CHAPTER 2

DESIGN OF BEAMS FOR FLEXURE USING WORKING STRESS DESIGN (WSD) METHODS

2.1 Basic Assumption:

1. A section which is plane before bending remains plane after bending. This implies strains across section are linearly varying. This is true for most section of flexural member except deep beam where shear deformation is significant.
2. Beam section behaves elastically when subjected to service load moment. This implies stress in the concrete varies linearly from zero at neutral axis to a maximum at the extreme fiber.
3. Tensile strength of concrete is ignored. The reinforcement assumed to takes all the tension due to flexure.
4. Perfect bond exist between steel bars and concrete such that no slip occurs. This is possible if adequate development length of bars and concrete cover are provided.
5. The modular ratio, $n = E_s / E_c$, may be taken as the nearest whole number (but not less than 6 or more than 15). In doubly reinforced sections, to consider creep of concrete in compression zone an effective modular ratio of $2E_s / E_c$ shall be used to transform compression reinforcement for stress computation.

2.2 Design Equations for Singly Reinforced Rectangular Section

Consider a singly reinforced rectangular section subjected to a service load moment, M as shown below.