

# NASH TESTING PROTOCOL

Lam Pham

Swinburne University of Technology

- Design by testing is an international accepted method of design (ISO2394)
- Design by prototype testing is a powerful tool in the development of steel framing system (NASH Technical Note 4 – Establishing Design Value by Testing)
- Not many Australian Standards have been developed for prototype component testing
- NASH has been trying to develop testing methods for the development of steel framing in collaboration with BlueScope & Swinburne

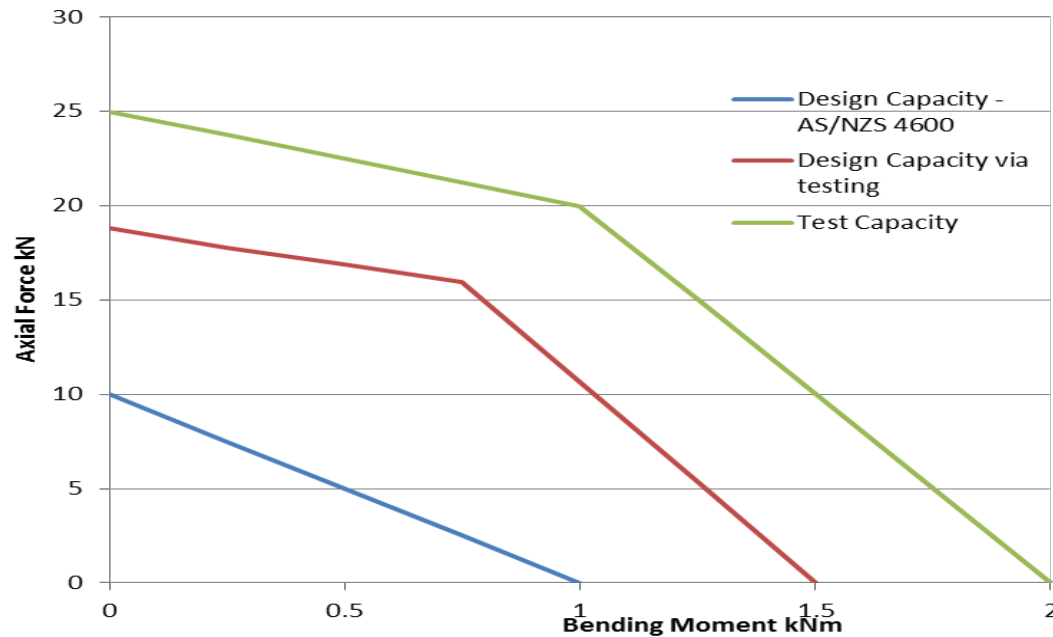
# What have we done?

- Protocol for drafting NASH Standard Test Method
- Performance of studs under combined bending and compression (in collaboration with BlueScope)
- Performance of bracing walls under wind action (in collaboration with Swinburne)
- Performance of bracing walls under earthquake action (in collaboration with Swinburne)

