202.05 LATERAL TENSIONING OF MULTI-BEAM UNITS (AASHTO 3.23.4.1)

Each lateral tensioning tie shall consist of a 38 millimeter diameter mild steel bar tensioned to 13,560 kg. Tension in the 38 millimeter diameter mild steel should be applied by the turn of nut method. The designer should determine the number of turns of the nut required to achieve the 13,560 kg force. This value should be shown on the plans.

A36M steel bars for the tie normally come in 6 meter lengths. the final total length of the tie should be made using threaded couplers; not welded splices. When couplers are used, the hole through the diagram should be increased from the normal 64 millimeter to 102 millimeter diameter to accommodate the couplers.

Adequate means shall be used to ensure that the ties are adequately protected from corrosion. the rod, nut and bearing plate shall be galvanized in accordance with ASTM A153 (AASHTO M-232).

202.06 LIVE LOAD DISTRIBUTION (AASHTO 3.6.3 AND 3.12.1)

In designing the superstructure, the live load distribution factors shall not be reduced for multiple lanes as specified in AASHTO 3.12.1 or rounded to a whole number as specified in AASHTO 3.6.3. These two reductions apply to substructure design only.

203 LOAD FACTORS

An essential feature of Load Factor Design (LFD) requires raw design loads or related internal moments and forces to be modified by specified load factors (γ, gamma and β, beta), and computed material strengths to be reduced by specified reduction factor (ϕ, phi).

These are safety factors which ensure certain margins for variation. The three different kinds of factors are each set up for a distinct purpose, each independent of the other two. In this way, any one of them may be refined in the future without disturbing the other two.

1. γ(Gamma) Factor

The γ (gamma) factor is the most basic of the three. It varies in magnitude from one load combination to another, but it always applies to all the loads in a combination. Its main effect is stress control that says we do not want to use more than about 0.8 of the ultimate capacity. Its most common magnitude, 1.3 lets us use 77%. Earthquake loads are not factored above 1.0 because we recognize that stresses in the plastic range are allowed, as long as collapse does not occur.

An example may be given to justify the use of gamma of 1.3 for dead load. Assuming the live load being absent, the probable upper value of the dead load could be a minimum of 30% greater than calculated. For a simple structure this percentage may be as follows:

10%	due to excess weight.
5%	due to misplaced rebar
5%	structure behavior approximation
<u>10%</u>	stress increase (actual vs. calcs.)
30%	Total variation assumed to occur concurrently at the section most heavily stressed.

2. β (Beta) Factor

The second factor, β(beta), is a measure of the accuracy with which we can predict various kinds of loads. It also reflects the probability of one load's simultaneous application with others in a combination. It applies separately, with different magnitudes, to different loads in a combination. For example, it is usually 1.0 for dead load. It varies from 1.0 to 1.67 for live loads and impact.

Due regard has been given to sign in assigning values to beta factors, as one type of loading may produce effects of opposite sense to that produced by another type. The load combinations with β_D=0.75 are specifically included for the case where a higher dead load reduces the effects of other loads.