



**SIMPSON**

**Strong-Tie**

# Response to proposed path of the Seismic Task Group

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# Proposal to replace existing seismic qualification with ASPC2 of AC510

- Proposal by Seismic TG 6 is too conservative for anchors used in majority of the building applications.
- The research behind the justification of ASPC2 of AC510 is limited and is not appropriate in majority of the anchor provisions today.
- Existing mechanical and adhesive anchors installed today qualified under ACI 355.2 and ACI 355.4 will not pass the proposed revision.
- ACI 318 Anchorage design provisions factors need to be revised to remove some of the conservatism.

## Justification for Crack Width within ASPC2 of AC510

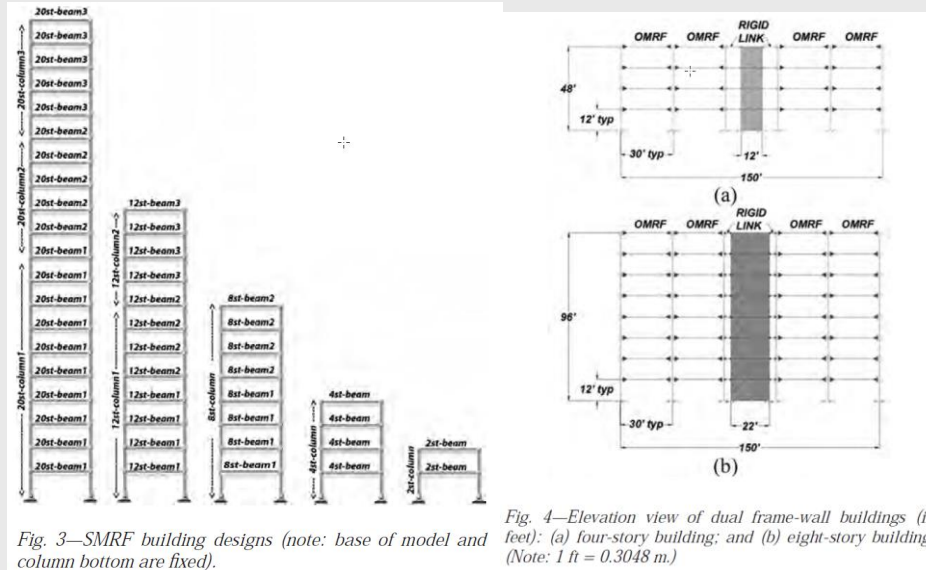
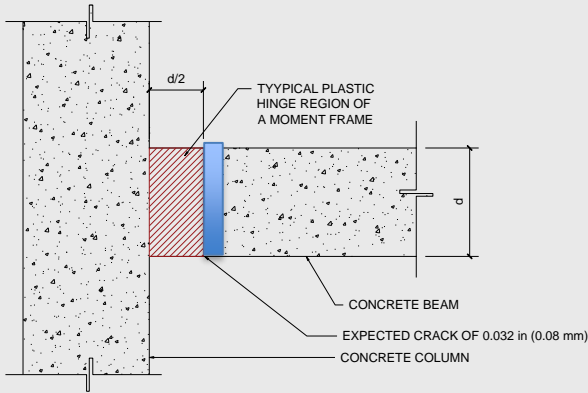


Fig. 3—SMRF building designs (note: base of model and column bottom are fixed).

Fig. 4—Elevation view of dual frame-wall buildings (in feet): (a) four-story building; and (b) eight-story building. (Note: 1 ft = 0.3048 m.)

- Justification of movement protocol and crack widths were derived from 2d frame concrete special moment frames and ordinary moment frames coupled with concrete shearwalls.

## Justification for Crack Width within ASPC2



- Crack widths of 0.032" (0.8mm) occurs right outside of the plastic hinge zones of concrete lateral systems
- Majority of anchors are installed outside of this area.

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Development and validation of European guidelines for seismic qualification of post-installed anchors

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### 3.3. Crack widths

The width of a crack in concrete coincident with an anchor can have a profound detrimental influence on the anchor behavior [37].

anchorage community regarding the applicable crack width for seismic qualification tests [19,38,39]. Although the discussion has been limited to tension and flexural cracking, 0.8 mm is generally accepted as the upper-bound crack width considered to occur at the onset of yielding of the reinforcement just outside the plastic hinge zone for structures designed according to the Eurocode 2 [40] or ACI 318 [41]. Anchors installed within the expected plastic hinge regions are outside of the scope of ETAG 001 and ACI 355.

As a structure responds to an earthquake, cracks in reinforced

## Buildings that should not require ASPC2



- Building with low aspect ratio shearwall
  - Anchors are located at equipment anchorage typically on concrete slabs-on-grade

## Buildings that should not require ASPC2



- Steel frame building
- Anchorage on concrete mat slabs at crawl spaces and on/ suspended from concrete floor over metal deck.

## Buildings that should not require ASPC2



- Wood framed building over concrete post tensioned podium.
  - Anchorage are typically located above concrete podium or suspended from concrete podiums.

## Buildings that should not require ASPC2



- Residential building
  - Anchorage are typically located at top of foundation.



## Summary – Proposed change of seismic qualification to ASPC2 per AC510

1. The research conducted at UCSD and U. Stuttgart is limited to lateral force resisting systems in Concrete Buildings. Anchors qualified per ACI 355.2 and 355.4 are attached to parts of a building that are not part of the concrete lateral force resisting systems.
2. Buildings also consist of steel framed buildings that contain concrete over metal deck where post installed anchors are attached. ASPC2 qualified anchors will be too conservative in these types of installations.
3. Anchors currently qualified per ACI 355.2 and 355.4 will not pass the proposed qualification. These types of anchors will be eliminated or their capacity will be drastically reduced.
4. Design factors in ACI 318 does not align with the capacities that will be derived from ASPC2 type of qualifications making the design too conservative.