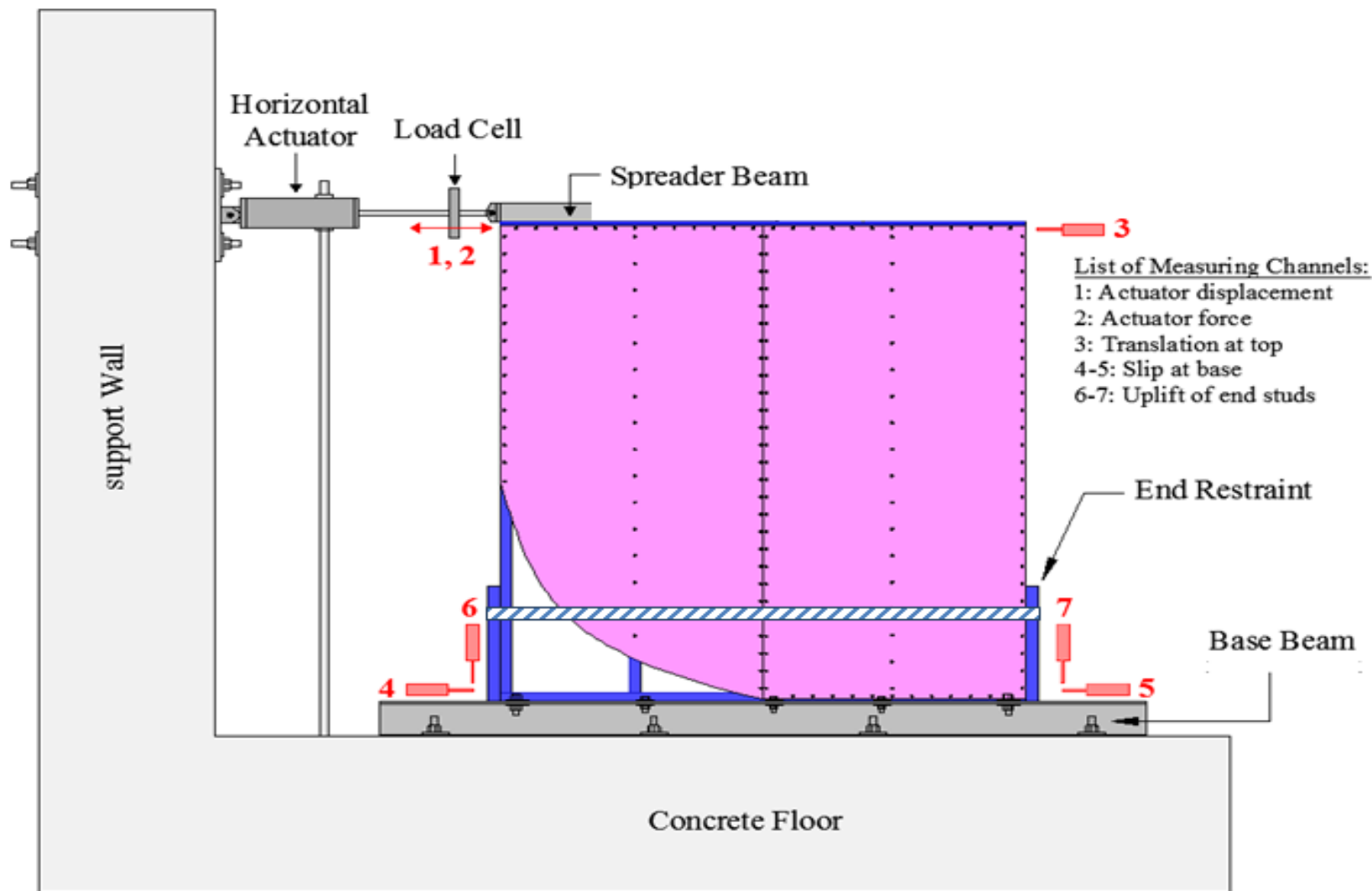
- To standardize the drafting of NASH test standard to ensure consistency in application
- Try to separate:
  - Reporting of the test and its results (independent, always valid)
  - Interpretation of the test results (may involve judgement and other factors well outside the test – may change with time)
- Standardize the reporting of the test

