EARTHQUAKE ENGINEERING RESEARCH INSTITUTE
COMMITTEE ON CONTINUING EDUCATION
499 14th Street, Suite 320
Oakland, California 94612-1934
Phone (510) 451-0905 Fax (510) 451-5411

SUBCOMMITTEE TO CREATE SLIDE SETS ON THE SEPTEMBER 19, 1985 MEXICO EARTHQUAKE

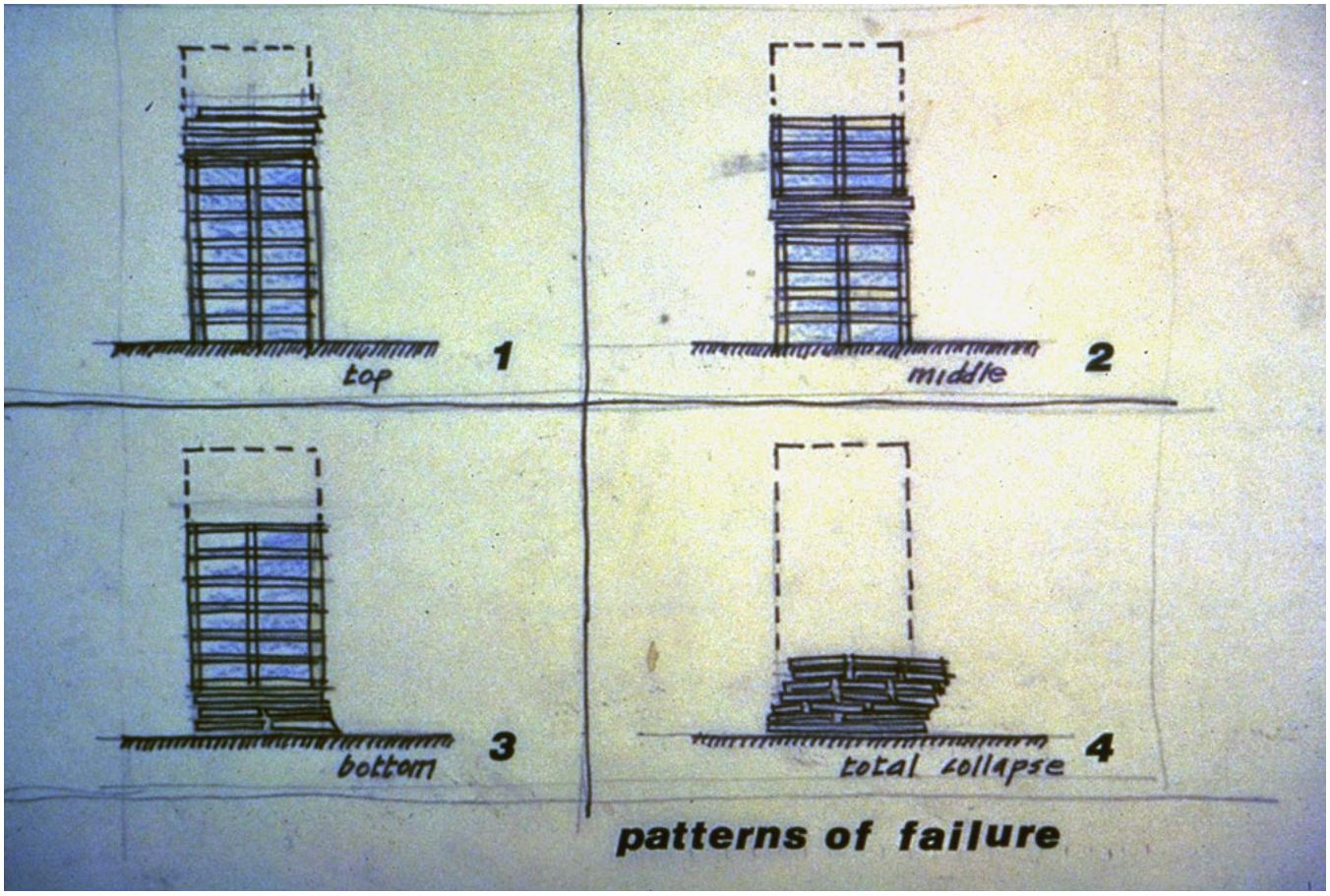
MEXICO - SET II: PATTERNS OF BUILDING FAILURE

MEMBERS:

Chris Arnold, Vit Bertero, George Brogan, Ted Canon, Ted Christensen, Lloyd Cluff, Gene Cole, Bob Hanson, Walter Hays, E. V. Leyendecker, Miguel Santiago, J. P. Singh, and Peter Yanev

FEBRUARY 1987

BACK TO MAIN MENU



Chris Arnold

Patterns of Failure

This graphic shows the four characteristic patterns of building failure apparent in Mexico City.

