

# Contribution of Floor Slabs to Steel Building Behaviour

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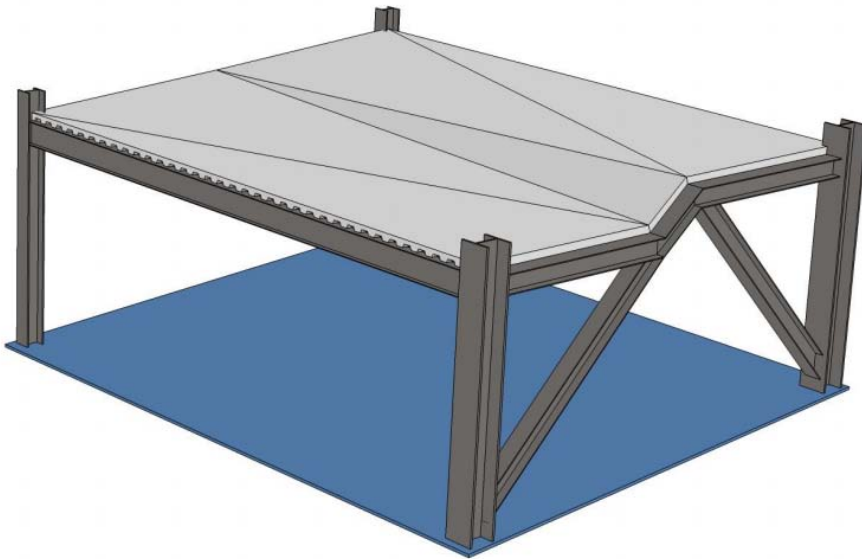
28 November 2012

## Background

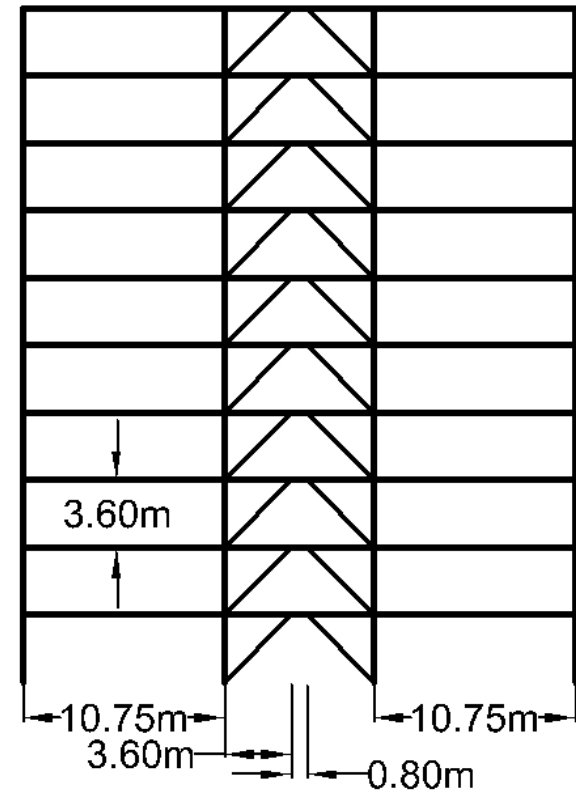
- Started this year
- Improvements
  - Replaceable Link
  - Strains near stiffener
  - Self-centring
- Similar configuration
- Slab applicable to all systems



# Honours Research



- Ten storey model, two slab conditions
- Bi-directional springs for slabs
- Yield line theory used to quantify slab resistance