# Performance of studs

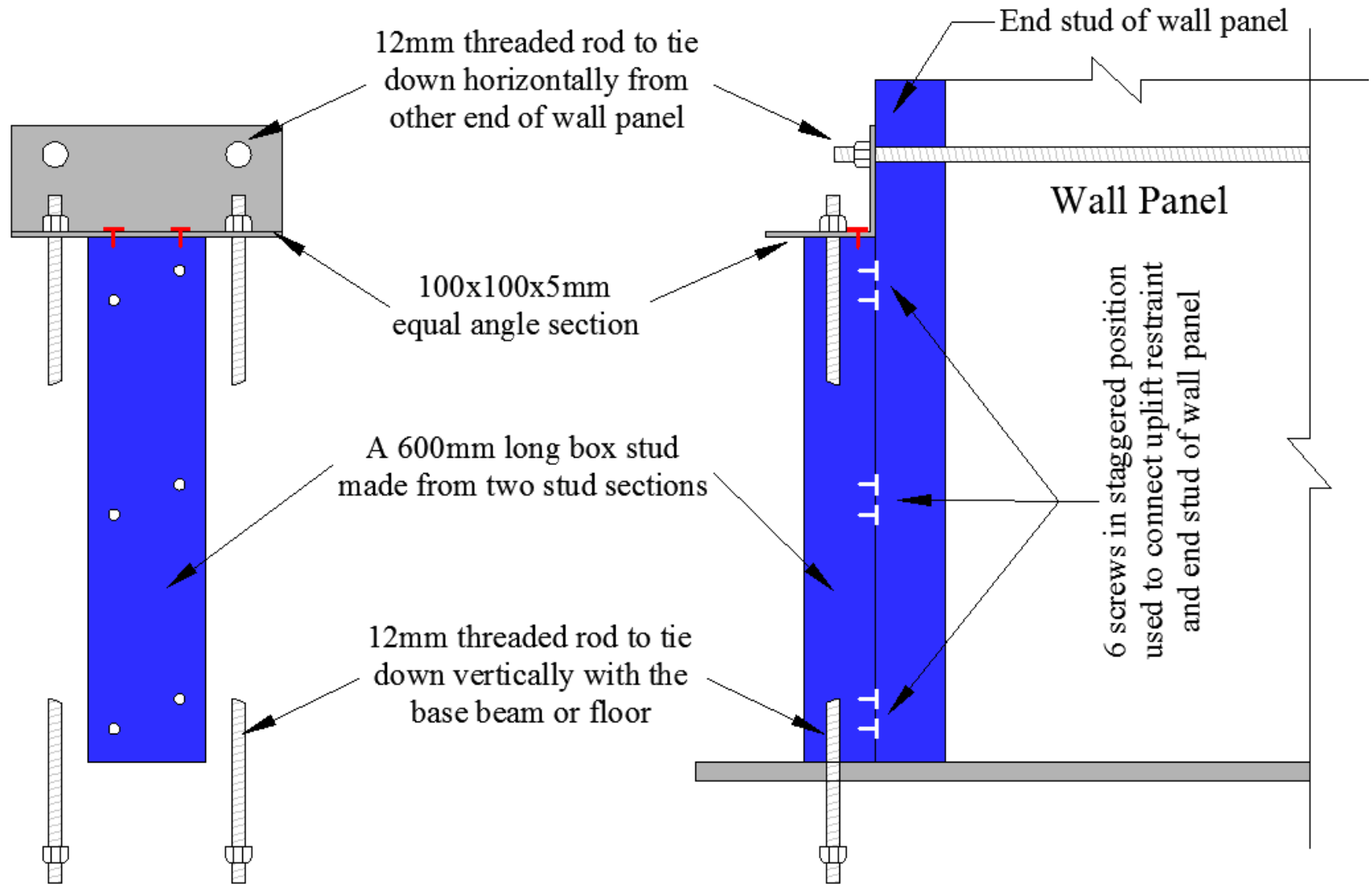
- Under combined bending and compression
- Unclad & clad on one or both faces
- Three kinds of tests: pure bending, pure axial compression, combined bending and compression



