RC Column Cyclic Tests

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Outlines

• Specimen Design
• Construction
• Test Setup
• Instrumentation Scheme
  – Interior
  – Exterior
• Material Property
• Test Result
Specimen Design
Cross Section of Members

\[ \rho_s = 2.53\% \]

Column A

- 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

Column B

- 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
Column A (30×30)

Aspect Ratio ≈ 8.66
Column B (30×75)

Aspect Ratio ≈ 8.66
Specimen Construction
Specimen Construction

Rebar Installation Completed  Formwork Assembly Completed  Construction Completed
Instrumentation Scheme

• Interior
• Exterior
Column A (30×30)

Total 45
Longitudinal: 24
Hoop: 21

Front View
Strain Gage C, E

Right Side View
Stain Gage A, B, F

Left Side View
Stain Gage D, F

Back View
Strain Gage G

Section B-B

Loading Direction

Longitudinal
Stain Gage A: 7
Stain Gage B: 7
Stain Gage C: 3
Stain Gage D: 7
Total 45

Hoop
Stain Gage E: 11
Stain Gage F: 6
Tie
Stain Gage G: 4

Column B (30x75)

Total 45
- Longitudinal: 24
- Hoop: 21

Front View
Strain Gage C, E

Right Side View
Stain Gage A, B, F

Left Side View
Stain Gage D, F

Back View
Strain Gage G

Section B-B

Loading Direction

Longitudinal
- Stain Gage A: 7
- Stain Gage B: 7
- Stain Gage C: 3
- Stain Gage D: 7

Hoop
- Stain Gage E: 11
- Stain Gage F: 6

Total 45
Exterior Instrument

Loading Direction

- NDI Marker

Column A

Column B
Test Setup
Loading Protocol

Axial Load

Column A

\[ P \approx 0.12A_g f'_c \]

Column B

\[ P \approx 0.06A_g f'_c \]

Lateral Load

Cyclic test in constant axial load \( P \)
Material Property
Yield Strength of Steel

- **D10 vs. D19**

![Graph showing yield strength comparison between D10 and D19. The graph displays stress (N/mm²) on the y-axis and strain on the x-axis. The D10 curve shows a yield strength of approximately 454 N/mm², while the D19 curve shows a yield strength of approximately 355 N/mm².]
Compression Strength of Concrete

<table>
<thead>
<tr>
<th>28 Days</th>
<th>$f'_c$ (kgf/cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen 1</td>
<td>210.16</td>
</tr>
<tr>
<td>Specimen 2</td>
<td>220.84</td>
</tr>
<tr>
<td>Specimen 3</td>
<td>227.83</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>219.61</strong></td>
</tr>
</tbody>
</table>
## Compression Strength of Concrete

<table>
<thead>
<tr>
<th>32 Days</th>
<th>$f'_c$ (kgf/cm²)</th>
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</thead>
<tbody>
<tr>
<td>Specimen 4</td>
<td>222.88</td>
</tr>
<tr>
<td>Specimen 5</td>
<td>240.70</td>
</tr>
<tr>
<td>Specimen 6</td>
<td>246.21</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>236.60</strong></td>
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</tbody>
</table>
## Compression Strength of Concrete

<table>
<thead>
<tr>
<th>35 Days</th>
<th>$f'_c$ (kgf/cm$^2$)</th>
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</thead>
<tbody>
<tr>
<td>Specimen 7</td>
<td>239.43</td>
</tr>
<tr>
<td>Specimen 8</td>
<td>227.41</td>
</tr>
<tr>
<td>Specimen 9</td>
<td>238.77</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>235.20</strong></td>
</tr>
</tbody>
</table>

Specimen 7, Specimen 8, Specimen 9
Test Results

• Column A
• Column B
Hysteretic Loop (Column A)
Crack Pattern (Column A)

**Start**
(V\text{max} = 96.86 \text{kN}
(Drift Ratio = 3\%))

**Final**
(Drift Ratio = 8\%)
Hysteretic Loop (Column B)

Displacement (mm)

Lateral Force (kN)

Drift Ratio (%)
Crack Pattern (Column B)

Start

$V_{\text{max}} = 225.24 \text{ kN}$  
(Drift Ratio = 3%)

Final

(Drift Ratio = 4%)
Hysteretic Loop

- **Column A vs. Column B**

![Hysteretic Loop Graph](image-url)
Thanks for your kind attentions