# Honours Results

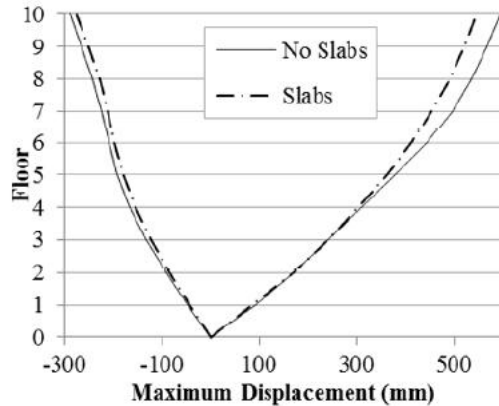


Figure 12 - Arcelik Maximum Displacements

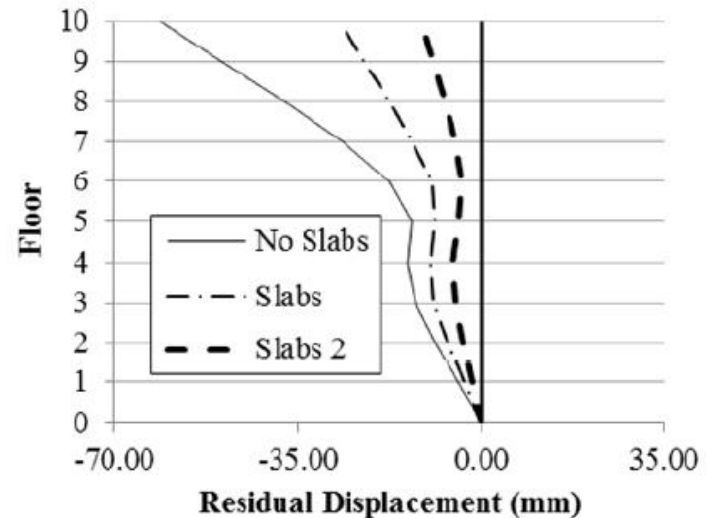


Figure 11 - La Union Residual Floor Displacements

- Improved performance
- Self-centring
- Slightly increased forces in secondary elements
- Design benefits from being free to select link and collector separately
- Further research prompted

# Literature

*Ricles & Popov 1989*

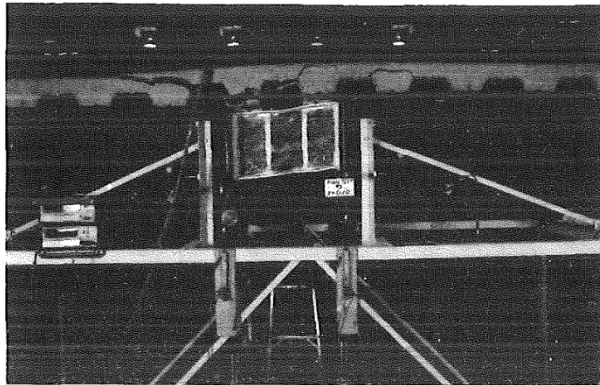
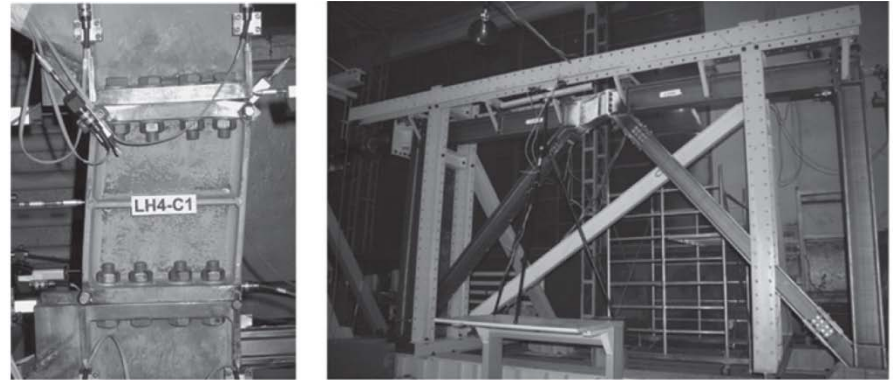
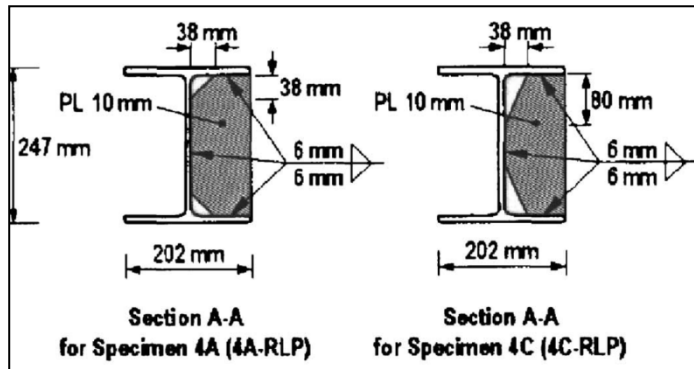


