

CHANNEL

FIELD OF THE INVENTION

The present invention relates to a channel device formed from a metal or
5 metallic material for the fixation of construction elements thereto, generally for the
construction industry. More particularly, the present invention relates to fixation of a
channel device to a structure.

BACKGROUND OF THE INVENTION

Various channel devices of conventional type are known that are
10 manufactured by the process of die casting, cold rolling, or hot rolling, which
comprise a channel rail having a hollow interior and one or more anchor shafts
attached thereto. Channel devices, as known within the prior art, are attachable to a
structure, such as a concrete or steel structure, and allow the fixation of other
construction elements, such as panels thereto, so as to engage the construction
15 elements with the structure.

The anchor shafts attached to the exterior surface of the web of the channel
and embedded into the concrete. A T-shape bolt (hereinafter called T-bolt) can be
inserted into the gap between the return legs of two flanges of the anchor channel rail,
whose head is fixed within the flanges. Since the inner surfaces of both the T-bolt
20 head and the channel wall are smooth, such type of anchoring device cannot
effectively prevent a shift of the T-bolt along the channel. Moreover, the channel
anchor shafts of above mentioned type are normally larger in size and may sometimes
conflict with the reinforced concrete installation, in particular with the outermost layer
of steel reinforcement bars.

25 As known, another common way of attaching other construction elements to a
concrete structure is to use an embedded steel part comprising a steel plate with steel
re-bars attached to the back. The embedded steel part is cast into the concrete only
with the face of the steel plate exposed. The construction element is attached to a set
of steel brackets, which are attached in sequence onto the exposed face of the
30 embedded steel part by site welding. Comparatively, the size and weight of the
embedded steel part is much larger and heavier than that of the steel channel anchor

mentioned above so as to bear the same amount of load. Moreover, the steel re-bars required on the embedded steel part are also more in quantity and longer in length and thus causing much more interference to reinforced concrete installation.

For other structures, for example steel structures whereby a channel may be required
5 to be fixed to a steel construction member, within the prior art such channels may be welded directly to the steel structure by on site welding.

Such channel devices must comply with various building codes and standards, so as to securely maintain engagement and fixation of construction elements with a structure. Furthermore, such channels must be securely fixed to the structure so as to ensure that
10 the construction elements are maintained in place, and that environmental factors such as moisture, rain, high wind forces, seismic activity, do not compromise the integrity of fixation, as loosening of construction elements may have severe consequences to surrounding persons and property.

OBJECT OF THE INVENTION

15 Accordingly, it is an object of the present invention to provide a channel anchoring device which substantially ameliorates at least some of the deficiencies as exhibited by those of the prior art.

SUMMARY OF THE INVENTION

In a first aspect, the present invention provides a channel anchoring device
20 having predetermined structural properties, for securing construction elements to a metallic structure, the anchoring device comprising:

a generally elongate metallic channel rail having an engagement surface for engagement with a fastener, the fastener providing fixation of a construction element to the channel rail;

25 a generally elongate metallic fixation member abutted against and engaged with said channel rail, said fixation member being formed from a material suitable for allowing welded fixation of the anchoring device to a structure;

characterised in that the fixation member and the channel rail are engaged by a riveting process such that the predetermined structural properties of the channel rail
30 are not altered by heat generated during the riveting process; and

the fixation member is sized such that the predetermined structural properties of the channel rail are not altered by heat generated from welding of the anchoring device via the fixation member to a structure.

Preferably the fixation member is engaged with the channel rail by a plurality
5 of rivet members extending through the fixation member and through at least a portion of the channel rail.

Preferably, the channel rail is of a hollow "C" cross section having a pair inwardly opposed flanges, said flange being separated so as to allow passage of the shank of a fastener therebetween, said fastener having a head of size greater than the
10 shank and sized so as to be disposed within the channel and adapted to abut with engagement surfaces located adjacent the flanges upon being urged against the engagement surfaces upon application of tension to the fastener

Preferably, the channel rail is formed from hot-rolled steel or steel material by a hot rolling process, and the fixation member is formed from hot-rolled steel or steel
15 material by a hot rolling process. The fixation process may be a hot riveting process.

