

# STRUCTURAL AND CONSTRUCTION STEELS

These are unalloyed steels and they are normally marketed in the natural state, i.e. without any heat treatment.

The following special conditions may be agreed upon in the order:

- stress relieving (300 °C),
- normalization,
- spheroidizing;
- soft annealing;
- annealing to achieve certain structures;
- annealing for mechanical working with a guaranteed hardness;
- quenching and tempering.

The rolled products are generally supplied without elimination of the calamine (oxide coating) but, if requested, they can be sandblasted, pickled, peeled etc. The cold plastic deformation processes are continually evolving, since parts can now be manufactured with dimensional tolerances similar to those which may be obtained with machine tools. This enables obvious savings in materials and machining times which, especially in volume production, make these technologies economically advantageous.

This category of steels essentially contains low carbon and manganese, and limited amounts of sulphur and phosphorus.

Sulphur is also added when they are used for tool working (SAE 1141-1116- 1117).

In general, unless otherwise agreed in the order, mechanical properties such as failure, yield, elongation and resilience are not requested, but merely a maximum hardness value.

They are considered as poor materials, but careful production makes them suitable for several delicate applications. Their ability to satisfy the cold-heading market is guaranteed by the long period of experimentation and their widespread use.

## SAE 11 41

This steel forms part of the series of improved machinability products. The sulphur content of 0.08-0.13% provides excellent workability with machine tools. The good distribution and morphology of the sulphur inclusions slightly damage its longitudinal mechanical characteristics, due to the fact that their shape is globular and not elongated.

## SAE 1116

This is similar to SAE 1141 but with the addition of 0.16-0.23% of sulphur. Chips easily removed and fast cutting speeds can be guaranteed, whilst maintaining good surface finishes. Another characteristic is that of being suitable for subsequent case-hardening, and quenching and tempering treatments. One should also note the presence of manganese which, linking with sulphur, forms manganese sulphides which, as well as giving good wear resistance, partly counteracts brittleness. In order to limit ductility, it is good practice with this steel to carry out a certain work hardening, by means of cold-drawing. Due to its sulphur content, this product is not very suitable for bending. From experience accumulated in the gear-rack sector, it appears that this steel is not suitable for induction hardening and has quite low mechanical values. Some project engineers have overcome this problem by increasing the resistant sections.

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## SAE 1117

This is a carbon steel with the addition of sulphur to improve chip removal. Only its chemical analysis is certified and if killed material is required this should be specified in the order. It is particularly suitable for volume production. It may be welded without preheating.

## SAE 1018

This steel is suitable for the production of parts with average stress and a good elasticity and toughness. It may be used for those structures which need not be too rigid. It Works well under cold deformation, when the sulphur and phosphorous contents are below 0.020%. When welded, even cold-welded, it behaves well, without the appearance of stresses, which can sometimes cause cracks. As for all the SAE steels, it is used for the manufacture of lightly stressed mechanical components and corsetry.

## SAE 1045

Refer to grade C45E of the family of carbon steels for quenching and tempering.

## CB4FF

This steel is the same as the CB 20, but has a lower carbon and manganese content. Consequently, it has an even better workability. Most common uses: nuts, bolts and screws and co/d headed parts. Since the surface must always be pre-machined, the greatest benefits will be achieved with peeled or cold-drawn materials.

## CB 20 FF

This steel is used for nuts and bolts and all coupling parts, It has been specifically studied with strict analysis limits to best satisfy very severe requirements. It is marketed in the annealed condition, better if spheroidizing annealed, so that it is suitable for the subsequent cold transformation operations. This operation arranges the fibres to contrast the stresses which the material will suffer during operation and, since there is no tool cutting, there will be a good fatigue resistance. The considerable experience gained in the continued use of this specific steel, always with excellent results, is certainly the best guarantee that can be given.

## C20

This steel is normally used for small parts, where a low core resistance but a good toughness is required. Use: rollers, chucks, gears, gauges, levers, bushings, pins, drive units etc. It is suitable for surface hardening as for instance case-hardening. It is used widely in the automotive sector, where low stresses are present.