FIG. 8. Damaged Floor Slab above Link

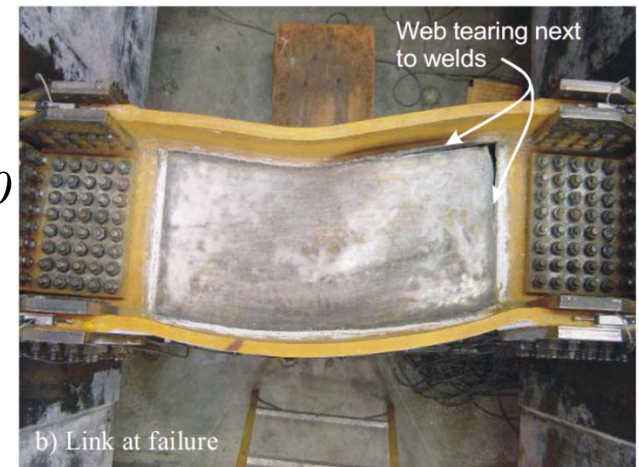
*Stratan, Ioan & Dubina 2012*



*Okazaki et al. 2005*

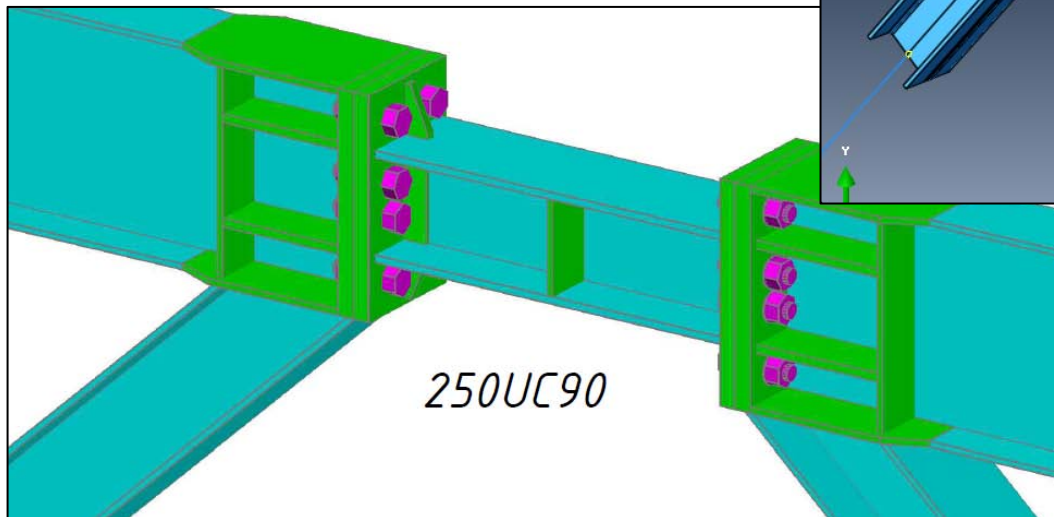
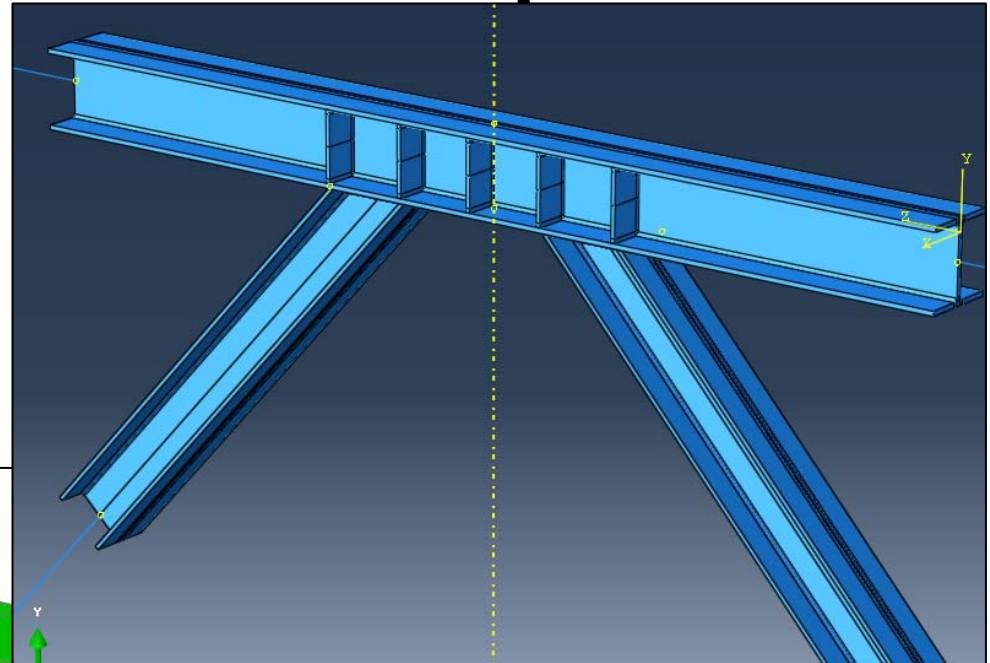


