2.3 Other design requirements

Sections normally used in steel structures are I-sections, Channels or angles etc. which are called open sections, or rectangular or circular tubes which are called closed sections. These sections can be regarded as a combination of individual plate elements connected together to form the required shape. The strength of compression members made of such sections depends on their slenderness ratio. Higher strengths can be obtained by reducing the slenderness ratio *i.e.* by increasing the moment of inertia of the cross-section. Similarly, the strengths of beams can be increased, by increasing the moment of inertia of the cross-section. For a given cross-sectional area, higher moment of inertia can be obtained by making the sections thin-walled. However, the buckling of the plate elements of the cross section under compression/shear may take place before the overall column buckling or overall beam failure by lateral buckling or yielding. This phenomenon is called *local buckling.* Thus, local buckling imposes a limit to the extent to which sections can be made thin-walled.

Local buckling has the effect of reducing the load carrying capacity of columns and beams due to the reduction in stiffness and strength of the locally buckled plate elements. It is useful to classify sections based on their tendency to buckle locally before overall failure of the member takes place. The codes also specify the limiting width-thickness ratios β = b/t for component plates, which enables the classification to be made. The cross-sections are classified into plastic, compact, semi-compact and slender depending upon their width-thickness ratios β = b/t for component plates. This will be discussed in more detail in the chapter on beams.

Fabrication and erection are important aspects to be considered in the design of any steel structure. Fabrication includes the process of straightening, bending, cutting, machining and drilling. The difficult involved in performing these operation will have a major influence on the cost of the structure. Fabrication may be done either entirely in the stags, or entirely in the field or partly in both places. Similarly case of erection also influences the design.

It should be noted that the code gives only guidelines for design which when followed will reduce the probability of a structure collapsing. However, it is the designer's responsibility to ensure that the structure does not collapse due to loads or actions which are special to the particular structure, improper construction and erection techniques, mistakes in calculations etc.