The engagement surfaces of the flanges preferably includes a plurality of laterally disposed serrations, said plurality of serration extending longitudinally along the length of the channel rail. The fastener is preferably a T-bolt, and the head of T-bolt includes serration adapted for cooperative and complimentary engagement with
20 the serrations of the flanges. The width of the head of the T-bolt is preferably greater than the internal width of the channel rail, so as to prevent continuous rotation of the T-bolt about its axis.

Preferably the channel rail and fixation member each have a corresponding series of apertures extending therethrough, so as to allow passage of the rivets therethrough, a
25 least the apertures of fixation member including a rebated portion to allow a portion of the rivets when forged to be located therein. The rebate may be a countersunk or counterbore section.

In a second aspect, the present invention provides a channel anchoring device for construction industry, which comprises a channel rail with a hollow interior and a
30 T-bolt, anchor shafts or steel base plates attached onto the exterior surface of the web of the channel rail, the channel anchoring device with anchor shafts is suitable to be embedded into a concrete structure, while the channel anchoring device with steel

base plates is suitable to be welded onto a steel structure, the T-bolts are inserted into a gap between the return legs of two flanges of the channel rail; characterized in that the said channel rail with a hollow interior is an anchor channel, preferably manufactured from hot-rolled steel or steel material by the process of hot rolling; the
5 said flanges of two legs of anchor channel are separated from each other, the width of the gap is slightly larger than the diameter of the shank of inserted T-bolt, and the head of T-bolt is locked within the flanges of two legs of anchor channel; on the inner surface of the said flanges of two legs of anchor channel, continuously outspread serrations are arranged respectively; on the lower surface of the said head of T-bolt,
10 continuously outspread serrations are arranged; the serrations of T-bolt head connect with the serrations on the flanges of two legs of anchor channel in an engaged lock.

Preferably the anchor shaft is attached to the anchor channel has a smooth shaft shank, a shaft base and a shaft head, the shaft head is a protruded one in the shape of disc, whose area is larger than that of the shaft base.

15 Preferably the base of anchor shaft is welded to install onto the web of anchor channel, namely the base is installed onto the exterior face of the web of anchor channel by means of electric arc fusion welding firstly, then the rim of base is attached to the wall of anchor channel by means of fillet welding.

Preferably the base plates attached to the anchor channel are in the form of
20 square or rectangle.

Preferably the base plates can be attached to the anchor-channel with hot rivets.

Preferably the head of T-bolt is a bolt head in the form of parallelogram, the serrations are respectively arranged on the lower surface of two shorter side portions of the bolt head.

25 Preferably the serrations of T-bolt head enjoy the same size and tooth space with the serrations on the return legs of two flanges of the anchor channel.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the present invention will be explained in further detail below by way of examples and with reference to the accompanying drawings,
30 in which:-

FIG. 1 is the side view of an embodiment of a channel anchoring device according to the present invention.

FIG. 2 is the cross sectional view of C-C in FIG. 1.

FIG. 3 is the side view of one embodiment of the channel rail of the anchoring device applicable to the first and second aspects of the present invention;

FIG. 4 is the cross sectional view of A-A in FIG. 3

FIG. 5 is the cross sectional view of B-B in FIG. 3.

FIG. 6 is the structural view of the T-bolt of the channel anchoring device in FIG. 1.

FIG. 7 is the top view of the T-bolt showed in FIG. 6.

FIG. 8 is the detailed structural view of the T-bolt with serrations in FIG. 6.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Fig. 1 and Fig. 2, there is shown an exemplary embodiment of a channel anchoring device according to the present invention. The channel anchoring device 100 includes a generally elongate channel rail 110 and a generally elongate fixation member 120. The fixation member 120 is abutted against the channel rail 110 so that the two form a unitary structure that forms the anchoring device 100. The channel rail 110 and fixation member 120 are joined by a series of rivets 130, which extend longitudinally along the length of the anchoring device 100. A plurality of apertures 140 extend through the channel rail 110 and a complimentary series of apertures 150 extend through the fixation member, the apertures providing passage for the rivets 130 to extend therethrough.

