NARLabs

Beam-Column Joint Testing

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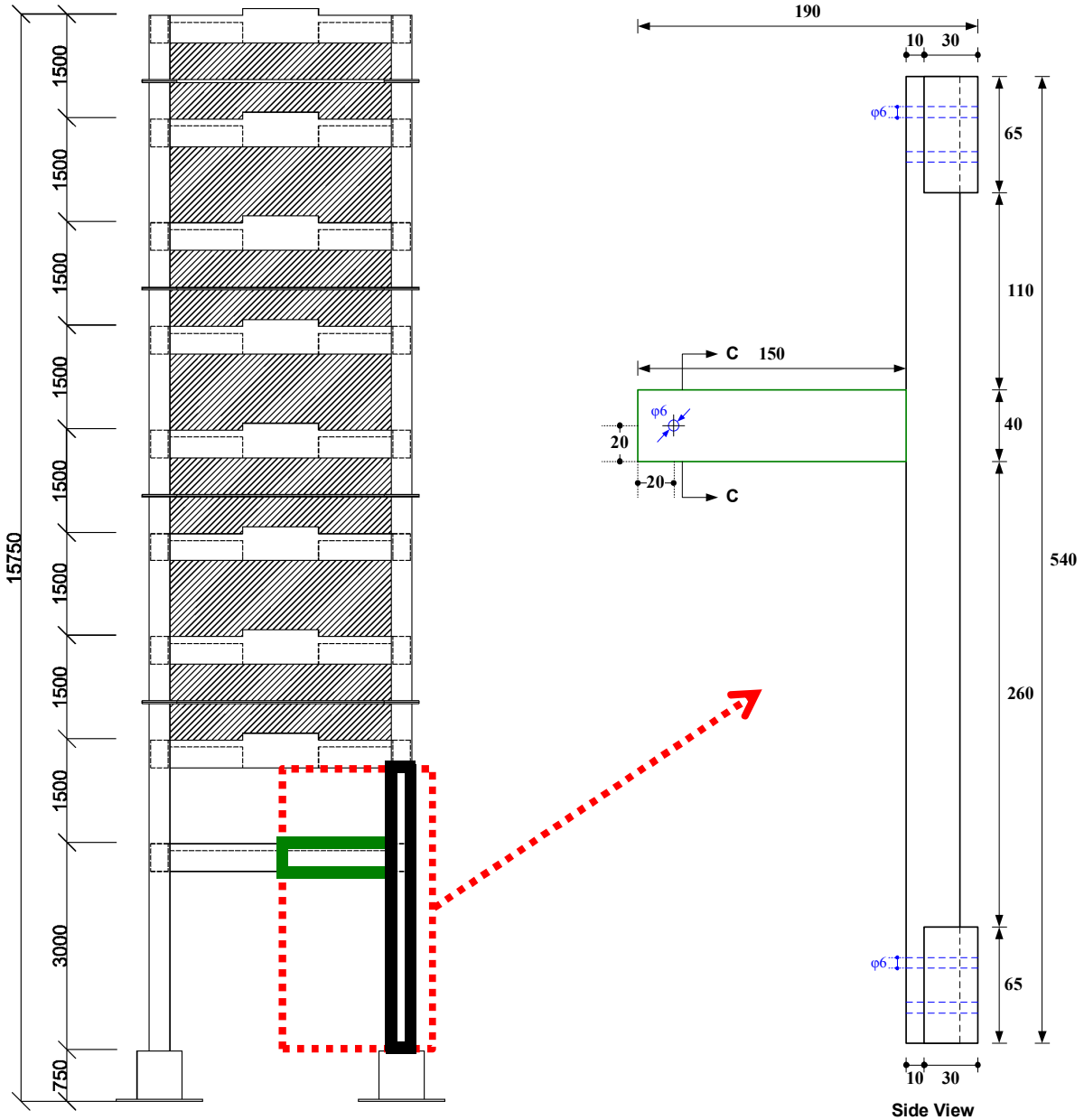
Outlines

- Specimen Design
- Construction
- Test Setup
- Instrumentation Scheme
  - Interior
  - Exterior
- Material Property
- Test Result

Specimen Design

Scope of Beam-Column Joint Specimen

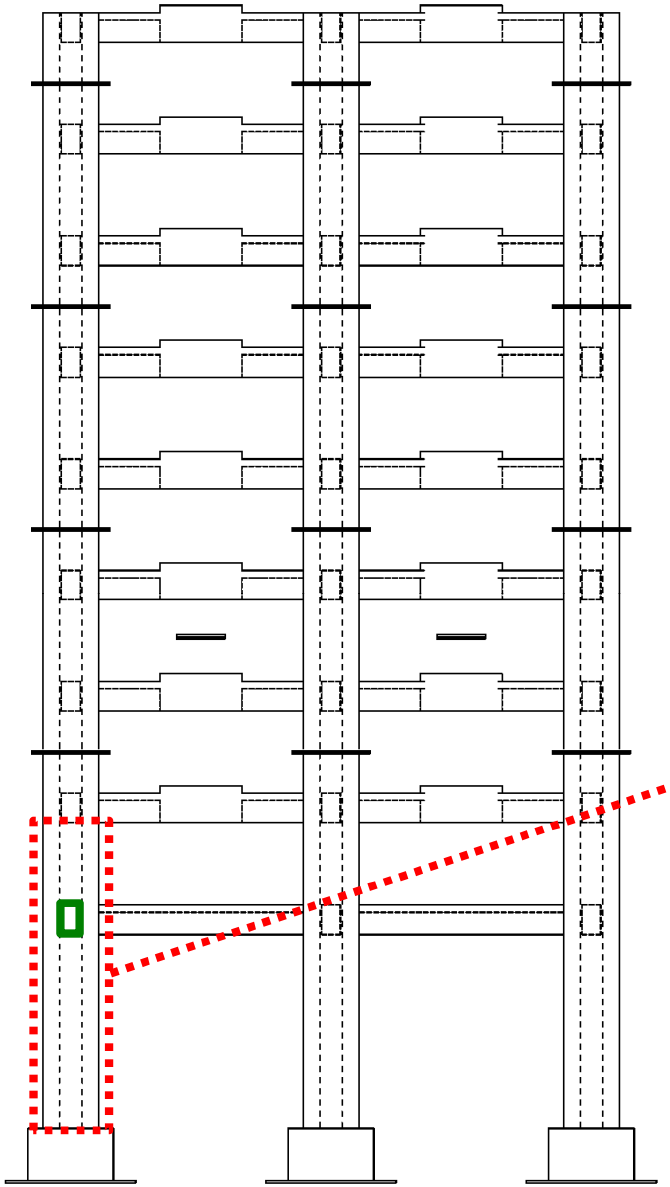
Front View

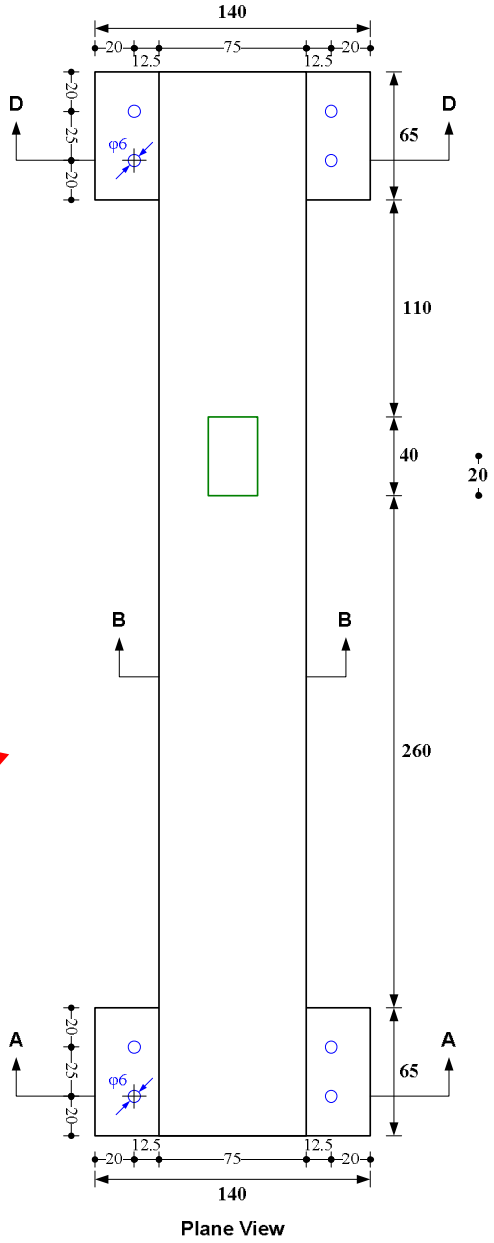


Side View

Scope of Beam-Column Joint Specimen

Side View



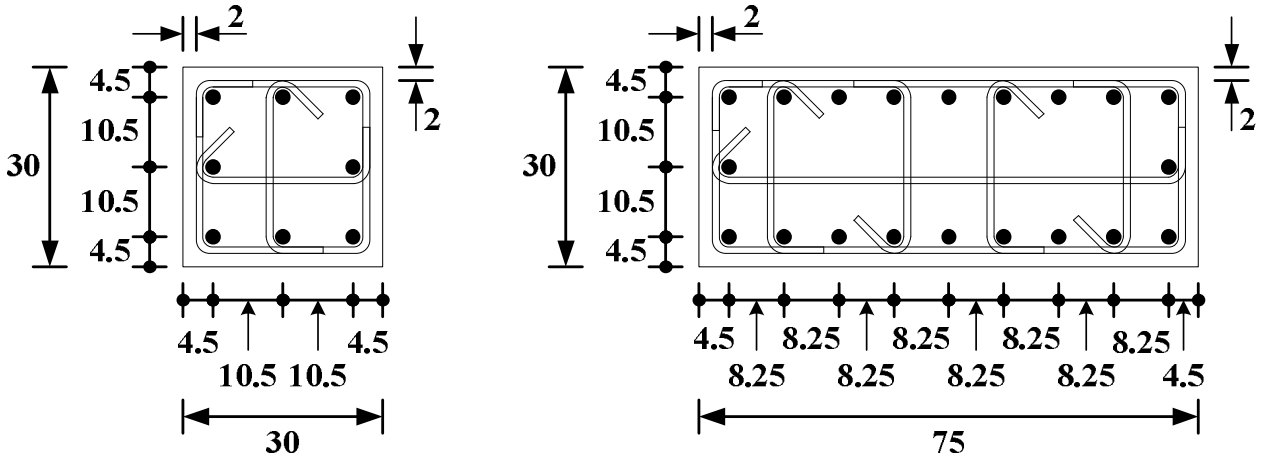


Plane View

Cross Section of Members

$\rho_s = 2.53\%$

Column



Longitudinal Rebar: 8-D19
Stirrups: D10@12 *cm*
Crossties: D10@24 *cm*

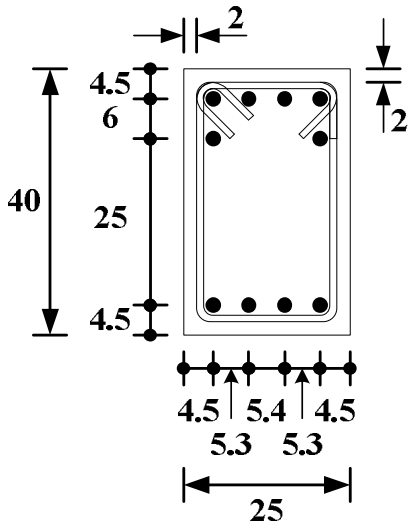
Stirrups: 90° Hook, Staggered
Crossties: 135° and 90° Hooks, Staggered
Cover: 2 *cm*

