

A CONNECTOR

Field of the Invention

5 The present invention relates generally to connectors and methods of using such connectors.

In one form, the present invention relates to connectors for use in the building industry for connecting one building item to another building item within a building during construction and/or renovation of the building.

10 In one form, the present invention relates to connectors for use in connecting a building cover item, such as for example, a cladding panel, to a suitable support member, such as for example, a frame member to more or less permanently attach the building cover item to the support member.

15 In one form, the present invention relates to a connector which requires the use of a separate fastener or integral fastener, or fastening element, to attach the connector securely to a support member before the building cover panel or similar, is mounted or attached to the connector and hence to the support member during construction and/or renovation of the building.

20 In one form, the connector of the present invention is a top hat section for securing cladding, typically in the form of panels or sheets, to one or more studs of a stud type wall, during construction and/or renovation of a building.

25 Although the present invention will be described with particular reference to one or other forms of a connector, typically in the form of a top hat connector or section for use as a fixing fitting for securing panels to the studs of a stud wall, it is to be noted that the scope of the present invention is not restricted to the described embodiment(s), but rather the scope of the invention is more extensive so as to include other forms and arrangements of the connector or fixing fitting and to the use of the various forms of the connectors in applications other than specifically described.

Background

30 Modern building methods increasingly use preformed or prefabricated components, such as for example, preformed panels which are attached or mounted on or to individual supporting members such as for example, the studs of a stud wall or similar frame members of a building being constructed or during renovation. One device which is used to permanently attach the preformed panels to the studs of a stud wall structure is a connector
35 known as a top hat section. One definition of a top hat section includes the following: a structural sheet metal member of a generally U-section but incorporating flanges extending

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outwardly from the sides of the U-section for securing the section to a flat mating panel such as for example, by welding or assembling. Other descriptions of a top hat section are possible.

Although top hat section fixing fittings or connectors have a variety of different
5 forms, almost all currently available forms suffer from one or other shortcoming or disadvantage which prevents their efficient use. Top hat sections are usually provided in the form of elongate lengths so that each length can be used to attach more than a single building panel collectively to the individual studs of a stud wall.

One problem of existing top hat fixing lengths or sections is that the lengths are
10 difficult to align in the correct position for attaching the top hat sections to the upright support members or frame elements, including studs, due to the length of the top hat sections, which can extend for a metre or more. Currently the top hat section needs to be held with one hand in the approximately correct position and a suitable fastener, such as a screw or similar, driven through the thickness of the flange or flanges of the top hat section to
15 embeddingly engage with the structural member or stud on the other side of the flange to attach the top hat section in position against the stud, which requires each fastener to pass entirely through the thickness of the flange and to be embedded within the structural member to a distance to ensure secure attachment. Not only does the length of the top hat sections have to be held in place by hand, but the fastener, typically in the form of a
20 specialised fastener, such as a self tapping or self drilling screw or similar, needs to be held against the smooth surface of the flange of the connector with the same hand as the hand holding the fixing length in place to enable the tool used to drive the self tapping screw, usually a power drill or similar, to be held in the other hand for contacting the head of the screw to drive the screw through the thickness of the flange into the stud.

Often rotatingly driving the head of the screw by the power drill causes the point of
25 the screw to be deflected away from the smooth surface of the metal flange, often to such an extent that the screw dislodges entirely from contact with the top hat section resulting in the screw falling ultimately to the ground where it is discarded, thus preventing the individual screw from being driven through the connector into the support member, or deflecting the
30 screw to such an extent that the screw may be damaged and is unable to be driven perpendicularly to the plane of the flange, so that the screw is either wasted as it is replaced by a new screw, or the screw enters the stud behind the flange askew at an angle other than being perpendicular, which reduces the holding power of the screw as often the screw is prevented from being driven home fully against the surface of the connector.

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Therefore, there is a need for a top hat section or fixing length which allows suitable fasteners to be more readily driven through the connector to more accurately and/or efficiently attach the top hat section to the structural building component.

5 Additionally, there is a need for a top hat section or fixing length that allows a suitable fastener to be driven through the flange of the top hat section in a desirable direction of entry or trajectory to increase the holding power of the fastener.

10 Another shortcoming of existing top hat section fixing lengths is that the screw or other fastener being driven through the flange of the top hat fixing length often contacts the sloping wall at the side of the central raised portion of the top hat section as it is being rotatingly driven, particularly the head of the fastener, such as the enlarged head of a self tapping screw fastener, to contact the sloping or tapered side wall of the raised portion of the connector, which again deflects the screw from the correct angle of entry into the stud or other support member. The premature contact of the edge of the enlarged head of the screw against the sloping or tapered side wall of the top hat fixing length often prevents the
15 screw from being driven home fully since the undersurface of the rim of the head of the screw does not firmly contact the outer surface of the flange but rather contacts the tapering side of the wall or web of the top hat section so that the fixing of the top hat to the stud by that screw is not secure, but rather is loose allowing the top hat section to move away from the stud or support member, albeit a small amount, thereby reducing the effectiveness of the top hat section. Therefore, there is a need for an arrangement for more accurately locating the fastener with respect to the top hat section to facilitate secure attachment of the top hat section to the support member. Additionally, there is a need for a top hat section which allows a fastener to be more accurately located with respect to the top hat section to secure the top hat section to the stud or support member.