# Bracing wall test: test set-up



# Bracing wall test: detail of end restraint



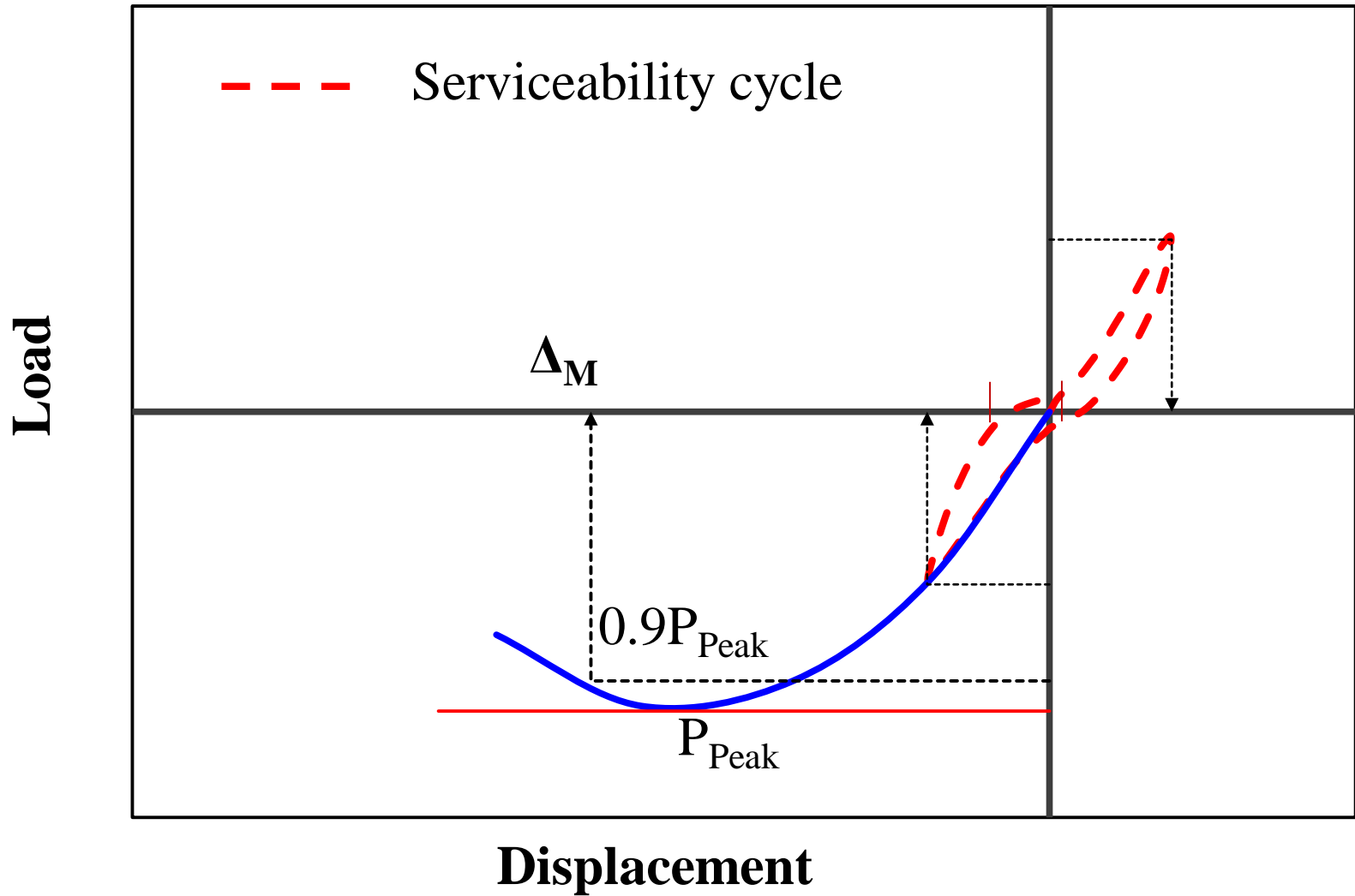
# Bracing walls under wind action

- Standard contains two parts:
  - Static racking test of wall
  - Evaluating bracing capacity of wall for wind action
- Applicable to all types of bracing walls:
  - strap bracing
  - sheet bracing, one or both face
- Key factor in testing is the end restraint to be provided to simulate the boundary conditions in a typical house
- Bracing capacity is the lesser of capacity under ultimate and equivalent serviceability load

