Aluminium Shear-Link for Seismic Energy Dissipation

**Shear-Yielding of Aluminium**
- Ductile with large shearing strains (up to 10%) without buckling or tearing.
- Low yield strength allows thicker web reducing the problem of web buckling
- Shear deformation maximizes material participation in plastic deformation
- Can be used to enhance energy dissipation potential of conventional structural systems

**Hysteretic Response**
- First yielding at 0.2% strain and stress at 20% strain is 2.6 times the yield stress. No buckling until 10% strain
- Stable response even after buckling due to tension field action formed with the help of transverse stiffeners

**Some Applications**
- **Shear-Link Truss Moment Frames**
  - Strong column - weak girder due to links yielding in vertical shear due to lateral loads, inelastic activities predominately in links and moment hinging in truss chords for a collapse mechanism.
  - Significant energy dissipation in comparison to conventional X-Diagonal STMFs

**Conclusions**
- Aluminium shear-links have very ductile shear-yielding and can dissipate large amount of energy effectively and reliably even at large strains (up to 20% shear strain)
- They have excellent strain-hardening behaviour which helps in avoiding excessive concentration of plastic deformations
- Systems equipped with shear-links showed significant reduction in (i) seismic energy input, (ii) Base shear, (iii) Storey drift
- Shear-links can be easily replaced after extreme earthquakes and can be deployed in existing structures for seismic strengthening

**Experimental Investigation**
- 24 specimens of three panel aspect ratios and three web depth-to-thickness ratio were tested to obtain key parameters for design of web panel and stiffeners

**Design Characteristics**
- Critical web buckling deformation angle
  \[ \beta = \frac{d}{l} \approx \frac{\sqrt{3}}{\sqrt{2}} \]

**Experimental Performance**
- Out-of-plane web deformation can be controlled by laterally confining shear web using rubber pads

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