

Light construction in steel

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Le voeu émis par le Quatrième Congrès tenu à Londres en 1952 par l'AIPC, concernant l'impérieuse nécessité de prévoir une simplification des alliages destinés à la construction et de leur désignation, en vue de favoriser leur développement ultérieur, doit être pris en considération.

IVc

Ossatures diverses

Différentes contributions présentées au Congrès tendent vers le même but: le développement de formes économiquement favorables pour les éléments d'ouvrages élancés et relativement légers. Pour les treillis légers et à larges mailles, tels que ceux qui sont employés en particulier pour les pylônes et les tours, le tube doit être de plus en plus largement utilisé; l'attention doit en particulier se porter sur une réalisation simple et appropriée des points d'assemblage. Les poutres «crénelées» constituent une forme qui retient à nouveau l'attention et qui avait déjà fait l'objet d'une discussion au cours du Premier Congrès tenu par l'AIPC à Paris en 1932.

IVd

Entretien des constructions métalliques

Le Congrès a mis en évidence le grand intérêt que présente l'amélioration de la protection des ouvrages en acier contre la corrosion. Il s'agit ici de dispositions dont l'importance dépend des conditions climatiques et qui peuvent toutefois prendre une très grande importance économique dans certains pays.

IVa

Light construction in steel

Light steel structures are characterised by the fact that very thin walls are employed in their various structural members. Compressive or flexural stresses, which are exerted on these thin-walled sections, can give rise to local instability (buckling), before the structural element undergoes complete breakdown. In order, nevertheless, to achieve the best possible use of the materials, the calculation is usually made in such cases, not in accordance with the local limit of resistance to buckling, but in accordance with the supercritical limiting load. The differences in approach, with regard to the method of calculation, which came to light during the Congress do not refer to fundamentals of the design, but to details; they show however that it is highly desirable to undertake further research. Attention should be directed more particularly to attempts to develop and test appropriate means of assembly. It appears to be established in principle that the use of such light sections has only proved economical for light loads. The light steel construction supplements the standard steel structures there, where the hot-rolled sections are

not economical and where besides sufficient strength other features of the elements (constitution of useful surfaces etc.) are desired

IVb

Construction in light alloy

Light alloy structures exhibit considerable similarities to steel structures as far as the shape of their structural members and the methods of fabrication are concerned. On the other hand, however, there are certain fundamental dissimilarities which are directly due to the differences in the behaviour of the materials. Consequently, it is impossible to apply the same principles of design and the same calculation procedures as are employed for steel constructions; on the contrary, new principles, which correspond to the special characteristics of light alloys, must be developed.

From the points of view of strength and deformation, these characteristic features take the form of differences in the stress-strain diagrams and of a greater sensitivity towards loads which vary with time and are applied for long periods. The absence of a yield point that is clearly defined from a physical point of view cannot be compensated by the adoption of a conventional value (ultimate elongation of 0.2%). A low value of the modulus of elasticity is essential, not only for shaping the various components, but also because it assumes decisive importance in the selection of the general arrangement of the supporting structure. The solution of the general problem of fatigue strength is also of particular importance in this instance, since light alloys can exhibit creep phenomena even at normal room temperatures.

Light alloys are not absolutely corrosion-resistant, but their resistance is nevertheless superior to that of steel and, consequently, economy in the cost of upkeep can often be achieved.

In the present state of the market, the advantages of lighter weight are usually counterbalanced by higher unit costs; under special circumstances (difficulties in connection with transport and erection, portable structures) lightness of weight may nevertheless prove to be a decisive factor from the economic point of view.

The suggestion put forward by the London Congress of the IABSE, in 1952, regarding the urgent need for the standardisation of alloys intended for constructional engineering purposes, and of their designation, with a view to promoting their ultimate development, must be taken into consideration.

IVc

Various structures

A number of papers were read during the Congress which aimed at the same objective, namely, the development of economically favourable forms for slender and relatively light-weight structural members. For light-weight, wide-mesh lattice structures, particularly such as are employed for pylons and derricks, tubes should be more extensively used; special attention should be directed to the design of simple and