Chris Arnold

Upper Floor Collapse

Time and Location of Slide: Hotel Intercontinental, December 15, 1985

Total collapse of the upper floors of the hotel building on the right. The portion of the hotel on the left is intact. Note cross-bracing on the infill end wall, believed to have been added after an earlier earthquake.

Chris Arnold

Upper Floor Collapse

Time and Location of Slide: Hotel Intercontential, December 15, 1985

Detail of upper floor failure to Hotel Intercontinental. Note damage to overhanging, concrete canopy at second floor, and damage at vertical seismic joint.

Chris Arnold

Upper Floor Collapse

Time and Location of Slide: Downtown Mexico City, December 15, 1985

Typical upper floor collapse. Note typical waffle slab structure and absence of suspended ceiling. Metal and glass curtain was removed subsequent to earthquake.

Chris Arnold

Pounding Damage

Time and Location of Slide: Hotel De Carlo, October 1, 1985

Damage caused by pounding results in intermediate floor collapse. Note that in spite of severe structural distortion, much glass is unbroken.

Chris Arnold

Intermediate floor collapse

Time and Location of Slide: Hotel De Carlo, October 1, 1985

Intermediate floor collapse, caused by pounding from the building at left. Note severe distortion of portions of building to the right.

Chris Arnold

Lower Floor Collapse

Time and Location of Slide: Downtown Mexico City, October 1, 1985

Collapse of a number of lower floors of a commercial building. Upper floors remain intact. Note open first floors contrasted to upper floor with the consequent stiffness differential probably leading to the failure.

Chris Arnold

Building Distortion

Time and Location of Slide: Downtown Mexico City, December 15, 1985

Severe distortion of building that is triangular in plan to fit the site requirement at a multiple street intersection. Form of building results in the torsional behavior shown.

Chris Arnold

Steel Truss Damage

Time and Location of Slide: Downtown Mexico City, December 15, 1985

Severe damage to a large theater. The balcony seats can be seen to the rear. The wide-span steel truss is severely damaged.

Chris Arnold

Building Subsidence

Time and Location of Slide: Downtown Mexico City, December 15, 1980

Moderate sized apartment house in corner location has sunk approximately half a story below grade level, while remaining structurally intact.

Chris Arnold

Infill Wall Damage

Time and Location of Slide: Downtown Mexico City, December 15, 1985

Typical patterns of damage in unreinforced masonry infill wall. Note damage concentration towards bottom of walls.

Chris Arnold

High Rise Supported by Masonry Buildings

Time and Location of Slide: Mexico City (Zona Rosa) Dec. 15, 1985

The nine sotry building has a soft first floor and very poor configuration. The masonry buildings to each side have provided lateral support so that the building acts as a set-back tower on a base. This behavior is an argument against large seismic separation designed to prevent pounding.

Chris Arnold

Unbalanced Cantilever Structure

Time and Location of Slide: Downtown Mexico City, October 1, 1985

This unusual structure has a roof supported by four columns at the center of the roof perimeter. There are no supports at the corners. The lack of damage, even to glass, shows the lack of response to ground motion.

Chris Arnold

High-Rise Residential Damage

Time and Location of Slide: Tlatelolco, October 1, 1985

Immediately to the right of the structure shown, a similar structure has totally collapsed. Severe damage can be seen in corner columns and in columns on the open portions of the facade.

Chris Arnold

Response of Masonry vs. Response of Tall Buildings

Time and Location of Slide: Downtown Mexico City, October 1, 1985

The old masonry building in foreground has suffered little damage. The large office building in the background has lost its top floor and suffered serious structural damage elsewhere.

Chris Arnold

Undamaged Masonry Buildings

Time and Location of Slide: Downtown Mexico City, October 1, 1985

This slide shows lack of damage to low- rise buildings including low quality unreinforced masonry buidings. It shows lack of response of these building types to the particular ground motion in Mexico City.

Chris Arnold

Curtain Wall Damage

Time and Location of Slide: Mexico City, October 1, 1985

Curtain wall damage to building with severe structural damage and collapse of top floor. In spite of damage and distortion, window glass is unbroken.

Chris Arnold

Latino Americana Tower

Time and Location of Slide: Mexico City, October 1, 1985

Undamaged glass wall of Latino-Americana tower designed in 1948. Note serious damage to older building in foreground, one-half black away from the tower.

Chris Arnold

Glass Damage

Time and Location of Slide: Mexico City, October 1, 1985

Distorted vertical glazing windows indicate deflection of second story slab. In spite of severe distortion to framing, much glass is still intact.

Chris Arnold

Undamaged Curtain Wall

Time and Location of Slide: Mexico City, October 1, 1985

Undamaged glass facade including glass at corner. This buildig is one block away from the Regis Hotel, an area of very severe damage.