25 Accordingly, it is an aim of the present invention to provide a top hat section of a suitable length which has provision for accurately locating a fastener which respect to the top hat section so that the fastener does not contact the tapered or sloping side wall portion or part of the sloping wall of the raised central portion of the top hat section fixing strip.

30 Accordingly, it is an aim of the present invention to provide a top hat section which is less wasteful of fasteners by increasing the efficiency of use of the fasteners to secure the top hat section to a support.

Accordingly, it is an aim of the present invention to provide a top hat section which requires less time to install than previously available sections.

35 Accordingly, it is an aim of the present invention to provide a top hat section for use in accurately determining the angle of entry of the fastener with respect to the top hat section.

Accordingly, it is an aim of the present invention to provide a top hat section connector that is provided with a guide for guiding movement of a fastener through the top hat section.

5 It is to be noted that not all forms of the connector, typically in the form of a top hat section, will satisfy all aims of the invention, one form may satisfy one aim, whereas another form may satisfy another aim. Some forms may satisfy two or more aims.

Summary of the Invention

10 According to one form of the present invention, there is provided an elongate connector for use in attaching a first building item to a second building item comprising a main body portion extending lengthwise along the longitudinal axis of the elongate connector, the main body portion having a first side portion on a first side, and a second side portion, on a second side of the main body portion,

15 the first side portion extending along the first side of the main body portion, and the second side portion extending along the second side of the main body portion, said main body portion being located intermediate of, or offset from, the two lengthwise extending side portions, wherein at least one of the first or second side portions is provided with a guide for use in locating the position of, and/or for guiding movement of a fastener for attaching the connector to the second building item.

20 According to one form of the present invention, there is provided a method of securely attaching an elongate connector to a building item, in which said elongate connector has a main body portion extending lengthwise along the longitudinal axis of the connector, the main body portion having a first side portion on a first side and a second side portion on a second side of the main body portion, the first side portion extending along the 25 first side of the main body portion, and the second side portion extending along the second side of the main body portion, said main body portion being located intermediate of, or offset from, the two lengthwise extending side portions, wherein at least one of the first or second side portions is provided with a guide for locating and/or for guiding movement of a fastener for attaching the elongate connector to the building item, the method comprising the steps of 30 locating the connector with respect to the building item, locating the fastener with respect to the guide and driving the fastener into the building item using the guide to position the fastener and/or to guide movement of the fastener to securely attach the connector to the building item.

35 According to one form of the present invention, there is provided a building having a plurality of first building items securely attached to a plurality of second building items by a multitude of elongate connectors in which at least one of the plurality of elongate connectors

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comprises a main body portion extending lengthwise along the longitudinal axis of the elongate connector, the main body portion having a first side portion located to one side of the connector, and a second side portion located to a second side of the main body portion,

5 said main body portion being located intermediate of, or offset from, the first and second lengthwise extending side portions,

 wherein at least one of the first or second side portions is provided with a guide for locating and/or for guiding movement of a fastener for attaching the connector to the second building item.

10 According to one form of the present invention, there is provided a method of constructing a building using elongate connectors to connect a plurality of first building items to a plurality of second building items in which the elongate connectors comprise a main body portion extending lengthwise along the longitudinal axis of the elongate connector, the main body portion having a first side portion on a first side and a second side portion on a second side of the main body portion,

15 the first side portion extending along the first side of the main body portion, and the second side portion extending along the second side of the main portion, said main body portion being located intermediate of, or offset from, the two lengthwise extending side portions,

20 wherein at least one of the first or second side portions is provided with a guide for locating and/or for guiding movement of a fastener for attaching the elongate connector to the second building item, the method comprising the steps of locating the connector with respect to the second building item, locating the fastener with respect to the guide of the connector, driving the fastener into the second building item using the guide to position the fastener and/or to guide movement of the fastener with respect to the connector, to securely
25 attach the connector to the second building item, and mounting the first building item on the connector to attach the first building item to the second building item.

Brief Description

30 One form of the first building item is a building cover item, assembly, member or element. One form of the cover item includes a panel, a partition, a sheet, a board, cladding, a preformed or prefabricated panel, or the like.

