Summary of fluid-structure-interaction analysis capabilities
Content

• Summary of fluid-structure-interaction and coupled analysis capabilities relating to
  – Blast loading and structural response
  – Wind loading and structural response
  – Flow-induced vibration and response
  – I-beam structural integrity under thermal loading
Blast loading and structural response

- The AUTODYN software offers a tightly integrated Euler flow and structural mechanics solvers
  - Blast loading
  - Structural response
    - Material failure
It is not advised to use steady-state “turbulence-model” CFD results to consider loadings on structures

- CFD not representing true fluctuations of wind flow
- Although companies such as Mott MacDonald have methodologies to apply scaling factors to their CFD results

Turbulence simulation methods will perhaps make this feasible
Flow-induced vibration and response

- **ANSYS CFD**
  - Provides inbuilt 6 degree-of-freedom rigid body solver
  - Movement of rigid-body can be driven by flow loading / constraining forces
  - Subject of ongoing academic usage
  - Coupling to ANSYS for two-way FSI possible

Bridge deck aerodynamic assessment
I-beam structural integrity under thermal loading

- Two-way transient coupled ANSYS CFD and ANSYS Mechanical example
  - I-beam subjected to hot gases and thermal radiation from a fire
  - Weakens under thermal load
I-beam structural integrity under thermal loading
Seminar summary and close

• Today we wished to show how Computational Fluid Dynamics and Computational Structural Mechanics are being used in challenging and novel built environment and civil engineering projects to meet design objectives as well as regulatory and customer requirements

• I hope the seminar has been informative and interesting

• Thank you to our two guest speakers
  – hurleypalmerflatt
  – Hilson Moran Partnership

• Before we conclude today’s seminar, we have time for any further questions....