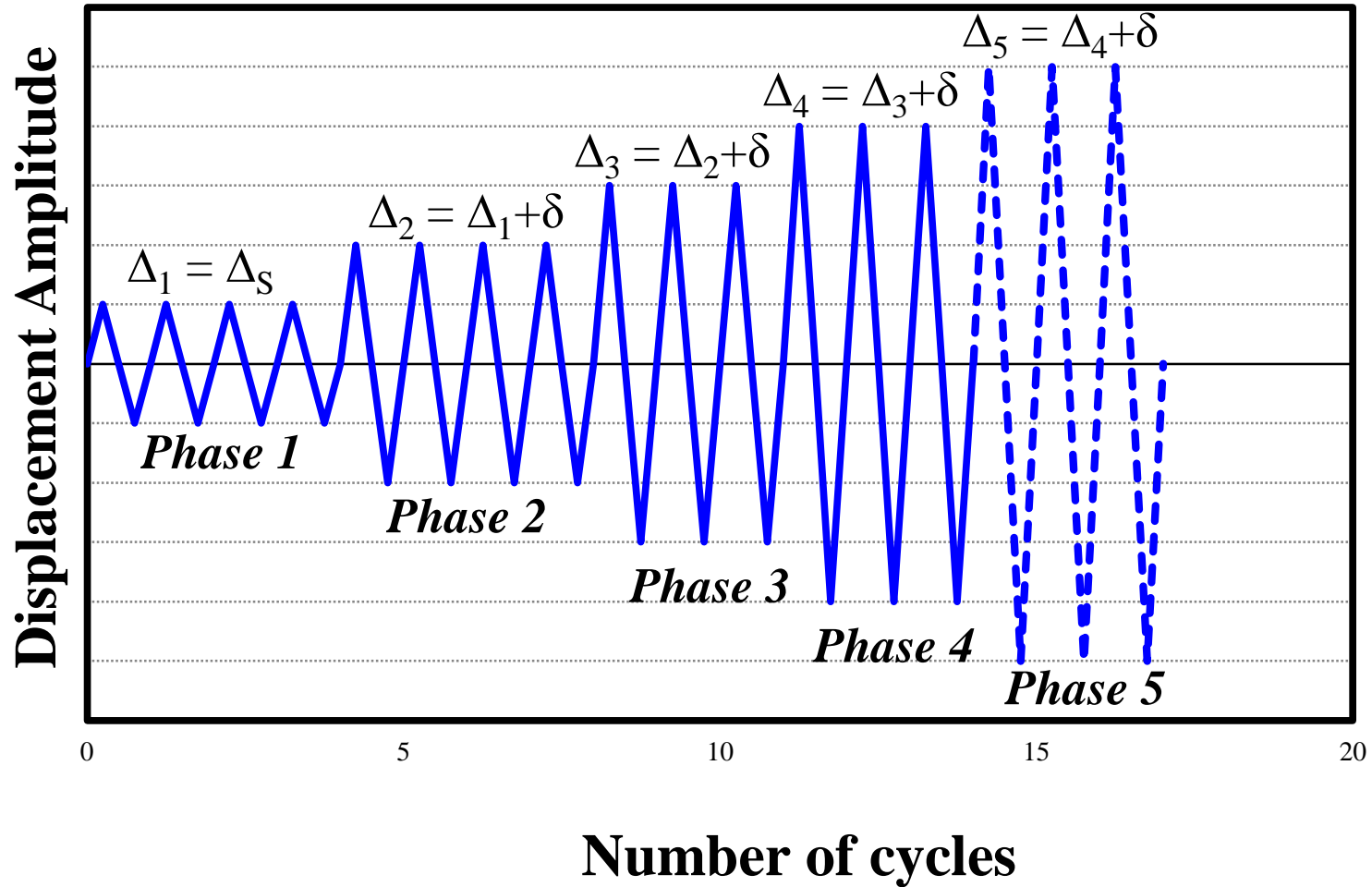


- Standard contains two parts:
  - Static and dynamic racking test of wall
  - Evaluating bracing capacity for earthquake action
- Key factor in testing is the use of static racking test to determine the parameters for the dynamic racking test
- Bracing capacity evaluation is much more complex than for wind:
  - Bracing capacity for force-based design
  - Bracing capacity for displacement-based design

