

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in Structural Steel Sections, Trusses and the like

I, FELIX LOUIS JAMES SAMUELY, a British subject of 8, Hamilton Place, London, W.1, do hereby declare the invention for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to beams such as rolled steel joists or welded steel trusses.

According to the invention there is provided a structural steel section or fabricated truss, hereinafter termed generically "beam", characterised in that the tension flange thereof is encased in reinforced concrete, the reinforcing wires embedded or anchored in the concrete being pre-tensioned or post-tensioned and wherein the concrete is bonded to the beam by mechanical or other means.

In cases where the beam for example of I-section supports a deck such as a reinforced concrete slab capable of taking compression by bond and/or mechanical means, a connection is made between the compression flange of the beam and the deck so that the deck acts as an enlargement of the compression flange, thus (independently or in conjunction with the strengthening of the tension flange) increasing the strength of the beam.

In a further modification, the concrete casing to the bottom flange may be extended to meet that of adjacent beams so as to provide a continuous ceiling constituting a projection against fire.

In addition, where a concrete deck is to be cast, the shuttering for this may be cardboard or other cheap expendable material in the form of a box or table resting on the casing to the bottom flange of the beam and lying between adjacent beams.

In order that the invention may be clearly understood and readily carried into effect, reference is directed to the accompanying drawing, wherein:—

Fig. 1 is a cross section of a beam strengthened in accordance with the invention, and

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Fig. 2 illustrates in cross section a floor of general construction embodying a strengthened beam according to the invention.

Referring to the drawing, an I-section structural rolled steel joist or beam is indicated by the reference *a* of which the lower or tensile flange *b* is encased in concrete *c* reinforced by high tensile steel wires *d* which are pre-tensioned or post-tensioned to induce compression in the concrete and lower flange of the beam. This compression will be transferred to the beam by bond and/or mechanical means. Tension will also be induced in the upper flange *e*. Where a truss is to be strengthened, only the bottom flange thereof would generally be affected.

Figure 2 shows in conjunction with a beam as illustrated in Figure 1, a concrete floor slab *f* cast in situ and reinforced in the usual manner by steel rods *g*. With such a construction the upper flange *e* may have welded thereto a plurality of transverse steel rods *h* spaced along the length of the flange *e* to provide a bond with the concrete of the floor slab *f*. In cases where the rods *h* are omitted, the normal bond alone serves to connect the deck to the compression flange *e*. Similarly rods similar to *h* are used on the bottom flange *b* as indicated in Figure 2 to connect the casing to such flange. Concrete casing *j* is applied if it is necessary to give protection from fire or to increase the bond. The bond may be further increased by forming holes and/or castellations in the web of the beam.

The advantages of the invention are that the beam is strengthened and stiffened thereby permitting the use of smaller beams. Also, where a deck such as *f* is used to strengthen the upper flange *e*, its (normally wasted) reservoir of compressive strength is utilised. The casing to the lower flange can be carried out in a factory and it may be standardised so as to make it economical to apply.

Where the beam has to be cased in concrete for purposes of fire protection, the casing

of the lower flange, as described, saves some of the site concreting and makes the shuttering more economical and convenient.

Where the beams are used at close centres and the encased flanges *b* may be extended to form a ceiling and support permanent shuttering for an in situ concrete deck, the resulting box beam ~~constructed~~ is lighter than most flooring systems so that savings in the load on the floor and on the supporting structure are achieved. Further, a high degree of fire resistance is achieved with such a construction without casing the web of the beam.

Connections between structural members may be as in normal steel work thus permitting of speedy erection.

WHAT I CLAIM IS:—

1. A structural steel section, truss or the like, characterised in that the tension flange thereof is ~~encased~~ in reinforced concrete, the reinforcing wires embedded or anchored in the concrete being pre-tensioned or post-tensioned and wherein the concrete is bonded to the steel section, by mechanical or other means.

2. A structural steel section as claimed in claim 1 wherein the mechanical bond between concrete and steel section is effected by forming holes and or castellations in the steel section.

3. A structural steel section as claimed in claim 1 adapted to support a deck such as a reinforced concrete slab capable of taking compression, by bond and/or mechanical means, characterised in that a connection is made between the compression flange of the steel section and the deck so that the deck acts as an enlargement of the compression flange.

4. A structural steel section, as claimed in claim 1 or 2 or 3 wherein the concrete casing to the bottom flange is extended to meet that of adjacent sections so as to provide a continuous ceiling.

5. A structural steel section, truss or the like as claimed in claim 1 or 3 or 4, wherein the tension flange and/or compression flange have welded thereto a plurality of transverse steel rods spaced along the length of the flange to provide a mechanical bond with the concrete in which the flange is encased.

6. The improved structural steel section, trusses or the like substantially as herein described with reference to the accompanying drawings.

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The concrete may be bonded mechanically to the beam, where necessary, and the reinforcing wires embedded or anchored in the concrete are preferably prestressed or post-stressed.

In cases where the beam, for example of I-section, supports a deck such as a reinforced concrete slab capable of taking compression, by bond and/or mechanical means, a connection is made between the compression flange of the beam and the deck so that the deck acts as an enlargement of the compression flange, thus (independently or in conjunction with the strengthening of the tension flange) increasing the strength of the beam.

In a further modification the concrete casing to the bottom flange may be extended to meet that of adjacent beams so as to provide

a continuous ceiling constituting a protection against fire.

In addition, where a concrete deck is to be cast, the shuttering for this may be cardboard or other cheap expendable material in the form of a box or table resting on the casing to the bottom flange of the beam and lying between adjacent beams.

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of the lower flange, as described, saves some of the site concreting and makes the shuttering more economical and convenient.

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