Longitudinal Rebar: 20-D19
Stirrups: D10@12 *cm*
Crossties: D10@24 *cm*

Stirrups: 90° Hook, Staggered
Crossties: 135° and 90° Hooks, Staggered
Cover: 2 *cm*

$\rho_s = 2.85\%$

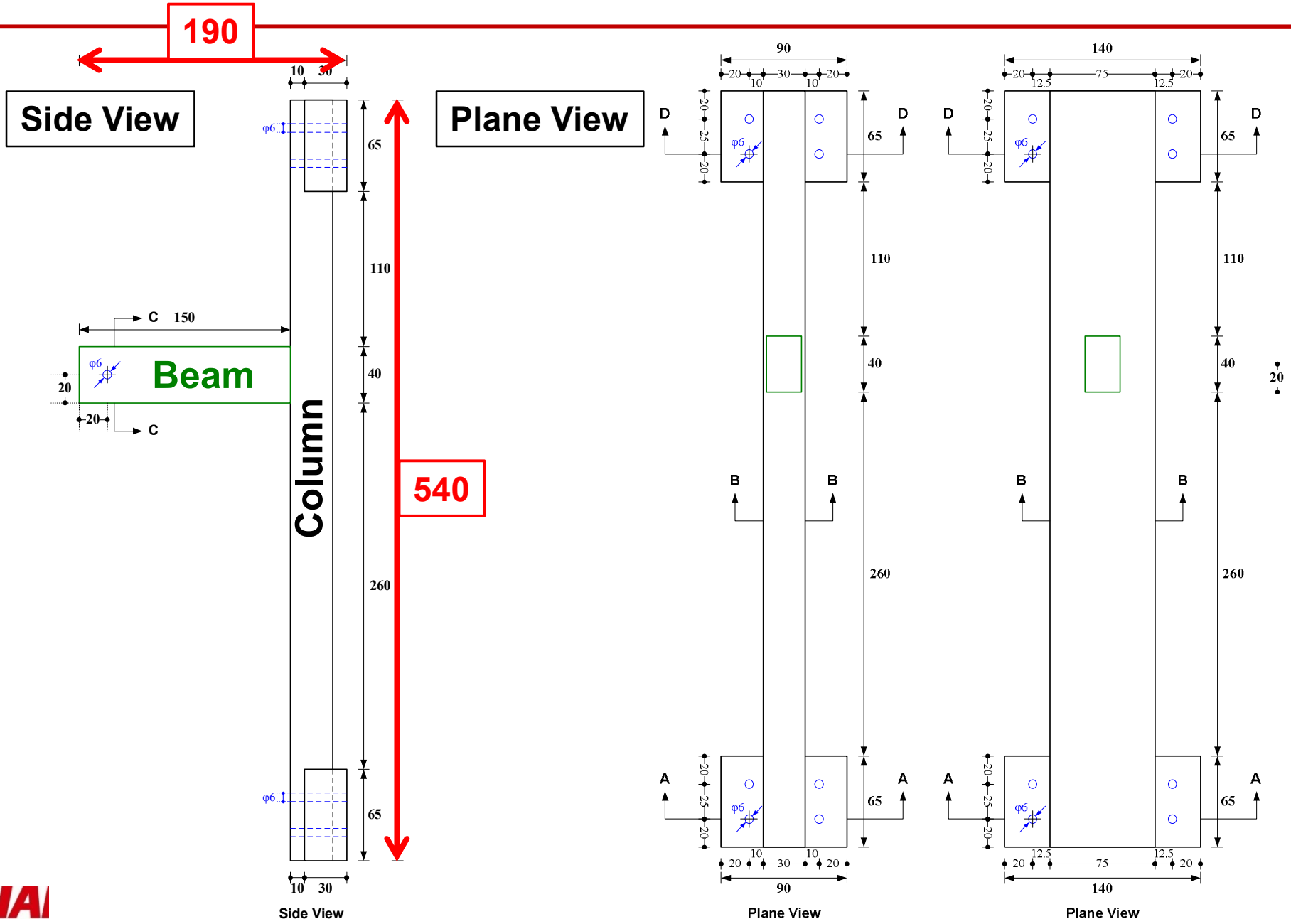
Beam



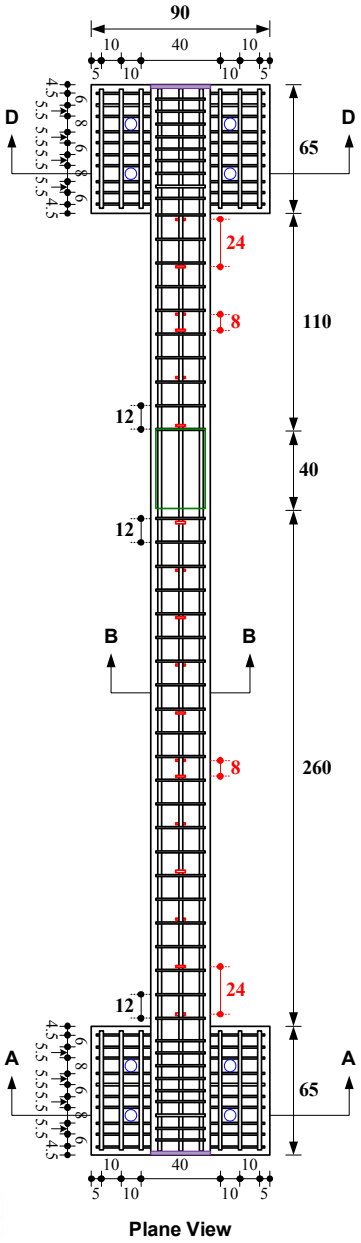
Longitudinal Rebar: 10-D19
Stirrups: D10@15 *cm*