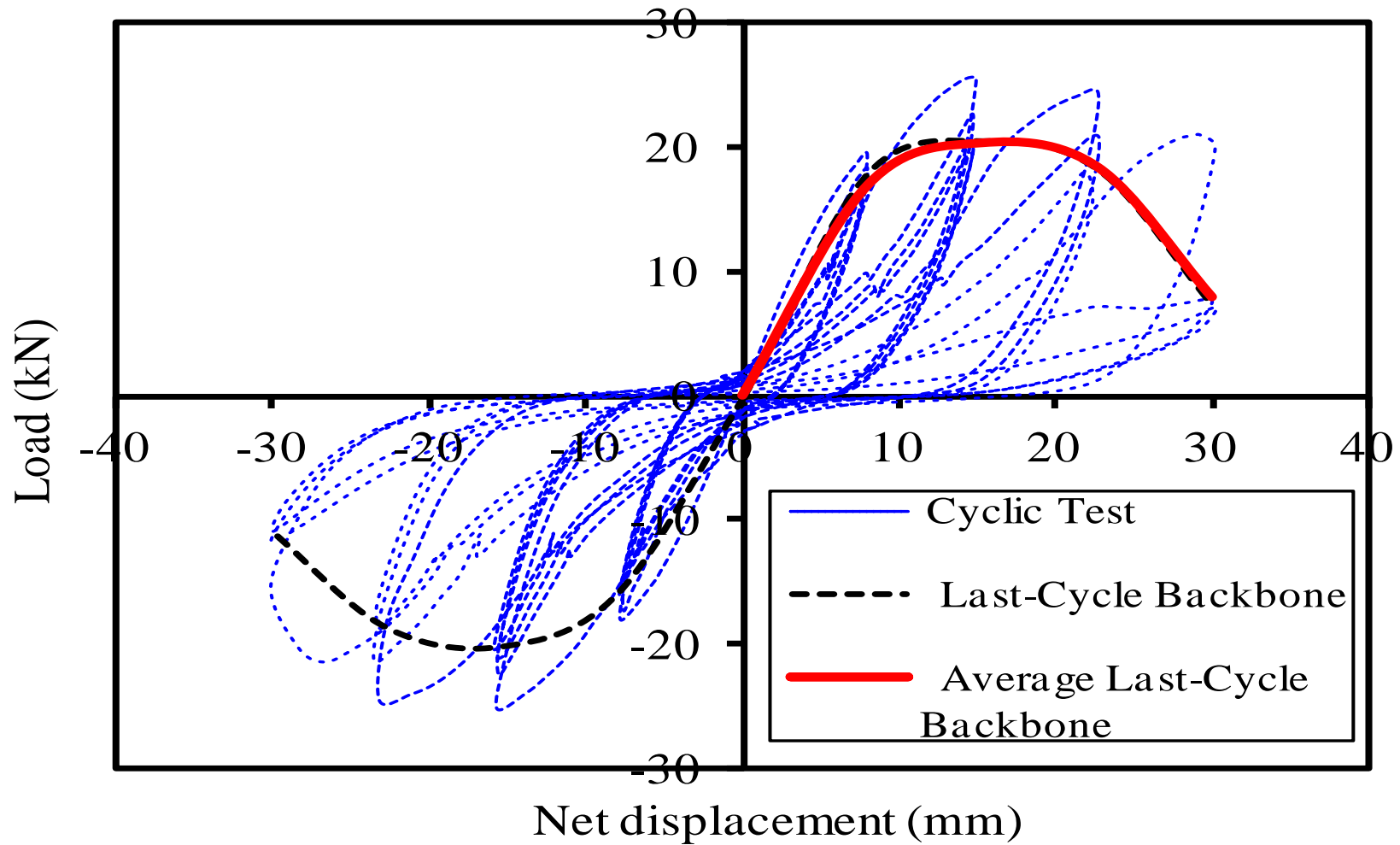
# Static Racking Test



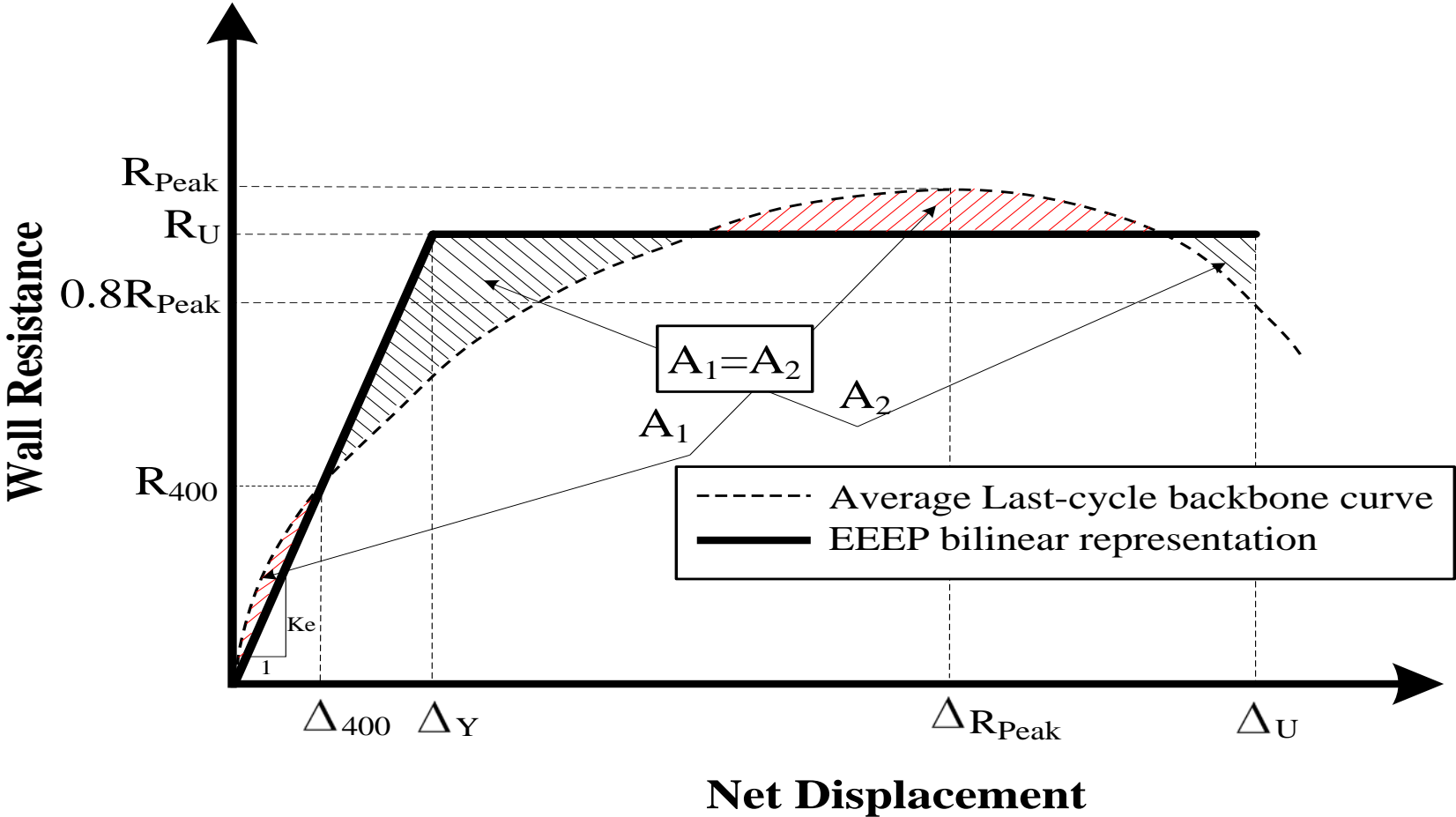
# Cyclic loading sequence



# TYPICAL CYCLIC TEST



# DERIVATION OF ULTIMATE RACKING STRENGTH



# Concluding Remarks

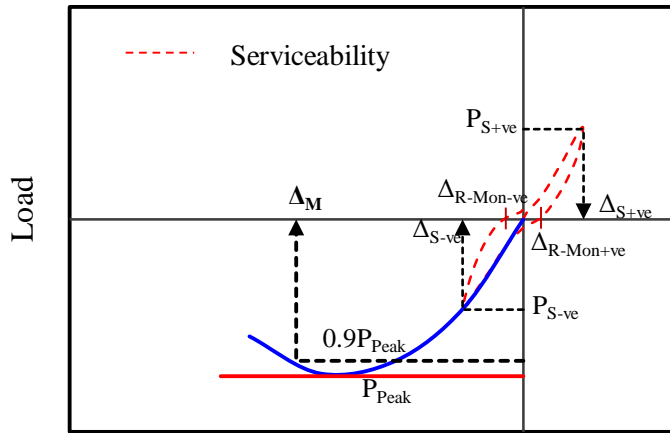
NASH has developed a test protocol and three test procedures to assist with the steel framing development:

- Studs under combined bending and compression
- Bracing wall for wind action
- Bracing wall for earthquake action

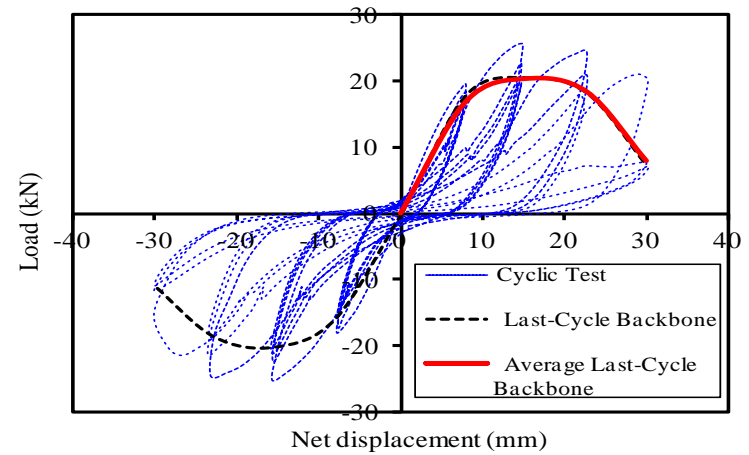
These procedures should be public reviewed and the placed as secondary references to NASH Standard Part 1

**THANK YOU FOR YOUR ATTENTION**

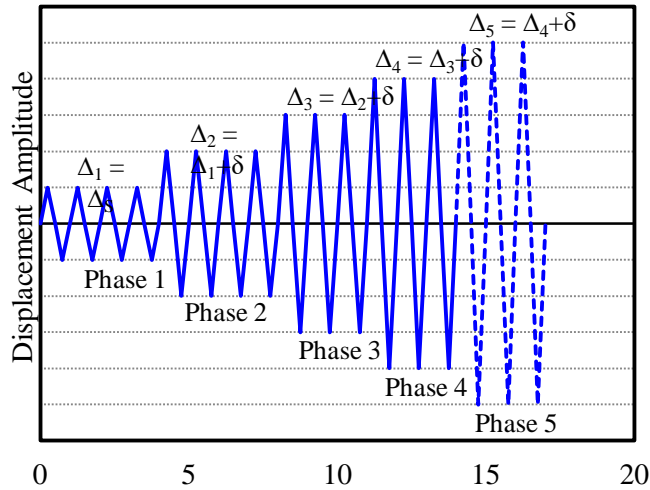
# Bracing wall test procedure for earthquake action



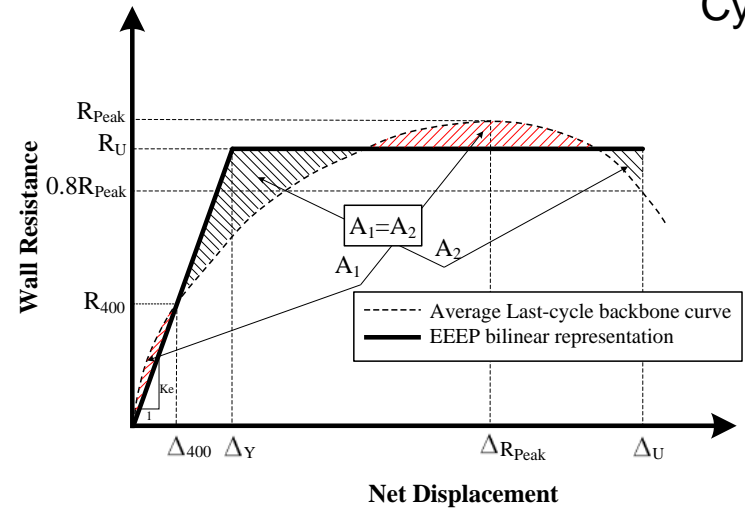
Static test



Cyclic test



Cyclic load sequence



Determination of ultimate strength