PARTITIONS AND CLADDING OF MULTISTORY BUILDINGS

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In summary

- Partitions and cladding were generally made of masonry.
  - their seismic performance was not satisfactory

  - **Reason:**
    - too stiff as compared to the frames
    - inadequately fixed to the structure
    - scarcely reinforced or not reinforced

- Gypsum board is seldom used
- More flexible or paneled facades are not used
About Multistory Buildings in coastal area

- Generally buildings are RC up to 10 stories
  older units: flat slabs or waffle-slabs on columns
  newer units: girder-column frames, RC floors
  shear walls are not used

- Building occupancy in coastal area:
  apartments / hotels
  hospitals
  government buildings
  few office buildings
About materials
partitions and cladding

● Generalized usage of masonry
  not reinforced
  very scarcely reinforced

● 2 main types:
  -- hand-compacted artisanal
    baked clay bricks
  -- blocks (standard size)
    concrete or cement-mortar

● sometimes
  -- extruded hollow clay units
    (thin walled horizontal cells)
Performance of masonry cladding

- Due to inadequate anchorage to main structure, masonry cladding frequently toppled and fell to the ground.

Or else due to lack of reinforcement cladding disintegrated.
Performance of masonry cladding

Cladding failure is of course, a very serious threat Both at ground and for the inhabitant

Hospital wall collapsing on ambulance garage
Performance of interior partitions

- Again, due to lack of reinforcement
  & inadequate anchorage to main structure
  partitions disintegrated or toppled
Blocked Means of Egress

- In several instances it was fortunate that the earthquake was Saturday evening
At the root of the performance problem

- Masonry partitions and cladding are brittle and too stiff for the typical building.
- This type of masonry starts to crack with a few millimeters of in-plane story displacement while the “typical” building frame can be shown to start yielding at 2 cm interstory displacements.
- If the masonry is under-reinforced it disintegrates at the design EQ loading.
- Even if partition is permitted to “slide” while prevented from toppling it is usually very difficult to achieve effective displacement isolation.
- For claddings a more flexible system or a paneled solution is necessary.

But before trying to “perfect” or “rescuing” the masonry system there is a more fundamental step to take:
As a conclusion
The “typical” structure is too flexible

- For the architectural usages in Ecuador and other Latin American countries **stiffer structures are needed.**

- **It is necessary to use resources such as shear walls to laterally stiffen the buildings (and to increase strength reliability)**

- **In the presenter’s view, only when stiffer structures are built should the issue of proper non-structural seismic design be addressed**

- It is not only the partitions and cladding which are threatened by too flexible structures hanging ceilings are a threat, especially in large, high rooms
An afterthought
Why the penchant with masonry in Lat Am

- One reason is simply custom, usage
  this is the case in Ecuador – gypsum partitions are simply not used

- In several other Latin American countries
  the use of gypsum partitions much more extensive,
  and more reinforcement is used in masonry partitions
  And the use of paneled facades is increasing.

- **But two factors still make masonry an issue**
  -- one is division between properties in the same floor
    (apartments surrounded by a “solid” barrier)
  -- the other factor is aesthetic –
    (brick facades are frequently an architectural choice)
Thank you