Stirrups: 135° and 90° Hooks, Staggered
Cover: 2 *cm*

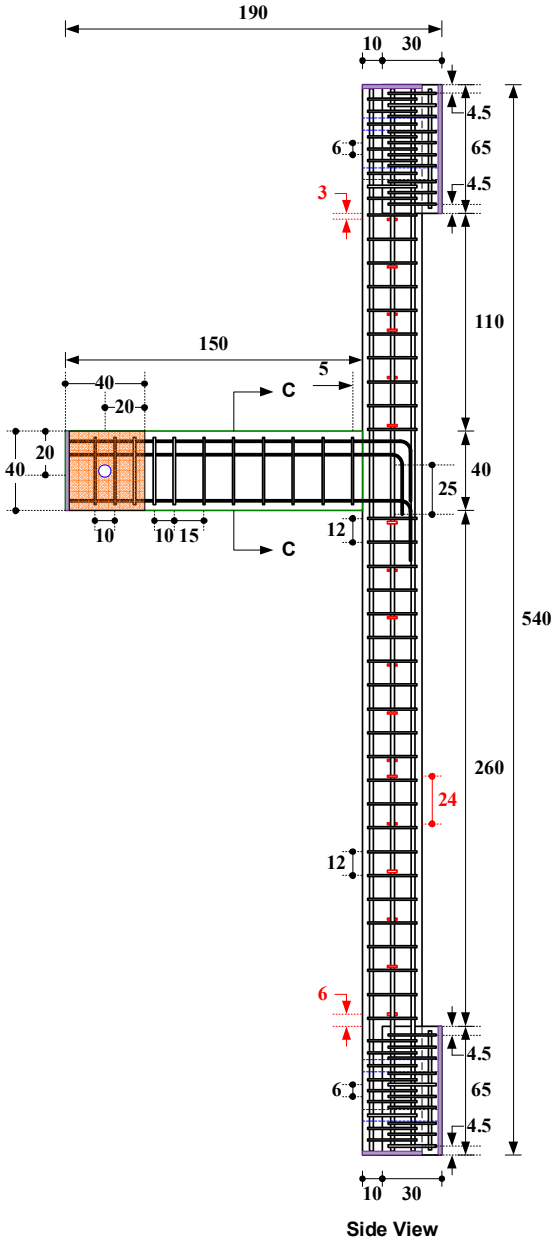
Beam-Column Joint A/B



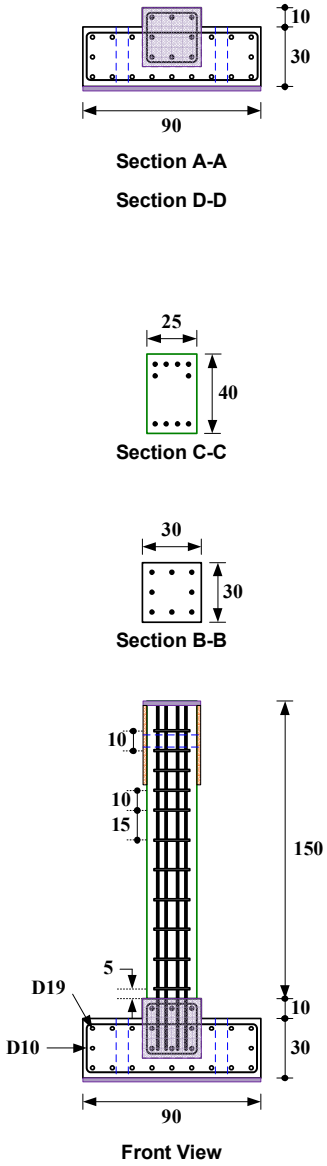
Beam-Column Joint A



Plane View



Side View



Front View

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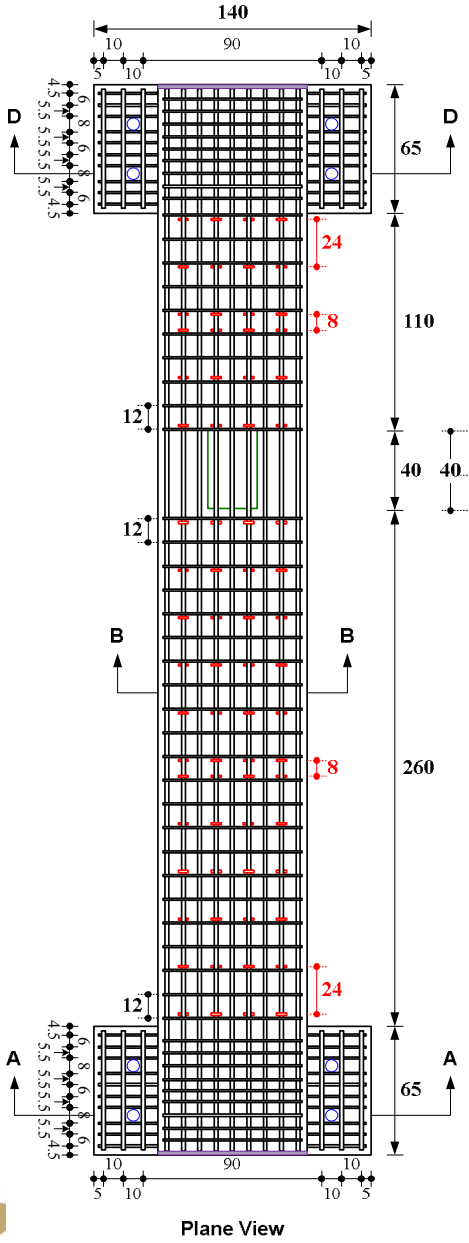
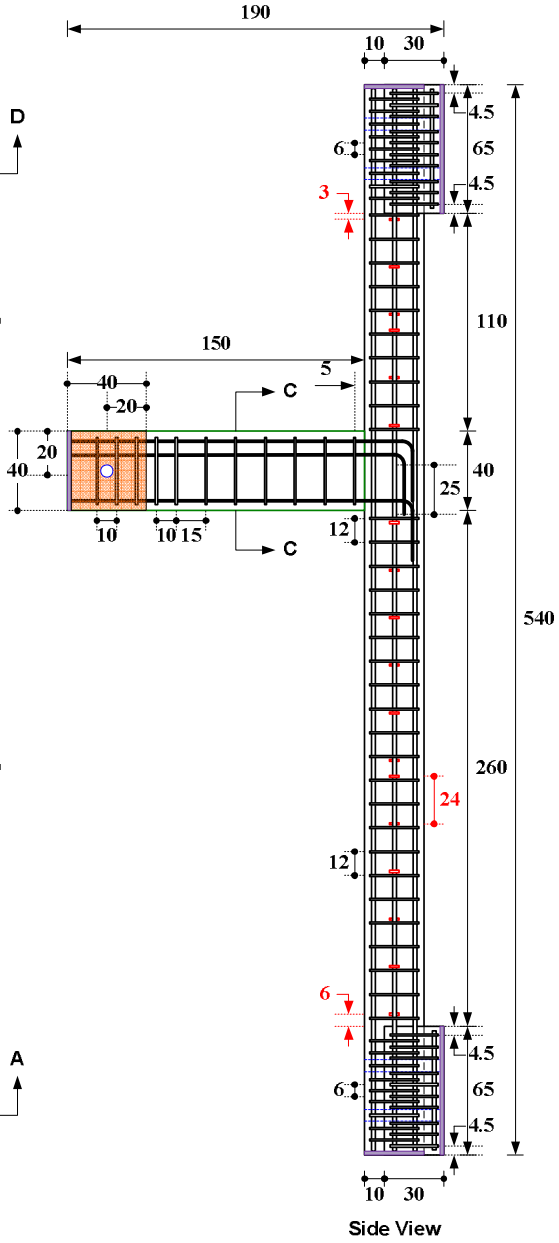
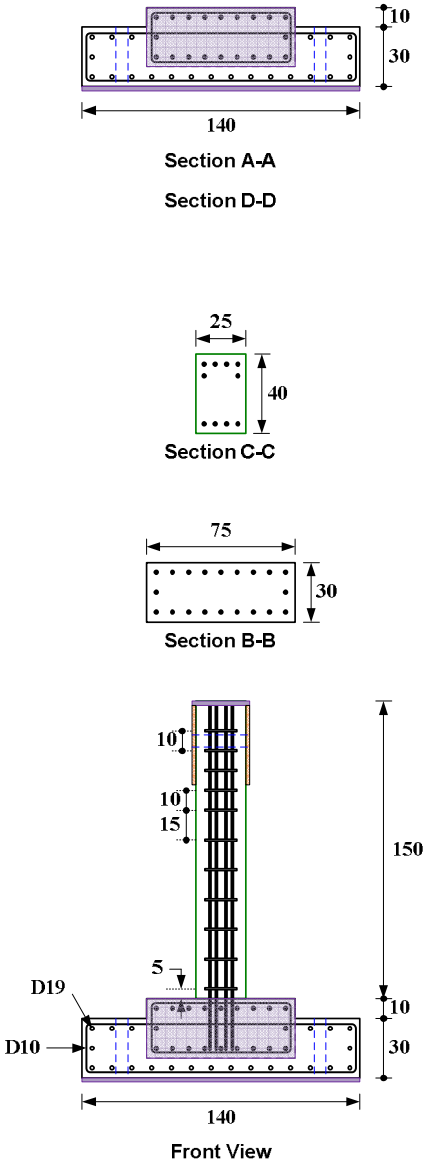
Beam-Column Joint B



Plane View



Side View



Front View

NARLab

Specimen Construction

Specimen Construction

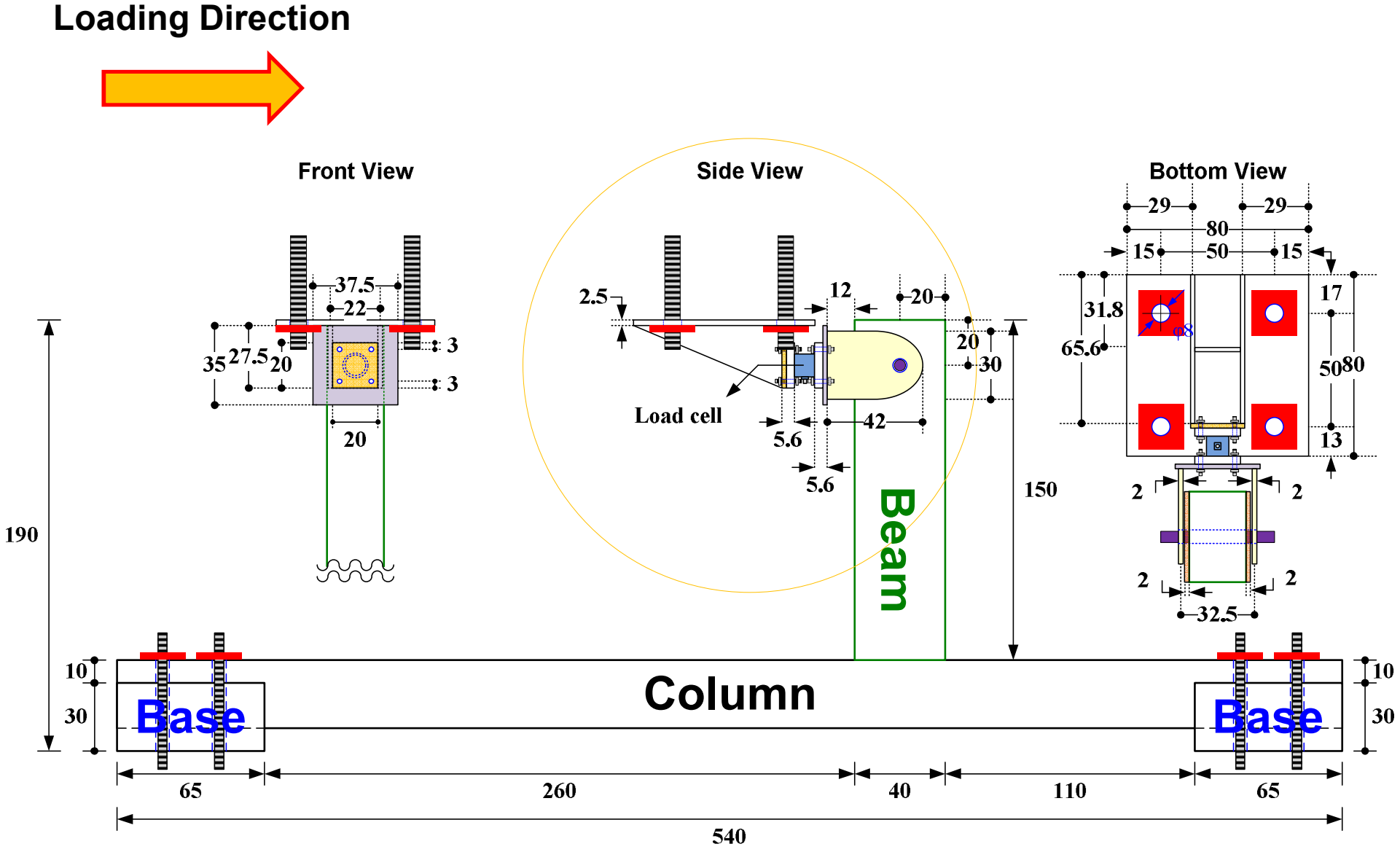
Rebar Installation Completed

Formwork Assembly Completed

Concrete Pouring Completed

Test Setup

Test Setup Sketch

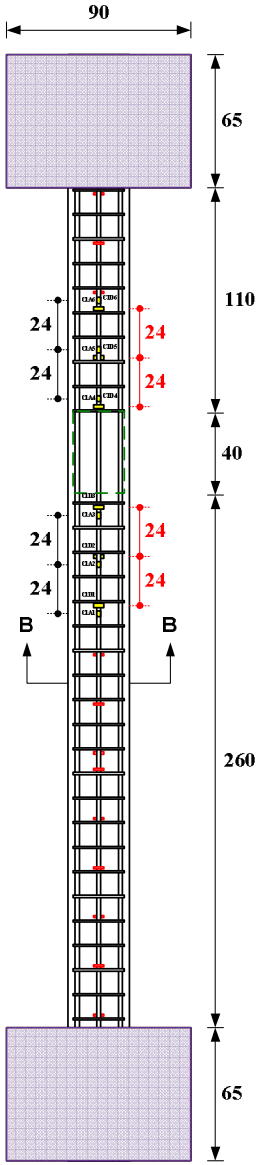


Instrumentation Scheme

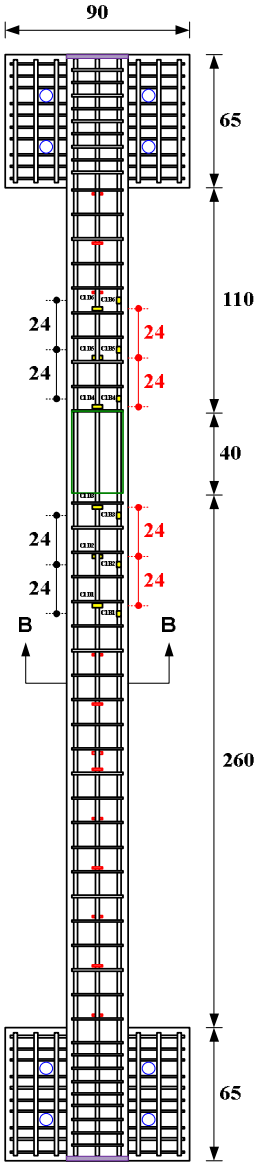
- Interior
- Exterior

Strain Gauge (Beam-Column Joint A)

