Behavior of prototypical concrete frame buildings in Mexico City

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BDST Reconnaissance Goal

To assess conditional external damage probabilities in areas of known intensity based on construction type and use, building age, and structural performance factors.
Recording Stations Visited by the BDST

13 Recording Stations of with varying intensities and construction types

(Gomez and Garcia-Ruiz, 1988
Colegio De Ingenieros Civiles De Mexico)
Summary of Intensity Measures

- PGV [cm/s]
- $V_g$ [cm/s]
- $S_{a,avg, 1-3s}$ [g]
- CAV [cm/s]
Structural Performance Factors

Plan Irregularity

Soft Story

Vertical Irregularity

Short Column

Pounding Potential
Damage Categorization

- Minor (mostly cosmetic) Damage
- Moderate (structural) Damage
- Severe Damage
  - Partial or Complete Collapse of Structure

Images of buildings showing different levels of damage.
Severely damaged typically were between 4 and 9 stories

Disproportionate number of severely damaged buildings were RC with URM infill
Damage Statistics

Pounding Potential and Soft Stories were prevalent in severely damaged buildings

More heavily damaged were more likely to have additional performance factors
Case Study Building

1960s to 1970s
8 stories
Apartments
Concrete frame
URM infill
Corner building
Soft Story

1976 Code
1987 Code
2004 Code
SCT2

Source: Google
Case Study Building: Masonry

1

2

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Case Study Building: Frame
Case Study Building: Façade

1

2
Case Study Building: Pounding
Case Study Building: Egresses

1. Image of damaged building
2. Image of damaged building entrance
3. Map showing egress routes

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Case Study Building: Orthogonal
Case Study Building: Summary

- Similar buildings: different degrees of damage – the earthquake targeted certain buildings
- Pounding Potential is high – close proximity of buildings might have helped in this case
- Corner building is a “fuse” in both directions
- Short columns are heavily damaged
- Large openings are not helpful
- Egresses blocked, stairs destroyed
New Construction in Mexico City
Acknowledgements

- Deborah Weiser (One Concern)
- Jeffrey Hunt (Exponent)
- Maurizio Gobbato (RMS)
- Arely Acevedo (CICM)
- Ricardo Ramirez and Abraham Tacho (WSP)
- Ted Allen (One Concern)
- Daniel Fuentes (Cesar Mendez Franco S.C.)

More information available at:
http://learningfromearthquakes.org/2017-09-19-puebla-mexico/