*Dusicka, Itani & Buckle 2010*

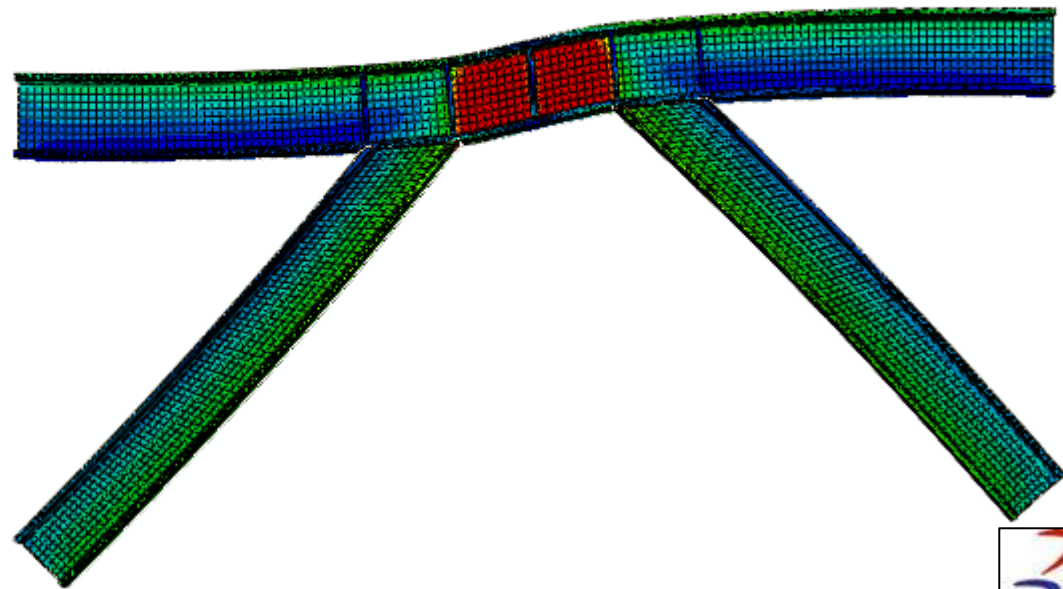
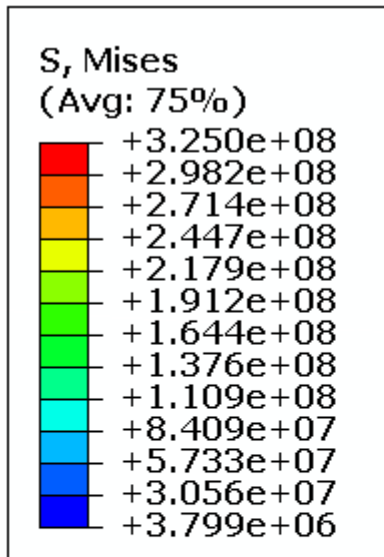


## Present Work: Model Concepts

- Conventional, bolted, contact stiffeners
- Strip and 3D slab
- Present technology
- Complicated, theory is sparse.