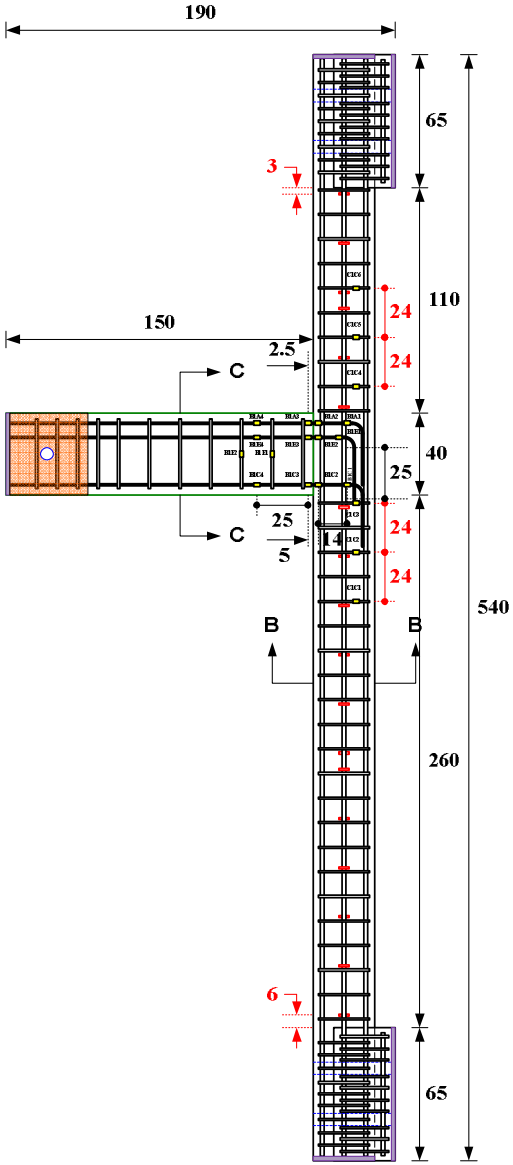
Total 46
Longitudinal: 32
Transverse: 14



Bottom View
Strain Gauge A, D



Top View
Strain Gauge B, D



Side View
Strain Gauge C

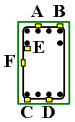
Section B-B

Longitudinal
Stain Gage A: 6
Stain Gage B: 6

Hoop
Stain Gage C: 6

Tie
Stain Gage D: 6

Total 24



Section C-C

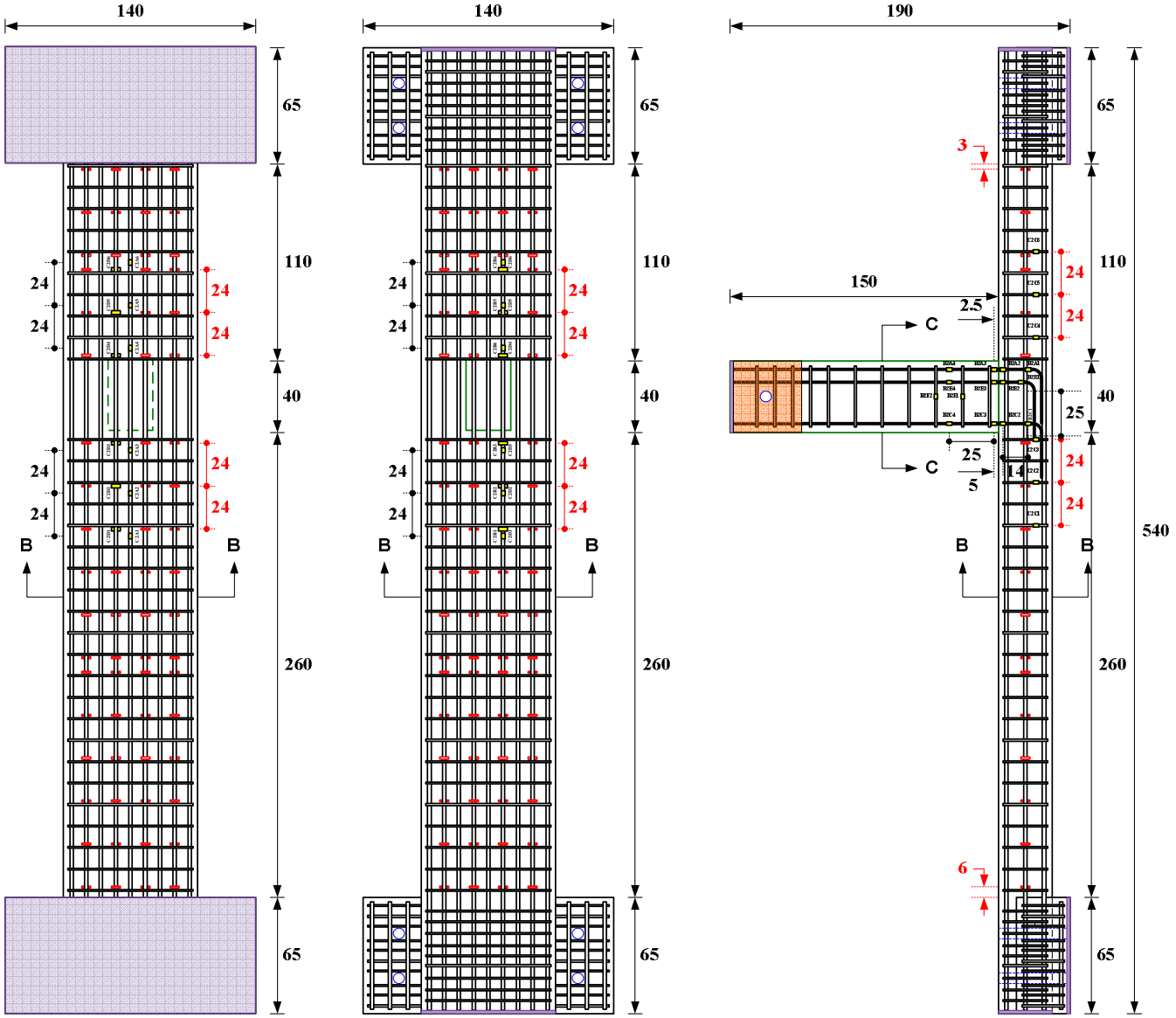
Longitudinal
Stain Gage A: 4
Stain Gage B: 4
Stain Gage C: 4
Stain Gage D: 4
Stain Gage E: 4

Total 22

Hoop
Stain Gage F: 2

Strain Gauge (Beam-Column Joint B)

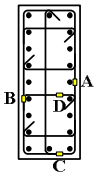
Total 46
Longitudinal: 32
Transverse: 14



Bottom View
Strain Gauge A, D

Top View
Strain Gauge B, D

Side View
Strain Gauge C



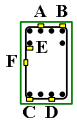
Section B-B

Longitudinal
Stain Gage A: 6
Stain Gage B: 6

Hoop
Stain Gage C: 6

Tie
Stain Gage D: 6

Total 24



Section C-C

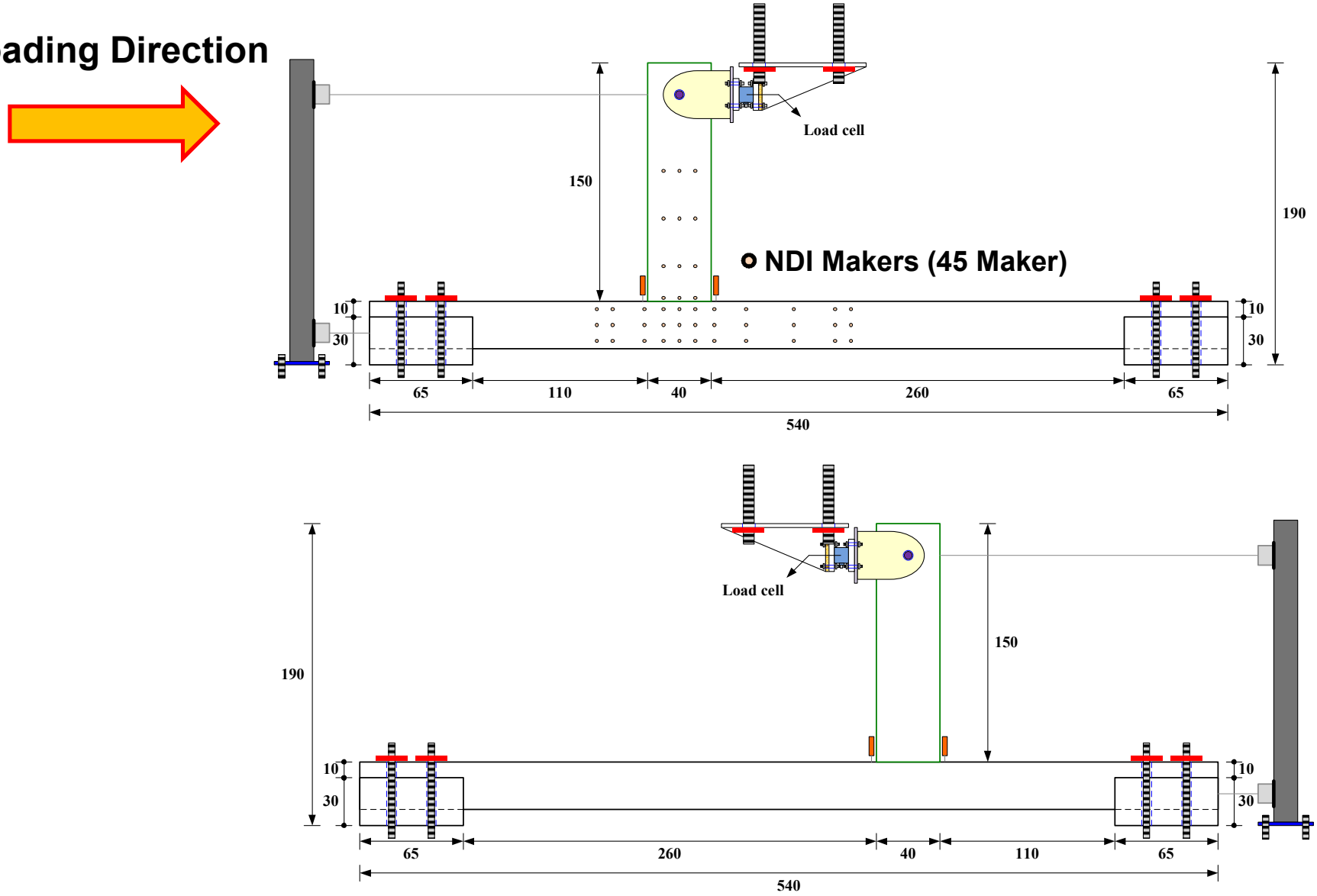
Longitudinal
Stain Gage A: 4
Stain Gage B: 4
Stain Gage C: 4
Stain Gage D: 4
Stain Gage E: 4

