CHAPTER III

STEEL STRUCTURES

I - TERMINOLOGY :

English	French	Arabic
Limite state design	Calcul aux état limite	تصميم في الحالة الحدية
One floor (storey) house	Batiment à un seul étage	بناية بطابق واحد
Multistorey building	Batiment à plusieurs étages	بناية بعدة طوابق
The creep	Fluage	سيلان
The statically determinite structure	Statiquement deterimé	جملةمحددة أستاتيكيا
The statically undeterminite structure	Statiquement undeterimé	غير محددة أستاتيكيا
Combinaison de charges	Load arrangements	حالات التحميل
The truss	Une ferme	شبكة
The structural frames	Structure en portique	بناية ذات أطر
The vertical load	Charge verticale	حمولة عمودية
Bond	Adherence	التصاق

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III-a/ Structural frames :
In situ reinforced concrete or steel structures, the frames behave as rigid elements and should be analyzed as such.
These Frames should be designed to resist vertical and lateral loads.

The **elastic modulus** of all steel classes is same and equal to 200000MPa or 2×10^6 MPa. As the load on the steel is increased, it would yield at a certain point after which plastic range will be reached.

This graph of the behavior of ductile material like the steel

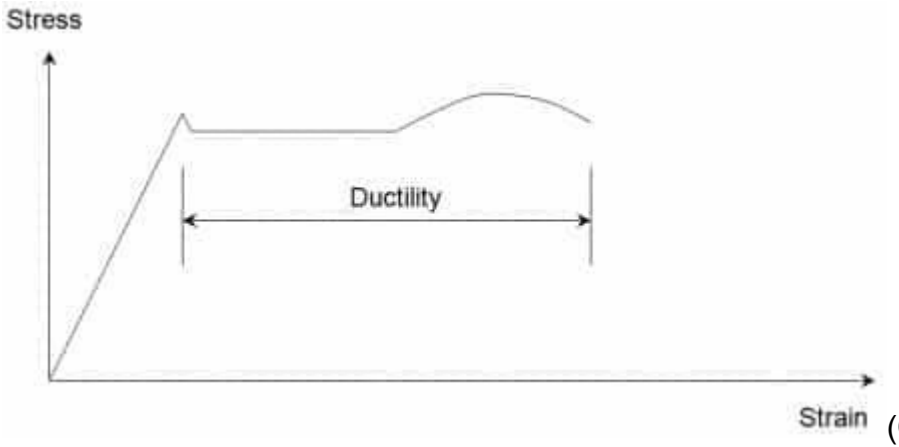

Fig.1: Stress Strain Curve of Structural Steel

III B) Characteristics of steel structure:

Properties of structural steel include:

- **Tensile properties : Propriétés sous l'effet de traction**

- **Shear properties** **Propriétés sous l'effet de cisaillement**
- **Hardness : La dureté**
- **Creep : Le fluage**
- **Relaxation: La relaxation**
- **Fatigue: La fatigue**

Notions:

Creep of Structural Steel Relaxation

Creep is gradual variation of strain of steel structure under constant stress. It occurs due to the influence of constant stress and the effect of fire.

Creep property is insignificant for structural steel frame design and construction apart from the case in which the effect of fire should be taken into consideration.

Structural Steel Relaxation

It is a step by step reduction of structural steel under a constant stress. Usually, yield strength of steel structure increases around 5% over stress relieved strain and the steel structure would suffer from plastic elongation which around 0.01.

Fatigue of Structural Steel

Fatigue is the failure of steel structure due to crack initiation and development under the influence of cyclic loading. Various tests are available to evaluate structural steel fatigue such as flexure test, rotating beam test and axial load test.

III-C) EXERCISE:

Calculate the local bond stress for the 16 mm diameter plain mild steel bars if the total ultimate load F on the beam is 190 KN.

Solution:

The shear force at the simply supported ends is;
T= F/2= 190/2= 95 KN.
We have the perimeter U_S of the three bars 16 mm diameter is $\Sigma U_S = 3\pi x16 = 151$ mm.

Thus, local bond stress : Load=T/ $\Sigma U_S xZ$=95x1000/151x1000
So the bond is : 0.630 MPa.

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Fig. 1: Glass, Carbon, and Aramid Fibre