The apertures 150 of the fixation member 130 may be countable, countersunk or the like so as to allow the rivets 130 to be contained therein upon being forged, so as to provide a surface of the fixation member which is free of protrusions from the rivets 130, which allows for the anchoring device to be abutted against a metallic structure 160 to which it is to be attached.

The anchoring device 100 is fixed to the metallic structure 160 by welds 170 as depicted in Fig. 2. The welds 170, are implemented on-site when the anchoring device is implemented within the application as desired or required. As is known and

will be appreciated by those skilled in the art, anchoring devices 100 as in the present invention must withstand large tensile and sheer loads experienced due to loads placed upon the construction elements for which the anchoring devices 100 must secure to a structure.

5 Various building and construction codes exist throughout the world, and these must be vigorously complied with when providing and utilizing anchoring devices due to safety requirements. Non-compliance and failure of such devices may result in loss of lift and loss or damage to property, both of which have significant adverse effects and are considered unacceptable.

10 The anchoring device 100 must secure the structural elements, securely and in the manner in which the structural elements are secured channel rail 110 of the anchoring device 100 is described further below in detail with respect to Figs. 3-8. However, as is known by those skilled in the art, channel rails in the present technical field must not be affected by any factors which may compromise their structural or
15 strength integrity, due to the consequences as recited above.

 The present invention, by providing a fixation member 120 which is formed and provided separately from the channel rail 110 provides for removing heat concentration during the welding process, thus substantially ameliorating any heat effect from welding which may compromise the integrity of the rail channel 110.

20 Very high tensile loads are placed upon the channel rail 110 in practice, as will be appreciated and known by those skilled in the art, and it is paramount to not affect the structural properties of the channel rail 110 during the fixation process.

 Further, by using a riveting process which may be a hot rivet process, the present invention provides a readily formable anchoring device which overcomes the
25 problem of heat damage to the channel rail 110 whilst allowing for ease of manufacture and formation of the anchoring device 100.

 Those skilled in the art will appreciate that formation and manufacture of a channel rail 100 which is suitably sized, toleranced, and includes the requisite features so as to secure construction elements to a structure is of high position, and such
30 devices are typically formed by a hot rolling process wherein the manufacturing process has been optimized so as to provide and produce a suitable channel rail. As those will also be appreciated, by welding such a channel rail directly to a metallic

structure apply excess heat to the channel rail which will affect the pre-defined mechanical and structural properties of that channel rail.

Thus, by providing a fixation member 120 as in the present invention, the anchoring device 100 allows the utilization of a channel rail 110 in conjunction with a metallic structure, such as an I-beam or RSJ type structure, those of which are prevalent in the construction industry.

Thus, the present invention allows implementation of channel rails in such applications, so as to allow construction elements, such as curtain walls, to be implemented in the construction industry, whilst not compromising upon structural integrity or human and property safety.

Furthermore, those skilled in the art will appreciate that by providing a series of rivet-type engagement mechanisms between the channel rail 110 and the fixation member 120, would not adversely affect production costs or time, as such a process may be easily automated, and not impact upon production or delivery time.

Those skilled in the art will also appreciate that although a single series of rivets has been used to engage the channel rail 110 with the fixation member 120, other arrangements or even fixation members may be implemented, without departing from the scope of the invention. Furthermore, those skilled in the art will appreciate that when implementing such a rivet arrangement, it is necessary to provide rivets formed from an appropriate material such as steel which are also appropriately sized so as to maintain the load requirements as experienced by a anchoring device 100 in typical and adverse industrial applications. For example, such rivets may have a diameter in typical applications of 8-10 kilometres and be utilized in a countersunk process.

Referring now to FIG 3. to FIG. 8, one a channel rail 110 which may be implemented in the anchoring device 100 of the present invention is depicted. It should be understood and noted that although the channel rail is depicted in reference to being used in conjunction with members which allow embedding in concrete in other construction applications in accordance with other aspects of the present invention, the features of the channel rail are equally applicable to the embodiment of the first aspect as depicted in reference to FIG 1 and 2, and no limitations should be inferred by the depiction of the members for embedding on concrete.