Hoop
Stain Gage F: 2

Total 22

Exterior (Beam-Column Joint A/B)

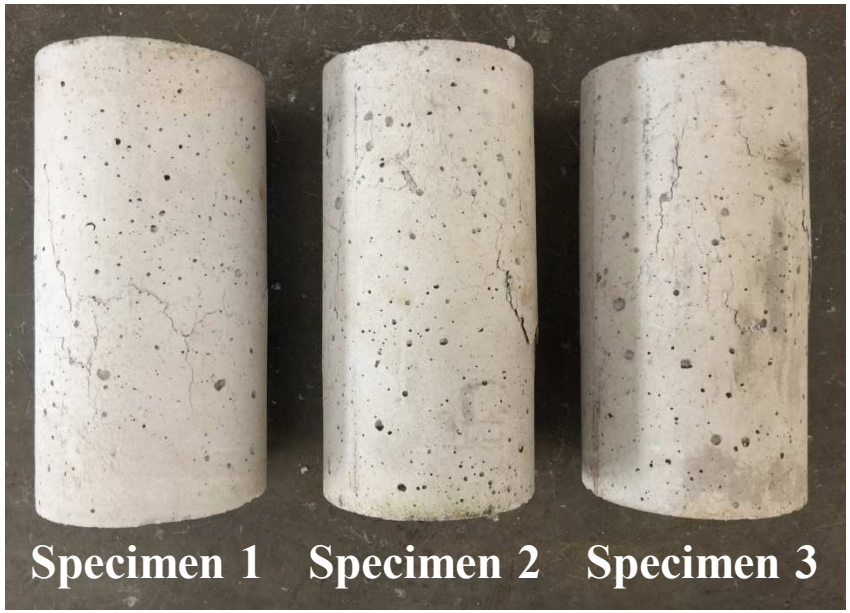
Loading Direction



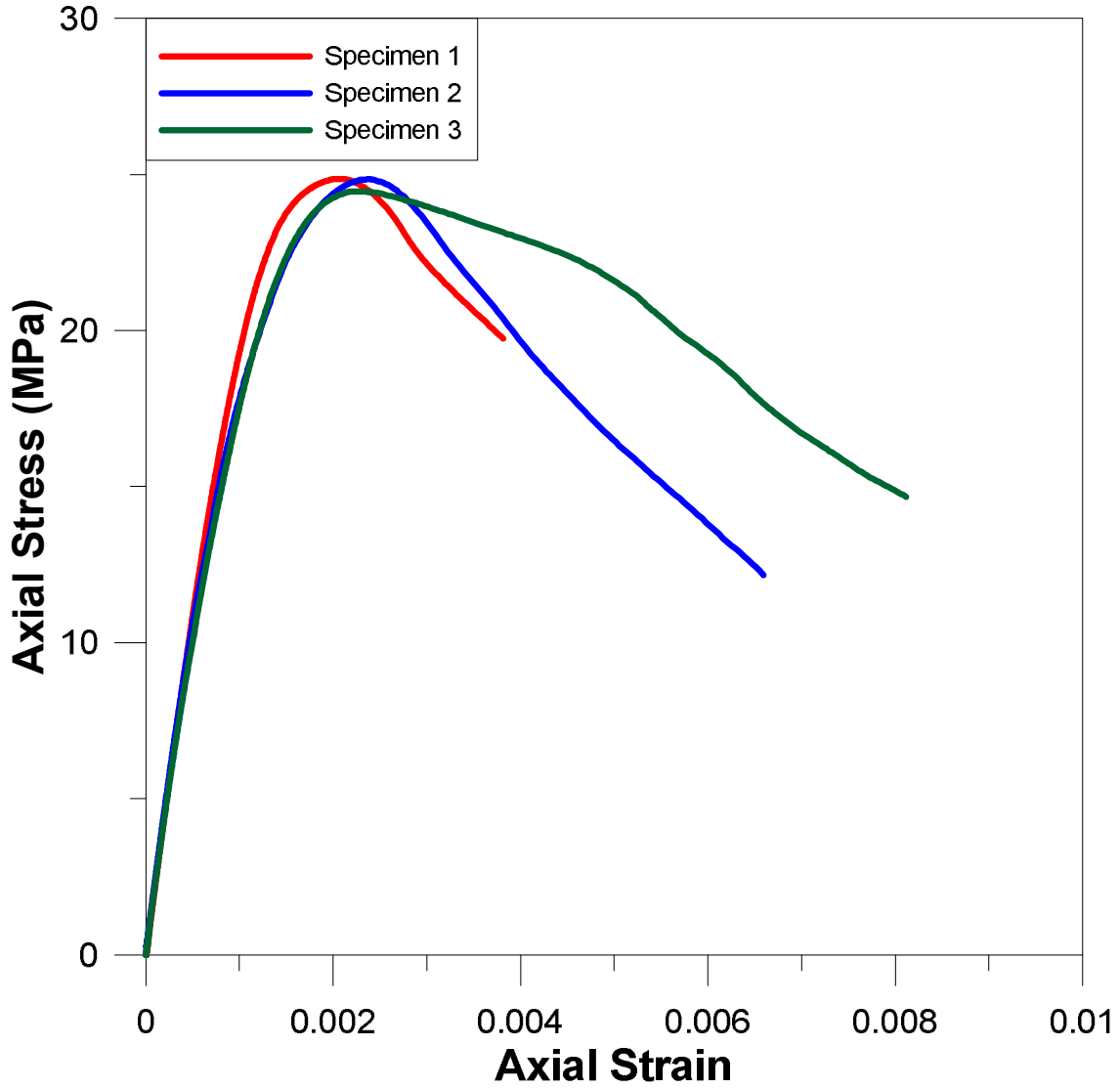
Material Property

Compression Strength of Concrete

	f'_c (*MPa*)
Specimen 1	24.87
Specimen 2	24.86
Specimen 3	24.47
Average	24.73



Stress-Strain Curve of Concrete

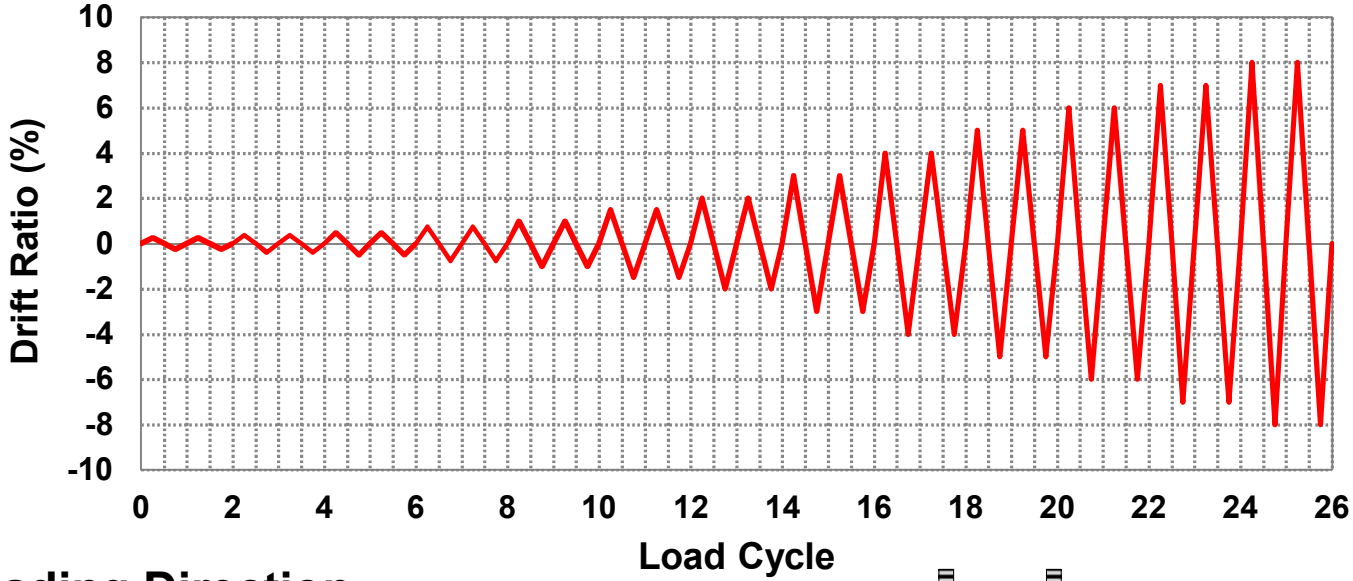


Test Result

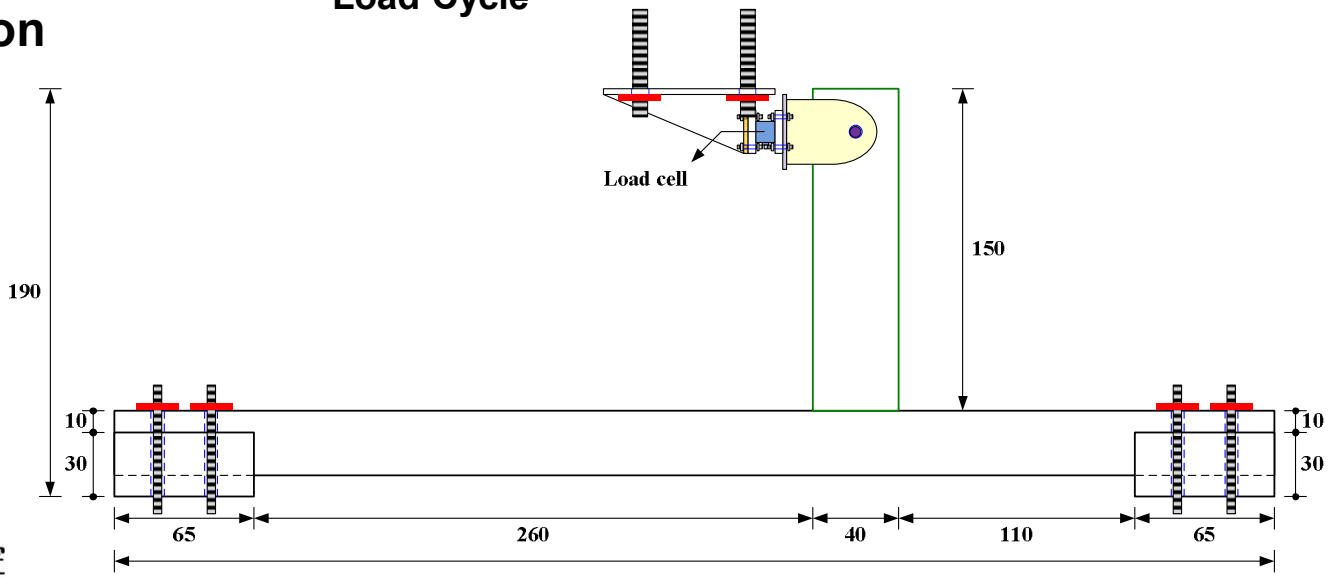
- Beam-Column Joint A
- Beam-Column Joint B

