during the 1995 Kobe Earthquake



# Mechanism of Failure



# Settlement of Road Surface



Focus of this lecture is given to “bridge” seismic design, because

- Bridges have a unique structural response which is different from buildings
- Bridges have the longest history and experience for seismic design among urban infrastructures
- Bridges have the most deep accumulated engineering knowledge for the seismic effect
- Bridges have high risk in urban areas



# Seismic Design of Urban Infrastructures

1. Seismic damage in past earthquakes
2. Characterization of ground motions
3. Dynamic response analysis
4. Strength and ductility of structural members
5. Seismic behavior
6. Seismic design of bridges
7. Seismic design of underground structures

# Seismic Design of Urban Infrastructures

1	4/13 (F)	8	6/15 (F)
2	4/20 (F)	9	6/22 (F)
3	4/27 (F)	10	6/29 (F)
	5/11 (F) (no lecture)	11	7/6 (F)
4	5/16 (W)	12	7/13 (F)
5	5/25 (F)	13	7/17 (Tue)
6	6/1 (F)	14	7/20 (F)
7	6/8 (F)	Exam	7/27 (need confirmation)

# Evaluation

Test (70%) + Report (30%)