CHECKING PROCEDURE FOR PRESTRESSED GIRDER SHOP DRAWINGS

The following is a list of items that should be checked to insure a complete and thorough review of prestressed girder shop drawings.

Submittal Data

Strand Certification

- Strand type (stress relieved or low relaxation)
- Ultimate strength
- Strand Area
- Modulus of elasticity

Jacking Force/Gauge Pressure

- Data from the calibration test and a graph or equation representing the relationship between jacking force and gauge pressure shall be included.

Bed Layout

- Total length of strand being tensioned
- Hold-down point locations with horizontal and vertical dimensions
- Hold-up point locations with horizontal and vertical dimensions

Elongation Calculations

- Elongation of each strand to be measured and the corresponding gauge pressure

Checking Procedure

The tensioning method varies with each fabricator and the method of calculating the elongations varies accordingly.

Jack Data

- Jacking data shall fit the graph or equation submitted and the jack used in the test shall be the jack used for tensioning.

Strand Data

- Strand data shall match the certification sheet. The prestressing manufacturer must be reminded in the review letter that if the actual strand properties being used vary by more than 5% from the assumed values in the calculations then new elongation calculations will have to be made.

Initial Prestress Force

- An initial force and initial gauge pressure shall be given. This is the force in the strand before any elongation measurements are made.

Final Prestress Force

- This is the desired force in the strand after all the elongation losses have occurred.
  Low relaxation strand $P_f = 0.75x270x$strand area
  Stress relieved strand $P_f = 0.70x270x$strand area

Calculated Elongations

Δi = initial elongation = $P_i L/AE$
Δf = final elongation = $P_f L/AE$

Elongation Losses

- Elongation losses are treated differently depending on when they occur. There are three different times an elongation loss can occur:
  a. Before the strand is seated, Δ_B (dead-end seating or abutment deflection due to the jacking in progress).
  b. When the strand is seated, Δ_S (strand slipping in the chuck when released).
  c. After the strand is seated, Δ_A (abutment deflection due to subsequent jacking of other strands).

- The values for the three different losses should be given since they are unique to each prestressing yard.

Gauge Pressure for Straight Strands

- Use the gauge pressure vs. jacking force graph or equation and solve for the gauge pressure.
  Fj = jacking force = $(\Delta f + \Delta_S + \Delta_A)$ AE/L

Elongation for Straight Strands

- Measured before seating $\Delta_M = \Delta f - \Delta i + \Delta_B + \Delta_A + \Delta_S$
- Measured after seating $\Delta_M = \Delta f - \Delta i + \Delta_B + \Delta_A$

Elongation for Harped Strand

- Use the geometry for the hold-down and hold-up points to calculate the increase in the strand length due to harping.
  Δ_H = elongation due to increase in length of harped strand
  Δ_{MH} = elongation of harped strand = $\Delta_M - \Delta_H$

Gauge Pressure of Harped Strand

- Use the gauge pressure vs. jacking force graph or equation and solve for the gauge pressure.
  Fj = jacking force = $(\Delta f - \Delta_H + \Delta_S + \Delta_A)$ AE/L

The above calculations should be made for each strand and a table prepared listing the measured elongation and corresponding gauge pressure for each strand.

Refer to Appendix H of the PCI *Manual for Quality Control for Plants and Production of Structural Precast Concrete Products,* 4th Edition, for sample tensioning calculations.