Loading Protocol

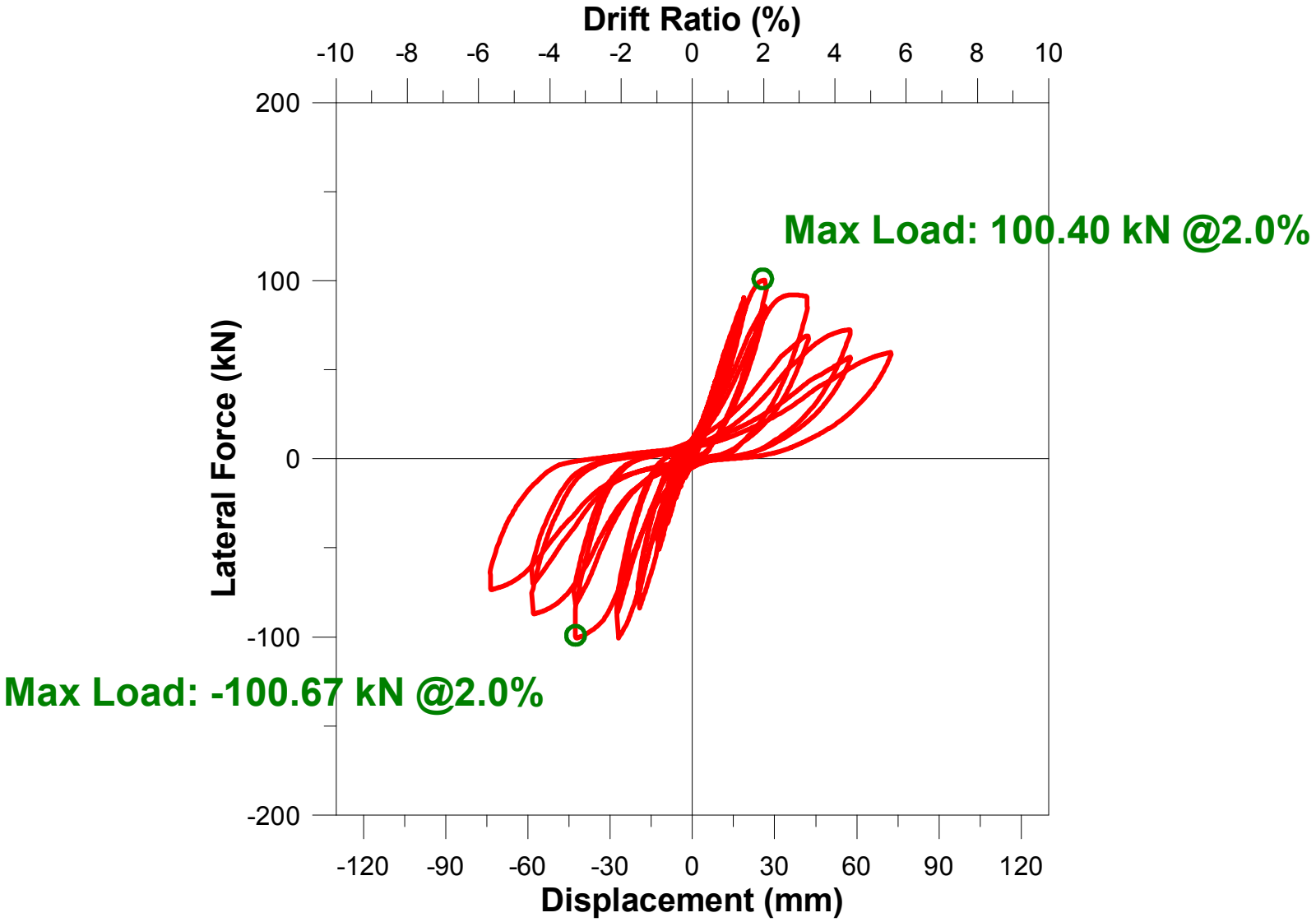
2 Cycles Applied at Each Displacement Level



Loading Direction

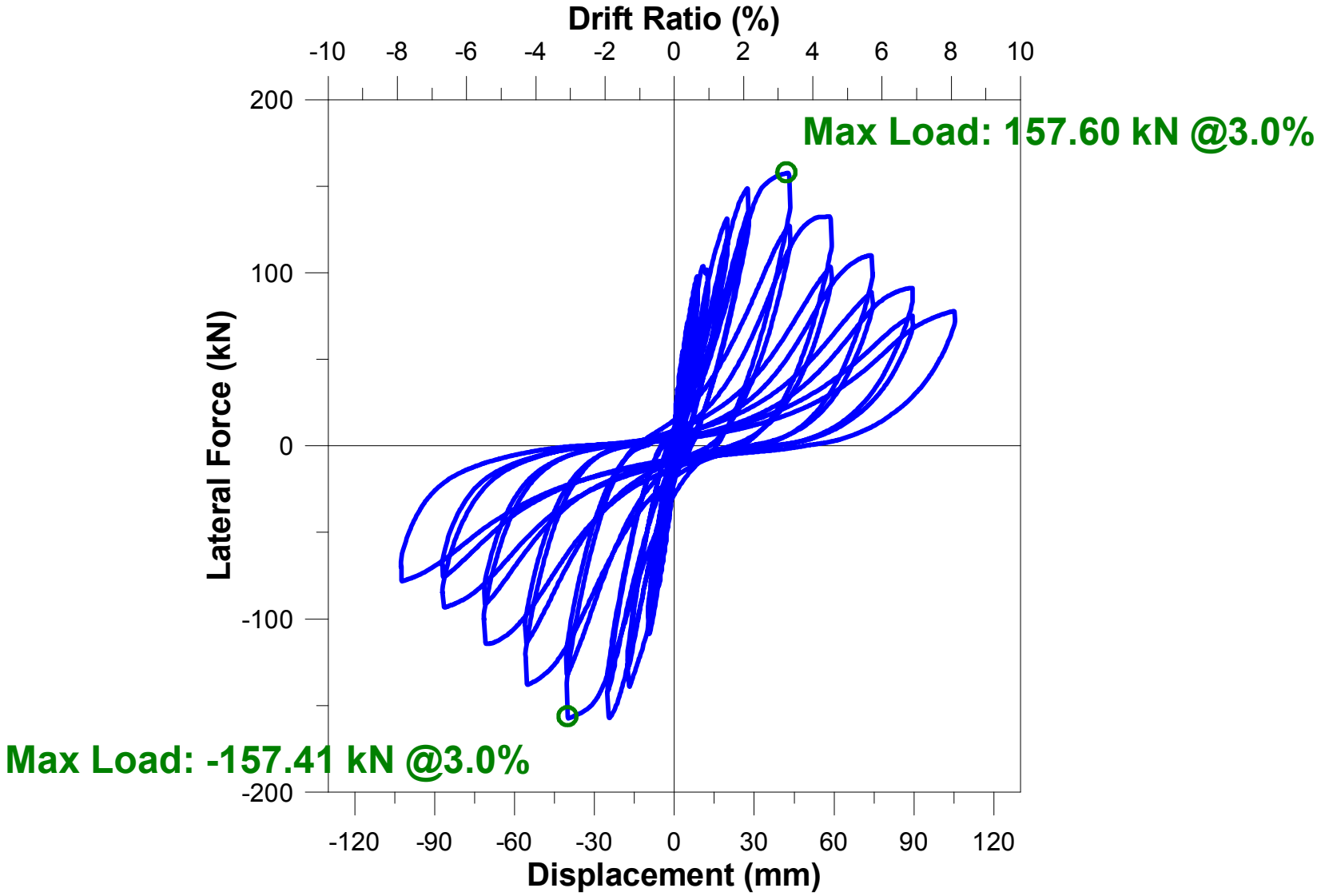


Hysteretic Loop (Beam-Column Joint A)

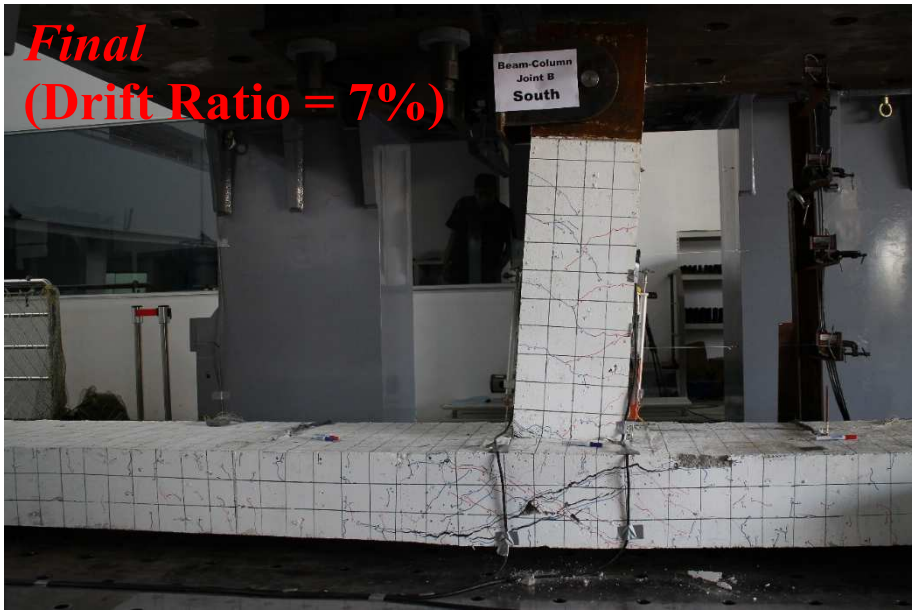


Crack Pattern (Beam-Column Joint A)

Hysteretic Loop (Beam-Column Joint B)

