Assessment of Ultimate Drift Capacity of Reinforced Concrete Shear Walls

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1. Research Motivation

Fig.1 Flexure failure through concrete crushing

Fig.2 Out-of-plane buckling failure

The 2010 Off Maule Chile Earthquake caused severe damage to a large number of RC structural walls.
Flexure failure and out-of-plane buckling are focused in the study.

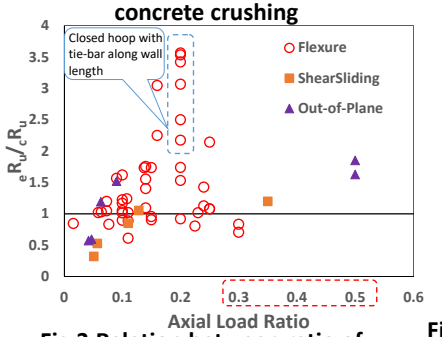


Fig.3 Relation between ratio of experimental to computed ultimate drift capacity and axial load ratio

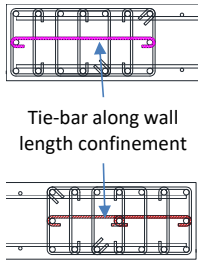


Fig.4 Closed hoop rebar with tie-bar along wall length confinement

From Fig. 3 and 4 :

- Experimental flexural ultimate drift capacity of RC wall under high axial load (0.3-0.5) is inadequate.
- A few experiment on out-of-plane buckling
- Tie-bar along wall length may cause a large error ($_eR_u/_cR_u$) in Fig.3

*$_eR_u$=Experimental ultimate drift capacity
$_cR_u$=Computed ultimate drift capacity
Axial load ratio = Axial load/Concrete capacity of wall cross-section

2. Meaning of Technical Term

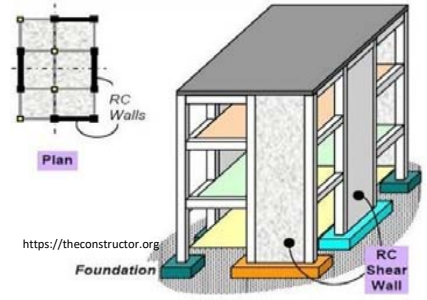


Fig. 5 Reinforced concrete (RC) shear wall

They are commonly used as lateral load resisting system in tall buildings.

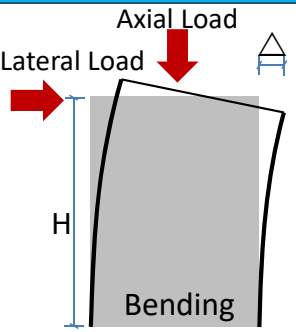
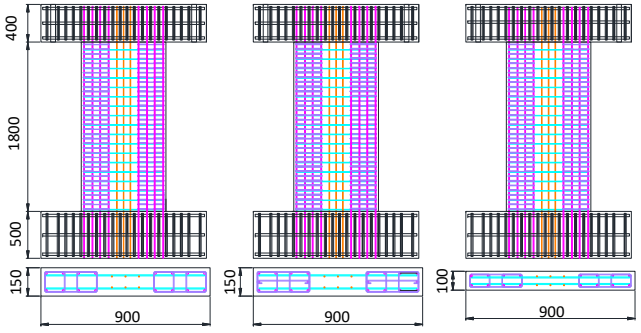


Fig.6 Drift of RC wall

$$\text{Drift} = \frac{\Delta}{H}$$

3. Research Plan



No.1 (Standard, Axial load ratio = 0.2)
No.2 (Axial load ratio = 0.3)
No.3 (Axial load ratio = 0.4)

No.4 (Add Tie-bar along wall length)

No.5 (Thin Wall)

Fig.7 Specimens

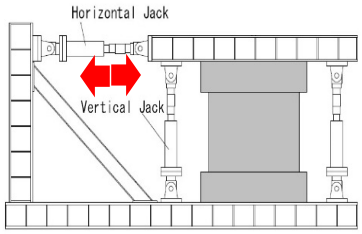


Fig.8 Loading System (Kabayasawa et al. 2014)

4. Expected Results

The fiber-based model was used to simulate specimens' behavior before the experiment.

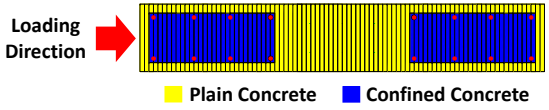


Fig.9 Geometry of fiber-based model

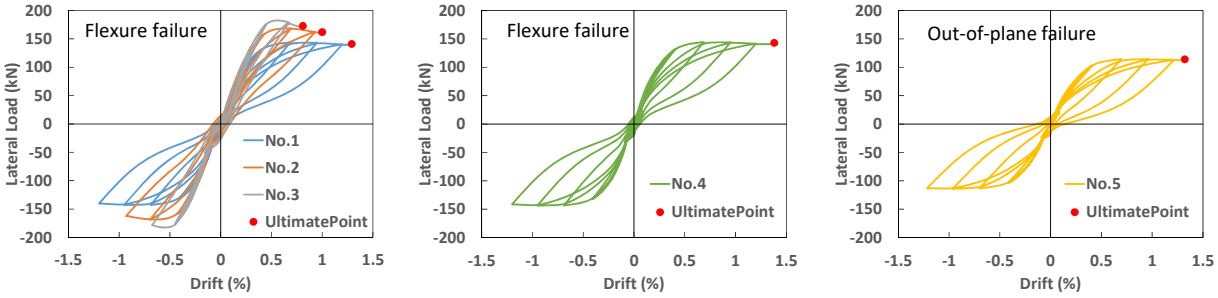


Fig.10 Expected hysteresis curves and ultimate drifts

5.Research Value

- This study will fulfill the missing experimental of RC shear wall in high axial load level failed by flexure and RC shear wall failed by out-of-plane.
- Engineer can predict ultimate drift capacity of RC shear wall which fail in flexure and out-of-plane. It will help to avoid undesired failure mode (out-of-plane).