 In one form, the first building panel is a masonry product in the form of a panel, typically an aerated building panel, and more typically an autoclaved aerated concrete panel (AAC panel). A particularly preferred form of the first building item is an AAC panel
35 manufactured by CSR Building Products Limited under the name of HEBEL®.

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One form of the second building item is a support or structural member or element, including a frame member, an upright support member in the form of a post, stud, channel section, framework element, support channel, pole, upright, or the like.

In one form, the connector is one type of fixer or fixing fitting. Typically, the
5 connector is an elongate length, such as for example, an elongate length or strip of metal. In one form, the connector can be of any suitable length or width and have any suitable size, profile, shape, cross-section or similar. In one form, the connector is of constant cross-section, or of variable cross-section or has a substantially regularly repeating cross-section of different shaped sectors, segments or the like. Preferably, the connector is a top hat
10 section having a fixed cross-section throughout its length.

In one form, the top hat section is an elongate fixing length having a centrally located body portion located intermediate two side portions in which one side portion is located on one side of the central body portion and the other side portion is located on the other side of the central body portion. In one form, the side portion includes a wall portion,
15 preferably an inclined wall portion. Preferably each side portion has an inclined wall portion. Additionally, each side portion has an extension portion in the form of a flange extending outwardly from either side of the connector.

In another form, the side portion includes a wall portion and an extension portion. In one form, the extension portion is a flange.

20 One form of the top hat section is planar in which the centrally located body portion or section is in the same plane as or is coplanar with the two extension portions. One form of the top hat section has the central body portion or section out of the plane of the two side portions, preferably the central portion is raised with respect to the side portions so as to have a substantially inverted distorted U-shaped profile or cross-section provided with
25 outwardly extending extensions, typically in the form of leg extensions, preferably flanges.

In one form, the top hat section has a substantially flat top section or shelf centrally located, typically between each side portion, in which each side portion includes a wall, either a straight wall or an inclined wall, a tapering wall, a sloping wall or similar.

In one form, the wall portion is straight, such as for example, substantially
30 rectilinear, typically, perpendicular, to the flat top section or shelf, and, more typically, perpendicular to the flanges when the top section is in parallel relationship to the flanges.

In one form, the side wall is a tapering wall or inclined wall, preferably a wall tapering outwards in the direction from the top flat section to the flanges. Tapering walls allow individual lengths of top hat sections, to be stacked or nested one above the other to
35 facilitate transportation and/or storage of the sections or lengths.

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In one form, the main body portion of the elongate connector is centrally or symmetrically located intermediate the two side portions. Alternatively, the main body portion may be located off-centre or off-set from the centre line along the longitudinal medial axis of the elongate connector, such as for example, off-set between the flanges or the like
5 so that the side portion on one side has a different width to the side portion on the other side of the main body section, i.e. the connector is asymmetrical about the central or median longitudinal or lengthwise extending axis.

In one form, the guide is located in the extension portion, preferably in the flange. It is to be noted that the guide provided on the top hat section can have any suitable or
10 convenient form.

One form of the guide is a perforation or aperture, typically a multitude of perforations or apertures located along at least one of the extension portions of the top hat fixing length, preferably along one of the flanges of the top hat section, and more preferably along both flanges of the top hat section. The perforation can have any form, such as a
15 hole, slot, or similar.

One form of the guide includes a groove, crack, score, slit, channel, flute, elongate notch, corrugate, indentation, line of weakness, a reduced thickness line, or similar located on one or both side extension portions of the top hat section, preferably along both flanges.

In one form, the guide can be a segmented array of discrete slots, grooves,
20 channels, indentations or the like.

In one form, the guides are in the form of perforations or apertures which are located in spaced apart relationship to one another. Preferably the perforations in spaced apart relationship extend from, at or towards one end of the top hat section along the entire length of the top hat section to, at or towards the other end of the top hat section.

25 In one form, the spacing of the guides, preferably the spacing of the apertures or perforations is a regular spacing. In other forms, the spacing of the guides, preferably the apertures or perforations, is irregular, variable, random, arranged in segments or sectors, or in repeating units or patterns, such as for example, repeating units of two or more sets of spacings, including regions of no perforations separating other regions having perforations
30 or similar.

In one form, the spacing apart of the individual guides, typically in the form of the apertures or perforations is in accordance with the width of the support member to which the elongate fixer is to be attached, or is in accordance with the spacing apart of the individual support members.

35 In one form, there is a single continuous groove, slit, channel, line of indentation, notch or similar located on one side portion, typically the extension, whereas in other forms,

there are two or more slits, channels, grooves, notches or similar in spaced apart relationship to one another, such as for example, two spaced apart parallel grooves or similar either on one side or on both sides of the top hat connector. The grooves may have a constant width or variable widths, including different widths. In one form, the guide is in the plane of the flange or in another form, is out of the plane of the flange.

