Masonry Construction Around the World: an Overview

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Short Course on Seismic Design of Reinforced and Confined Masonry Buildings  
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Confined Masonry Construction: a Definition

Confined masonry is a construction system where the walls are built first, and RC columns and beams are cast afterwards.
Key difference between the confined masonry and RC frame construction = construction sequence

Confined Masonry
- Walls first
- Concrete later

Reinforced Concrete Frame
- Concrete first
- Walls later

Source: Tom Schacher
Key Components of a Confined Masonry Building

Key structural components of a confined masonry building are:

- **Masonry walls** made either of clay brick or concrete block units
- **Tie-columns** = vertical RC confining elements which resemble columns in reinforced concrete frame construction
- **Tie-beams** = horizontal RC confining elements which resemble beams in reinforced concrete frame construction.
Confined Masonry Building: Key Components

SLAB
CONFINING BEAMS AND COLUMNS
WALLS
FOUNDATION
PLINTH
Confined Masonry: Beginnings

- Evolved though an informal process based on its satisfactory performance in past earthquakes
- The first reported use in the reconstruction after the 1908 Messina, Italy earthquake (M 7.2) - death toll 70,000
- Practiced in Chile and Columbia since 1930’s and in Mexico since 1940’s

Currently practiced in several countries/regions with high seismic risk, including Latin America, Mediterranean Europe, Middle East (Iran), South Asia (Indonesia), and the Far East (China).
Confined Masonry Construction – Examples
Confined Masonry Apartment Buildings (Chile)
Key Elements – Layout Rules

tie-column spacing ≤ 4.0m

thickness ≥ 100mm

tie-columns at wall ends and intersections

tie-columns at openings
Location of Confining Elements is Very Important!

- tie-beam in parapets ≥ 500 mm
- tie-columns in parapets
- slab
- tie-beam spacing
- H / t ≤ 25
  t ≥ 120 mm
- confining elements around openings
- Tie-columns at wall intersections
- Tie-column spacing:
  - 6.0 m (moderate seismicity)
  - 4.5 m (high seismicity)
Confined Masonry: Construction Process

Indonesia (C. Meisl)  Slovenia (Lutman and Tomazevic)
Confined Masonry Construction: Toothing at the Wall-to-Tie-Column Interface

Toothing enhances interaction between masonry walls and RC confining elements.