402 POST TENSIONED BOX GIRDER BRIDGES

402.01 GENERAL

Post-Tensioned Box Girder Bridges shall be designed in accordance with AASHTO specifications. Girders shall be designed by Working Stress Method and checked by the Ultimate Strength Method (Load Factor Design). The deck slab is to be designed by the Working Stress Method.

402.02 CONCRETE (AASHTO 9.2 AND 9.22)

The following concrete strengths are the desired strengths to be used. Higher strengths may be used if approved by the Abu Dhabi Roads Section Project Manager.

Initial $f'c = 290$ kg/cm^2 minimum.

Final $f'c = 350$ kg/cm^2 minimum
$f'c = 420$ kg/cm^2 maximum

402.03 BEARING PADS

Allow an extra 80mm movement per 100 meters of girder length for long-term creep and shortening due to post-tensioning.

402.04 CREEP AND SHRINKAGE (AASHTO 9.4)

For restrained members in continuous bridges where shortening due to post-tensioning induces moments and shears, a shrinkage and creep coefficient of 1.5 shall be used for design of substructure elements with the total movement equal to 1.5 times the initial shortening. For superstructure elements, no creep factor should be applied except for long term deflection considerations.

402.05 FLANGE AND WEB THICKNESS - BOX GIRDERS (AASHTO 9.9)

Minimum top slab thickness shall be 200 millimeters. Minimum bottom slab thickness shall be 150 millimeters. Minimum web thickness shall be 300 millimeters (measured normal to girder for sloping exterior webs). Interior webs shall be constructed vertical.

402.06 DIAPHRAGMS (AASHTO 9.10)

A single 250 millimeter thick intermediate diaphragm shall be placed at the midspan for all bridges. Special consideration for additional diaphragms should be given to box girders with large skews, curved boxes and boxes over 2 meters in depth. Diaphragms shall be placed parallel to abutments and piers for skews less than or equal to 20 degrees and normal to girders and staggered for skews over 20 degrees. Diaphragms shall be cast integral with girder webs.

402.07 DEFLECTIONS (AASHTO 9.11)

The deflection shall be calculated using dead load including barriers, but not the future wearing surface, gross section properties and calculated final losses. The additional long term deflection shall be calculated by multiplying the deflection by two. An additional parabolic shaped deflection with a peak equal to 30 millimeters per 100 meters should be added to the total deflection for simple spans. The final long term deflection shall be the sum of the deflection, the additional long term deflection and the additional deflection for simple spans. The camber shown on the plans shall be the final long term deflection.

402.08 ALLOWABLE STRESSES - PRESTRESSING STEEL (AASHTO 9.15.1)

In calculating the stress in the prestressing steel after seating, the friction and anchor set losses only should be included. For post-tensioned members, overstressing for short periods of time to offset seating and friction losses is permitted but the maximum allowable jacking stress for low relaxation strand shall be limited to $0.78\ f's$.

402.09 ALLOWABLE STRESSES- CONCRETE (AASHTO 9.15.2)

In calculating the temporary stress in the concrete before losses due to creep and shrinkage, the friction, anchor set and elastic shortening losses should be included.