The channel rail 110 is a channel rail 110 with a hollow interior, which is made from hot rolled steel or stainless steel material by the process of hot-rolling. The two flanges 13 of the anchor channel 110 are separated from each other, and the T-bolt 5 is inserted into the gap 11 between two flanges 13 of the anchor channel 110, the width of the said gap 11 is slightly larger than the diameter of the shank of inserted T-bolt 5, the head of T-bolt 5 is locked within the return legs 13 of two flanges of the anchor channel 1.

On the inner surface of the two flanges 13 of the anchor channel 110 are laterally extending serrations 14 which are arranged in a series longitudinally along the length of the channel rail 110. The serrations in this embodiment which form the toothed surfaces 15.

Referring to FIG. 7 and FIG. 8 specifically, on the lower surface of the head of T-bolt 5, continuously outspread serrations 52 are also arranged; the serrations 52 of T-bolt 5 head enjoy the same size and tooth space with the serrations 14 on the flanges 13 of two legs of the channel rail 110. The serrations 52 of T-bolt 5 head connect with the serrations 14 on the flanges 13 of two legs of the anchor channel 1 in the engaged lock.

Referring to FIG. 5, the head of T-bolt 5 is a bolt head 51 in the form of parallelogram, the serrations 52 are respectively arranged on the lower surface of two shorter side portions of the bolt head 51. The head 51 of T-bolt 5 is designed as parallelogram, so that the T-bolt 5 can be turned easily after it has been inserted into the gap 11 of the anchor channel 1, thus the serrations 52 on the head 51 of T-bolt 5 can be engaged to lock onto the serrations 14 of the return legs 13 of two flanges of the anchor channel 1. When the T-bolt 5 is locked onto the anchor channel 1, nuts can be used to screw it down after another element has been attached with the bolt (Not shown). Therefore, the T-bolt 5 is completely locked by both the serrations 14 on the anchor channel 1 and the serrations 52 on the bolt head 51, which will not be slid towards any directions under the permitted working load.

Referring to FIG. 3 to FIG. 5 the anchor shaft 2 attached to the anchor channel 1 having smooth shaft shank 22, shaft base 21 and shaft head 23, the shaft head 23 is a protruded one in the shape of disc, whose area is larger than the area of shaft base 21.

The base 21 of anchor shaft 2 is welded to install on the web 12 of the anchor channel 1, namely the base 21 is installed onto the wall 12 of the anchor channel 1 by means of electric arc fusion welding 4, then the rim of shaft base 21 is attached to the wall 12 of the anchor channel 1 by means of fillet welding 3, namely the fillet welding 3 is performed around the rim of shaft base 21. Thus, the anchor shaft 2 can be installed on the anchor channel 1 firmly through said twice welding, to secure the safety sufficiently. This dual-weld configuration increases the factor of safety and provides significant advantages. It must be understood that in accordance with this aspect of the invention, the fusion weld is first effect, which is then followed by the fillet weld. This is a commercially advantageous process from a manufacturing standpoint. Further, by having more than twice the factor of safety as a single weld, safety has been assured. Further, the fillet weld protects the fusion weld from oxidation and environmental factors. Also, the combination of welds increases both the tensile load and shear load capabilities.

Accordingly, for the common skilled technician in the art, it is to be understood that the said embodiments have been described only for the present invention and not for purposes of limitation on the present invention. Within the actual spirit and scope of the invention, any variation for the embodiment in the form and details that will be subject to the range of the invention claims. Therefore, the invention is limited only by the appended claims.

While the present invention has been explained by reference to the examples or preferred embodiments described above, it will be appreciated that those are examples to assist understanding of the present invention and are not meant to be restrictive. Variations or modifications which are obvious or trivial to persons skilled in the art, as well as improvements made thereon, should be considered as equivalents of this invention.