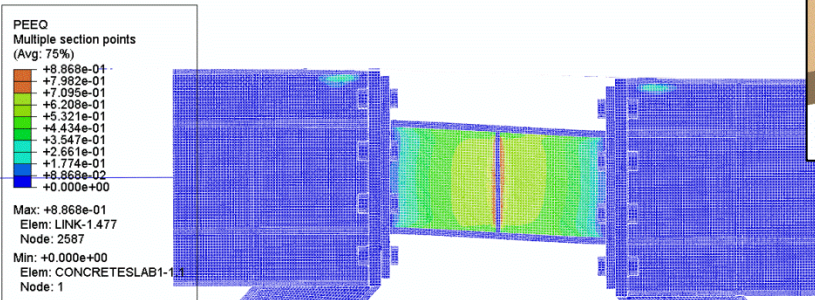
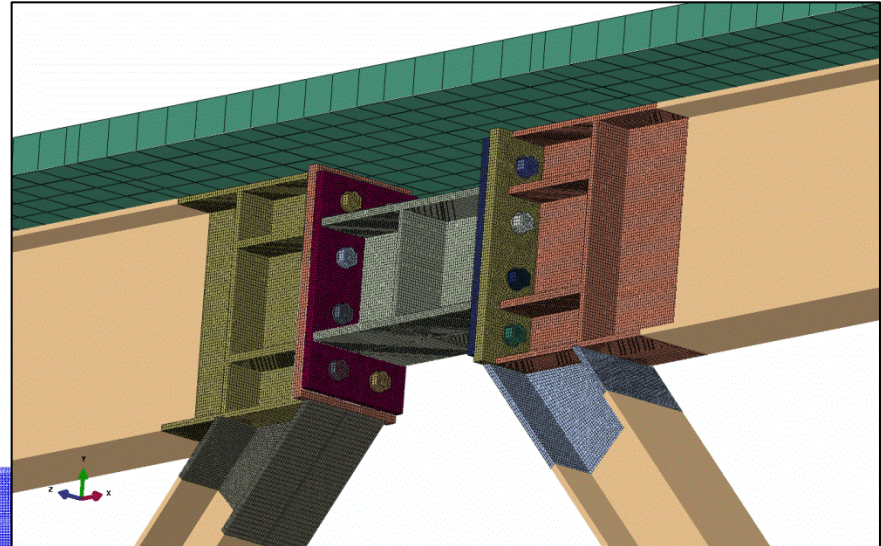
# Present Work: Model 1A



- As built now
- Each step requires careful knowledge of theory
- Detailed only in regions of interest

# Present Work: HERA

- Bolted link proof of concept
- Strains concentrate near stiffener
- Final shear stud placement



*Acknowledgements  
 to Nandor Mago at  
 HERA*

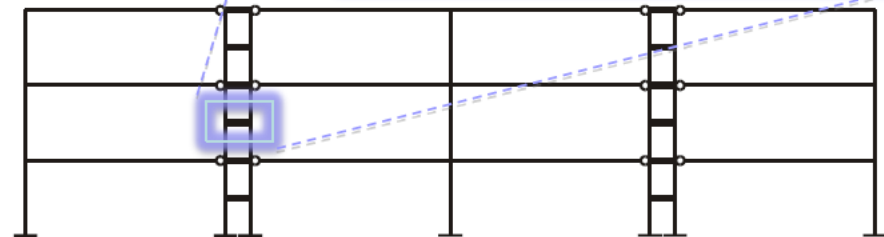
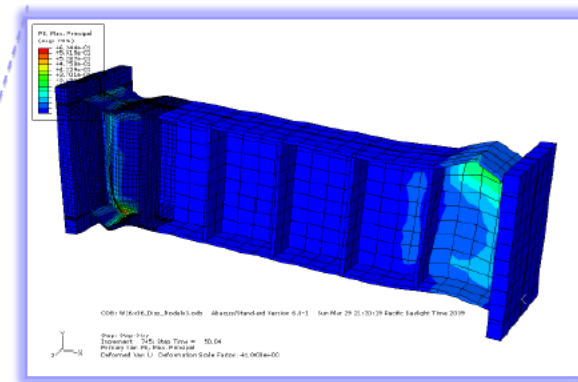
ODB: EBF-AF-1storey-CyclicD.odb Abaqus/Standard 6.12-1 Thu Aug 30 13:09:34 New Zealand Standard Time 2012

Step: Step-2, Cyclic enforced displacement starts  
 Increment: 157, Step Time = 70.00  
 Primary Var: PEEQ  
 Deformed Var: U, Deformation Scale Factor: +1.000e+00



# Future Aims: Experimental Work

- Link and slab experiments to validate models
- Portland, Oregon for
  - Expertise
  - Testing Facilities
  - Local Conferences
- Linked Column Frame (Dusicka 2009)



## Future Aims: Write Up

- Findings in a useful format
- Make it easy for practicing Engineers
- Generalise the slab contribution part to other systems, so that researchers can take advantage of it.

**Thank You**

**Questions?**

