Post-tensioning Design for the University of Arizona - Environmental and Natural Resources II Building

by

Asit Baxi, PhD, PE, FPTI

Baxi Engineering Inc.
University of Arizona - ENR II Building

Project Description

- Owner: The University of Arizona
- Architect of Record: GLHN (Richärd + Bauer)
- Engineer of Record: Turner Structural Engineering
- Post-tensioning Specialty Eng. Firm: Baxi Engineering Inc.
- General Contractor: Hensel Phelps
- PT Supplier: Suncoast Post-tension Ltd
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212 feet

10 inch Flat Plate with Upturn Beams
Total Load = SW + 105 to 145 psf

234 feet

E.J. E.J.
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North

South
Presentation Highlights

- Post-tensioning Design Challenges
  - Transfer Girders
  - Long Cantilevers
  - Wavy Edges
  - Column Isolation Detail
- Use of BIM Modeling
- Laser Scans
- Specifications – Tendon Finishing (Capping Report)
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5 Transfer Girders on Level 2
Size: 96”x 60”, f’c (28 days) = 6000 psi, f’ci = 4000 psi
Forces from 3510 kips (130 tendons) to 2079 kips (77 tendons)
### TG-1 STAGE-TENSIONING SCHEDULE

<table>
<thead>
<tr>
<th>TENDON TYPE</th>
<th>STAGE 1</th>
<th>STAGE 2</th>
<th>STAGE 3</th>
<th>STAGE 4</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TENDON &quot;A&quot;</td>
<td>864K</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>864K</td>
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<tr>
<td>TENDON &quot;B&quot;</td>
<td>378K</td>
<td>540K</td>
<td>135K</td>
<td>135K</td>
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<td>TENDON &quot;C&quot;</td>
<td>513K</td>
<td>216K</td>
<td>375K</td>
<td>351K</td>
<td>1,458K</td>
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<tr>
<td>TOTAL</td>
<td>1,755K</td>
<td>756K</td>
<td>513K</td>
<td>486K</td>
<td>3,510K</td>
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</table>

- **STAGE 1**: INITIAL STRESSING
- **STAGE 2**: AFTER LEVEL 3 HAS BEEN Poured & STRESSED
- **STAGE 3**: AFTER LEVEL 4 HAS BEEN Poured & STRESSED
- **STAGE 4**: AFTER LEVEL 5 HAS BEEN Poured & STRESSED

Beam to remain formed & shored until Stage 3 tendons have been stressed & elongations approved. P-T supplier to add 3 extra tendons in beam with tendon "C" to account for low elongations &/or broken tendons. The extra tendons to be stressed at the discretion of the structural engineer.
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TENDON NUMBERING FOR STAGE TENSIONING
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LEVEL 5
Anchor intentionally placed with eccentricity
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One or two cantilever upturn beams
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One or two cantilever upturn beams
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Cantilever with add tendons and intentional eccentricity at live end
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One or two cantilever upturn beams
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**WAVY EDGES – VARIES AT EACH LEVEL**

Load transfer along curved edges with use of tendons and rebar
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COLUMN ISOLATION DETAIL
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COLUMN ISOLATION DETAIL

½” BEARING PAD BY FABREEKA

BOND BREAKER ON COLUMN BARS FOR DEPTH OF SLAB

6-#8 VERTICAL

(3) ADDITIONAL TIES @ 3” O.C.

2 LAYERS OF 20# FELT

DETAIL @ G/5, D.7/5, & D.5/6
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Columns G-5, D.7/5, D.5/6
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USE OF BIM FOR CLASH DETECTION
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Transfer Girder with 130 tendons
Capping and Grouting Report
Q3 Level 2
## Special Inspection Report - Monostrand Stressing

<table>
<thead>
<tr>
<th>Tendon No.</th>
<th>Location</th>
<th>Jacking Force</th>
<th>Gauge Reading</th>
<th>Calc. Elong.</th>
<th>Measured Elongation</th>
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- Engineering Approval
- Tendons cut to length
- Packets clean
- PT encapsulation cap fixed
- Good to grad., 5000 psi NS ASTM-1106

**Tendon Finishing Report**

**Remarks:**

- Engineering Approval
- Tendons cut to length
- Packets clean
- PT encapsulation cap fixed
- Good to grad., 5000 psi NS ASTM-1106
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<table>
<thead>
<tr>
<th>Report</th>
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THANK YOU FOR YOUR ATTENTION