CLAIMS

1. A channel anchoring device having predetermined structural properties, for securing construction elements to a metallic structure, the anchoring device comprising: a generally elongate metallic channel rail having an engagement surface for engagement with a fastener, the fastener providing fixation of a construction element to the channel rail; a generally elongate metallic fixation member abutted against and engaged with said channel rail, said fixation member being formed from a material suitable for allowing welded fixation of the anchoring device to a structure; characterised in that the fixation member and the channel rail are engaged by a riveting process such that the predetermined structural properties of the channel rail are not altered by heat generated during the riveting process; and the fixation member is sized such that the predetermined structural properties of the channel rail are not altered by heat generated from welding of the anchoring device via the fixation member to a structure.
2. A device according to claim 1, wherein the fixation member is engaged with the channel rail by a plurality of rivet members extending through the fixation member and through at least a portion of the channel rail
3. A device according to claim 1, wherein the channel rail is of a hollow "C" cross section having a pair inwardly opposed flanges, said flange being separated so as to allow passage of the shank of a fastener therebetween, said fastener having a head of size greater than the shank and sized so as to be disposed within the channel and adapted to abut with engagement surfaces located adjacent the flanges upon being urged against the engagement surfaces upon application of tension to the fastener
4. A device according to claim 1, claim 2 or claim 3, wherein the channel rail is formed from hot-rolled steel or steel material by a hot rolling process.
5. A device according to any one of them proceeding claims, wherein the fixation member is formed from hot-rolled steel or steel material by a hot rolling process.
6. A device according to any one of the preceding claims, wherein the engagement surfaces of the flanges includes a plurality of laterally disposed serrations, said plurality of serration extending longitudinally along the length of the channel rail.
7. A device according to claim 5, wherein the fastener is a T-bolt, and the head of T-bolt includes serration adapted for cooperative and complimentary engagement with the serrations of the flanges.
8. A device according to claim 6, wherein the width of the head of the T-bolt is greater than the internal width of the channel rail, so as to prevent continuous rotation of the T-bolt about its axis.
9. A device according to any one of the preceding claims, wherein the fixation process is a hot riveting process.
10. A device according to any one of the preceding claims, wherein the channel rail and fixation member each have a corresponding series of apertures extending therethrough, so as to allow passage of the rivets therethrough, at least the apertures of fixation member including a rebated portion to allow a portion of the rivets when forged to be located therein.
11. A device according to claim 10, wherein the rebates is a countersunk or counterbore section.
12. A channel anchoring device for construction industry, which comprises a channel rail with a hollow interior and a T-bolt, anchor shafts or steel base plates attached onto the exterior surface of the web of the channel rail, the channel anchoring device with anchor shafts is suitable to be embedded into a concrete structure, while the channel anchoring device with steel base plates is suitable to be welded onto a steel structure, the T-bolts are inserted into a gap between the return legs of two flanges of the channel rail; characterized in that the said channel rail with a hollow interior is an anchor channel, preferably manufactured from hot-rolled steel or steel material by the process of hot rolling;

the said flanges of two legs of anchor channel are separated from each other, the width of the gap is slightly larger than the diameter of the shank of inserted T-bolt, and the head of T-bolt is locked within the flanges of two legs of anchor channel;

on the inner surface of the said flanges of two legs of anchor channel, continuously outspread serrations are arranged respectively;

on the lower surface of the said head of T-bolt, continuously outspread serrations are arranged; the serrations of T-bolt head connect with the serrations on the flanges of two legs of anchor channel in an engaged lock, & the said base plates are attached to the anchor-channel with hot rivets.

13. The channel anchoring device for construction industry according to claim 12, characterized that the said anchor shaft attached to the anchor channel has a smooth shaft shank, a shaft base and a shaft head, the shaft head is a protruded one in the shape of disc, whose area is larger than that of the shaft base.

14. The channel anchoring device for construction industry according to claim 11, claim 13 or claim 12, characterized that the said base of anchor shaft is welded to install onto the web of anchor channel, namely the base is installed onto the exterior face of the web of anchor channel by means of electric arc fusion welding firstly, then the rim of base is attached to the wall of anchor channel by means of fillet welding.

15. The channel anchoring device for construction industry according to any one of claims 12 to 14, characterized that the said base plates attached to the anchor channel are in the form of square or rectangle.

16. The channel anchoring device for construction industry according to any one of claims 12 to 15, characterized that the said head of T-bolt is a bolt head in the form of parallelogram, the serrations are respectively arranged on the lower surface of two shorter side portions of the bolt head.

17. The channel anchoring device for construction industry according to any one of claims 12 to 16, characterized that the serrations of T-bolt head enjoy the same size and tooth space with the serrations on the return legs of two flanges of the anchor channel.