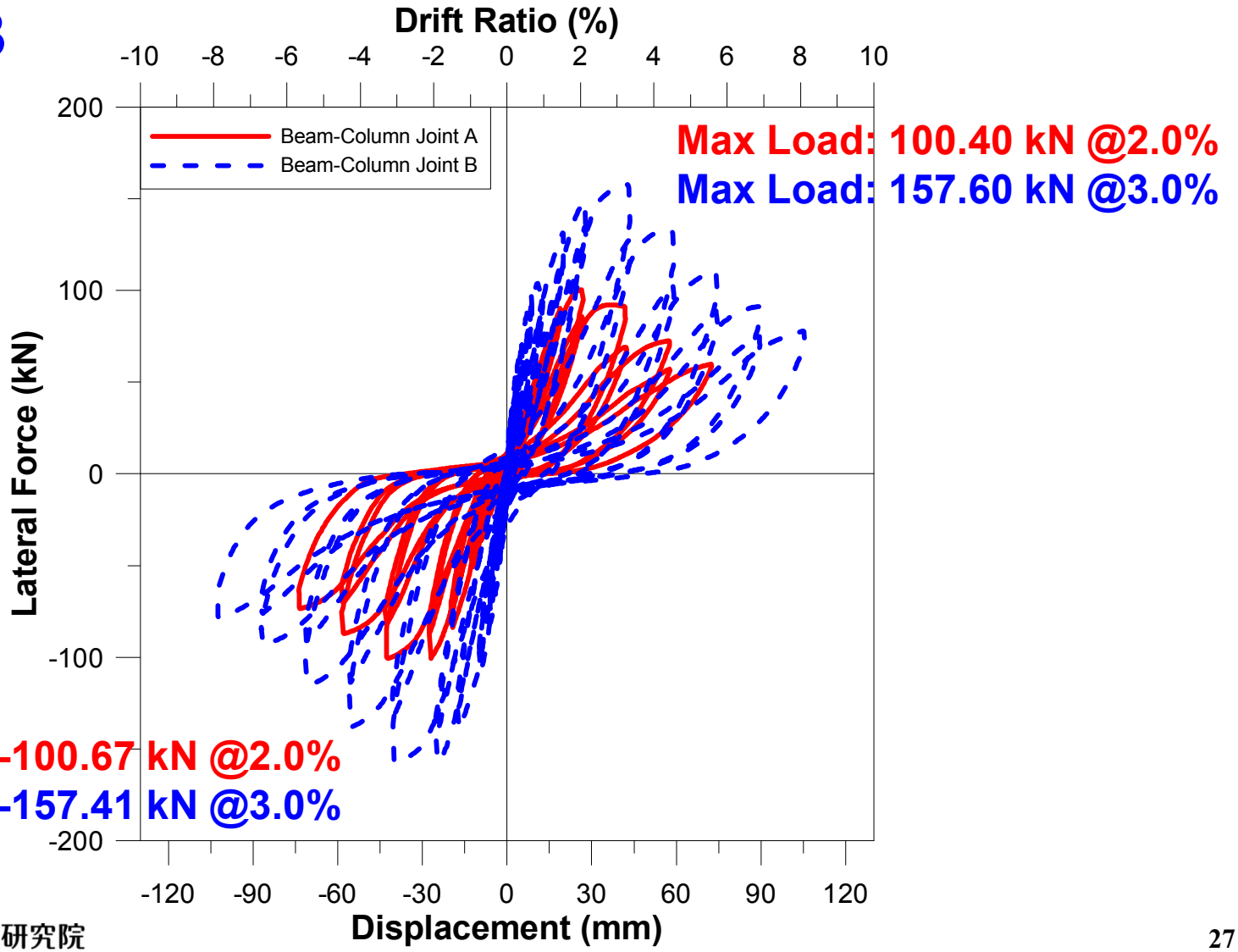


Crack Pattern (Beam-Column Joint B)



Comparison of Hysteretic Loop

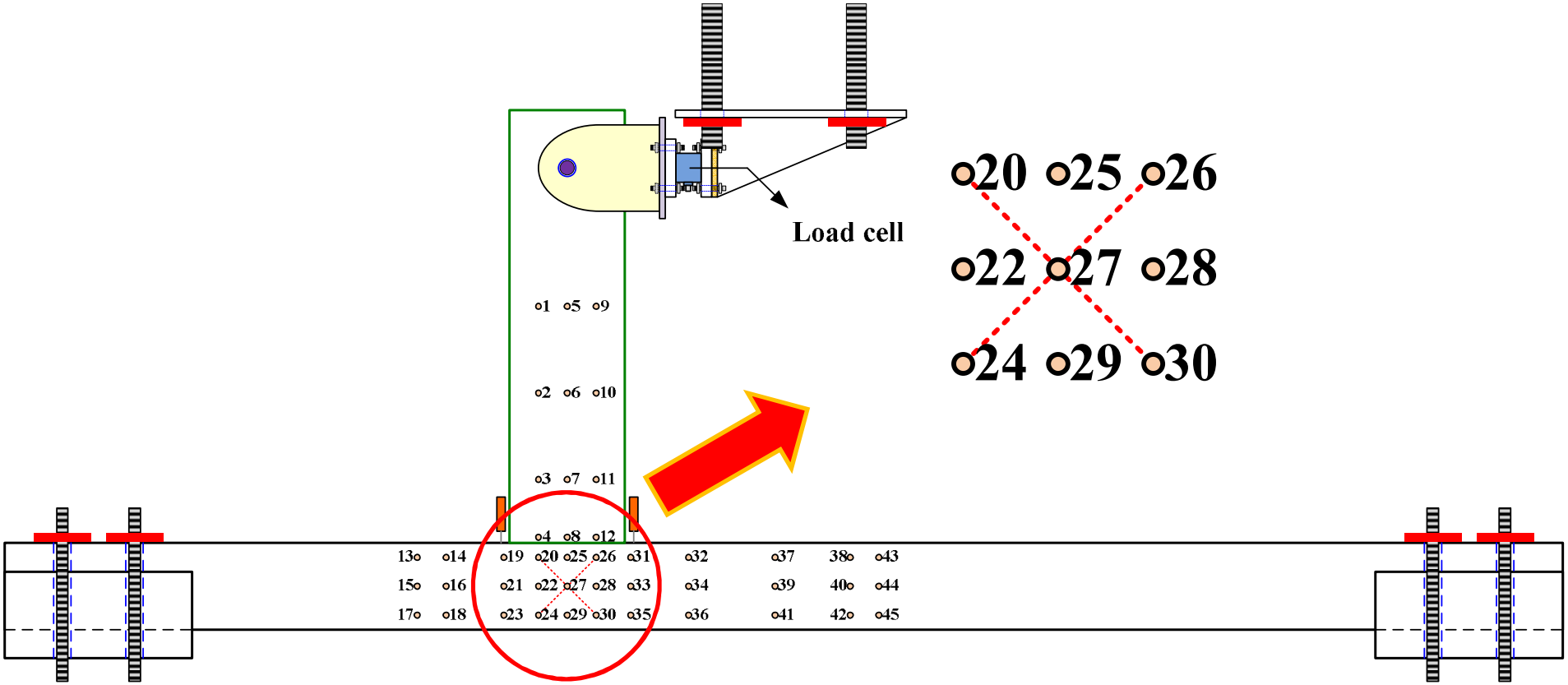
- **Beam-Column Joint A vs. Beam-Column Joint B**



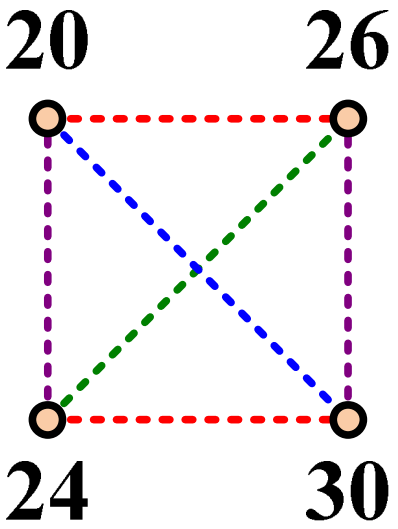
Analytical Result

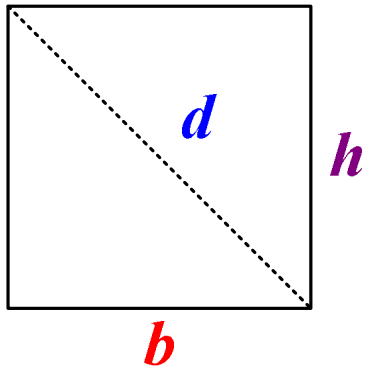
- Beam-Column Joint A
- Beam-Column Joint B

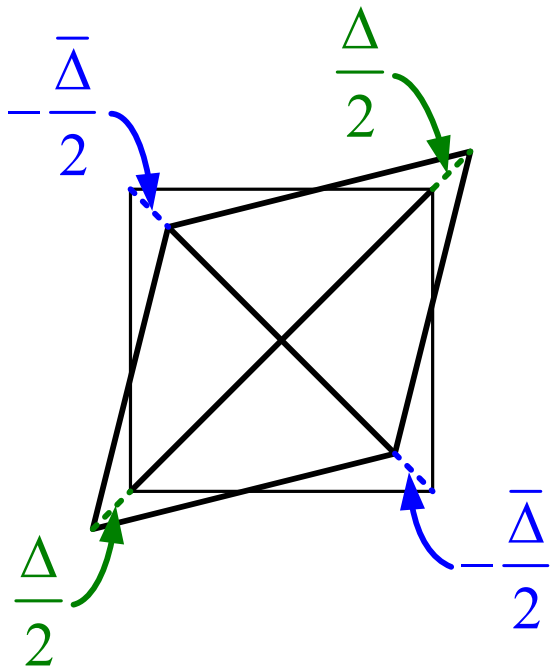
NDI Maker Position



Calculation of γ_{avg}







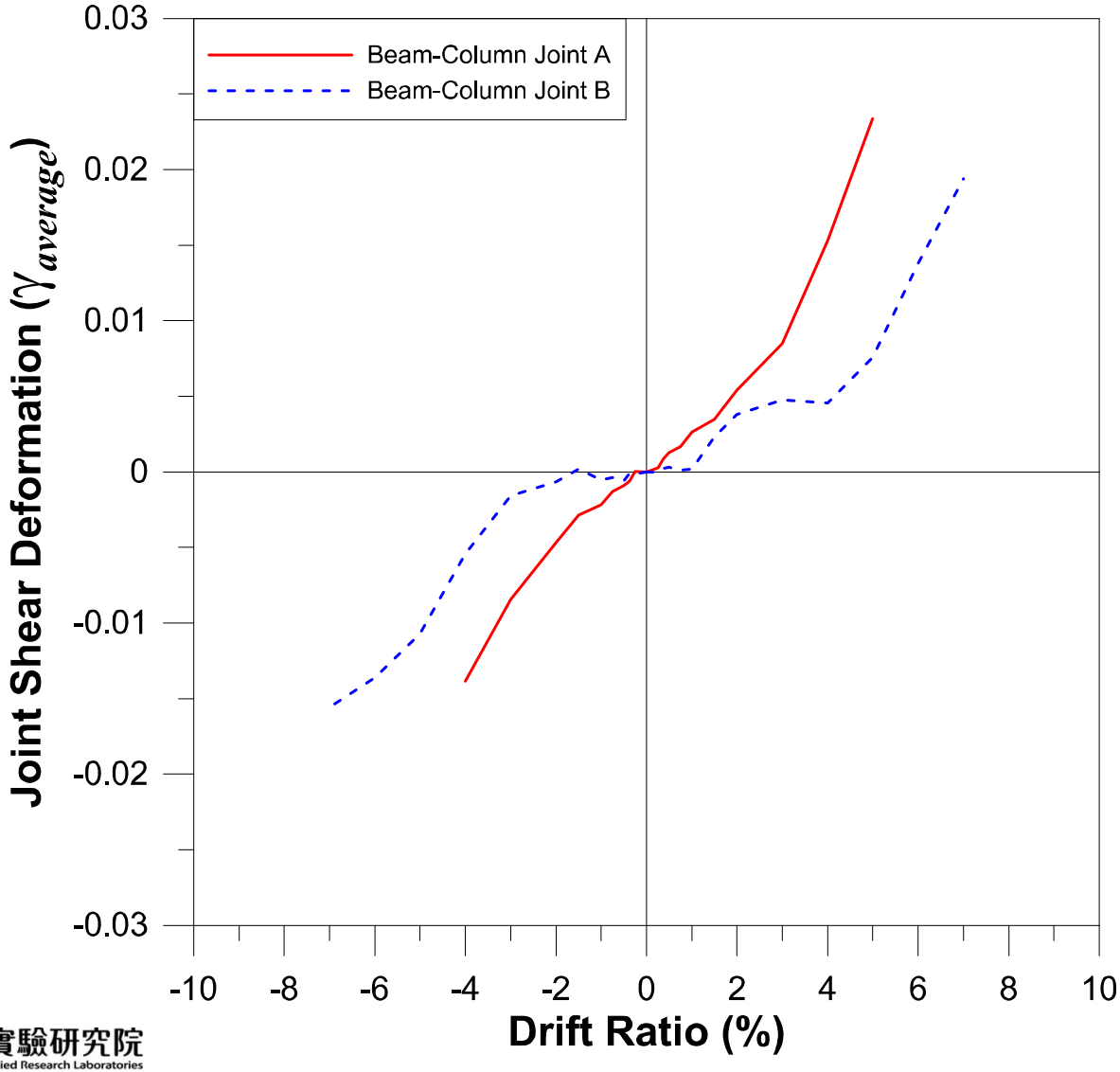
where $b \cong 200\ mm$, $h \cong 200\ mm$,

d is calculated by NDI embedded program

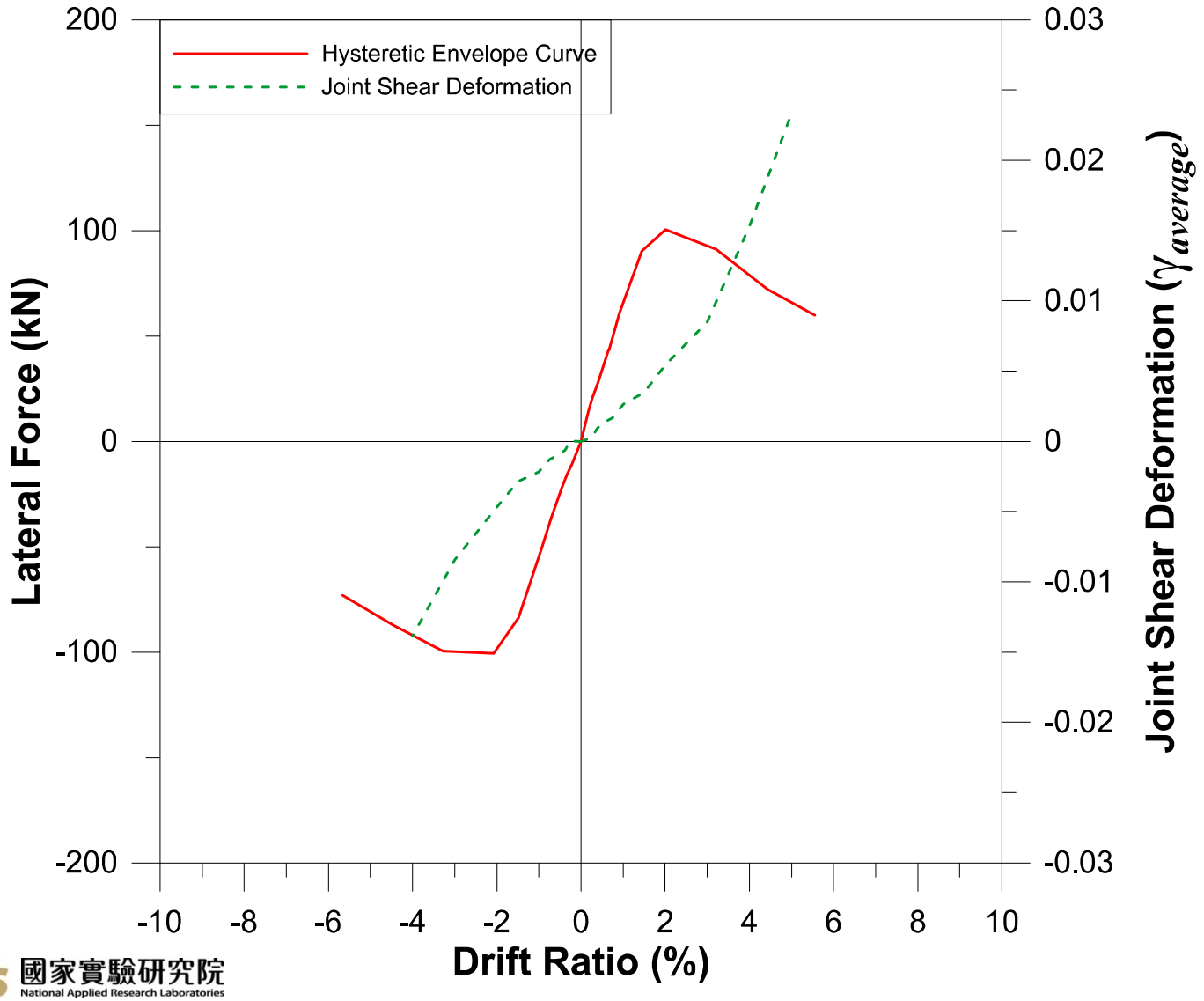
$$\gamma_{avg} = \frac{\Delta - \bar{\Delta}}{2} \times \frac{d}{bh}$$

Comparison of Shear Deformation

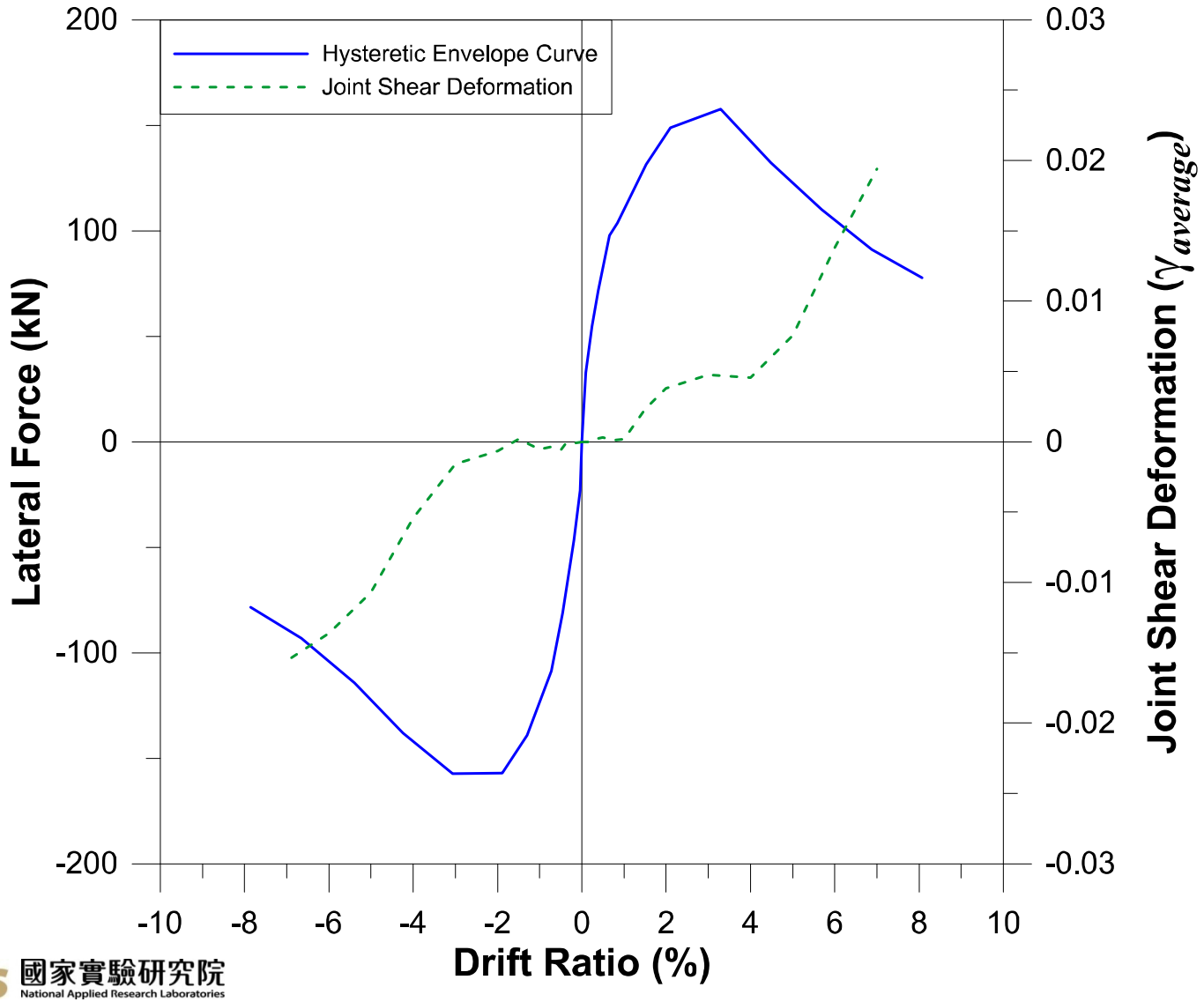
- **Beam-Column Joint A vs. Beam-Column Joint B**



Lateral Force vs. Shear Deformation (Beam-Column Joint A)



Lateral Force vs. Shear Deformation (Beam-Column Joint B)



Thanks for your kind attentions