It is to be noted that the guide can have any suitable form or be of any suitable type to assist in accurately aligning the fastener.

Typically, the second building item is a support member. More typically, the support member is a stud forming part of a wall frame such as for example, a stud wall or similar. More typically, the stud is made from, wood, metal, engineered timber or other suitable material including plastics, composites, laminates or the like.

Preferably, the spacing apart of adjacent perforations or apertures along the flange or flanges of the top hat section is such that there are about three to four adjacent apertures corresponding to the width of the individual studs forming the stud wall. Preferably, a fastener is received through at least one of the apertures, more preferably all of the apertures, to attach the top hat section to the stud. More typically, more than one aperture or perforation is in register with an individual stud when the top hat section is placed against the stud. Preferably, each of the perforations in register with the stud is able to receive a suitable fastener therethrough for attaching the top hat section length to the same stud.

In one form, the guide in the form of the apertures or perforations is used to accurately locate the position of the fastener with respect to the top hat section.

In one form, the guide is located in or on the flange intermediate one edge of the flange, and the wall portion of the side portion having the guide for locating and/or guiding movement of the fastener to securely attach the elongate connector to one of the building items.

Typically, the guide is located intermediate of the wall of the side portion and the edge of the side portion.

More typically, the guide is located intermediate one edge of the side portion having the guide, and the wall of the side having the guide, said guide for locating and/or for guiding movement of the fastener to securely attach the elongate connector to the second building item during construction and/or renovation of the building.

Typically, the guide also guides the angle of entry of the fastener into the stud or other frame element or support member, so as to guide the direction of movement of the fastener so as to more or less centrally locate the fastener on the flange of the top hat section so that the rim of the head of the fastener is clear of the wall of the central body portion, typically clear of the tapered wall, and is clear of the edge of the flange on that side

of the top hat section, typically clear of a strengthener located at or along the outboard side of the flange (to be described later) so as to securely affix the top hat section to the stud or similar by the undersurface of the head of the fastener abutting against the outer surface of the flange around the individual aperture or perforation to securely attach the flange to the stud, and hence the connector to the stud.

In one form, the shape of the guide, typically in the form of an aperture or perforation, is circular, round or the like, or the aperture or perforation can have any suitable shape, such as triangular, a quadrilateral shape, an elongate slot or piercing, elliptical, or any other suitable or convenient shape to receive the tapered end or tip of the fastener.

In one form, the guides are arranged in pairs on either side of the top hat section. In one form, each one of the guides forming a single pair of guides is in alignment or register with one another. In one form, the guides are located off-set or staggered with respect to each other so that the individual apertures forming a nominal pair of apertures are off-set with respect to one another.

In one form of the top hat section, the guides in the form of perforations have a spacing about 10mm apart taken from the respective centres of adjacent perforations.

The spacing of the guides can vary from being about 3mm apart to about 50mm apart, including any value in between these limits, such as for example, from 5mm to 20mm, preferably 10mm apart.

The length of the top hat section can be any suitable, desirable or convenient length, and can extend for more than about 2 metres.

The width of the top section or raised section or top shelf of the top hat section can range from about 100mm to about 300mm, with typical widths being from about 120mm to about 160mm, preferably from 125mm to 146mm and the like.

The size of the perforations of the top hat section, if provided, can range from about 0.5mm to about 5mm, typically about 1mm or similar.

In forms of the top hat section having a raised main body portion located intermediate two side portions, the height of the main body portion can range from about 10mm to about 150mm, with respect to the side portions, particularly the flanges of the side portions, typically from about 20mm, to about 130mm, preferably about 24mm, 35mm, 70mm, 125mm or other, with respect to the side portions, particularly the flanges of the side portions.

The thickness of the top hat section can vary from about 0.2mm to about 3mm, typically from about 0.30mm to about 1.50mm, preferably from about 0.4mm to about 1.20mm, including being about 0.42mm, 0.55mm, 0.75mm, 1.15mm or similar.

In one form, the flange is a simple flange having a single section, whereas in other forms, the flange is a compound flange having two or more parts or sections located with respect to each other being a main part which is located more inboard or proximately, and a distal or peripheral part which is located more outboard of the main part at or along the outer edge of the flange.

In one form, the flange is of a compound shape. In one form, the distal edge or peripheral portion of one or both side portions or flanges is provided with a strengthener, typically in the form of a rib or similar extending longitudinally along the length of the connector. One form of the strengthener is formed by folding part of the side edge of the side portion longitudinally to extend along the length of the top hat section, such as the distal portion, with respect to the main part of the flange, such as for example, the edge of the flange is folded over itself so as to form two layers in which one layer is superposed over the other layer so as to form a double thickness edge, or the like to provide increased strength for the top hat section.

In one form, the distal part of the flange is folded at an angle to the main part of the flange, such as for example at right angles to the main part of the flange so as to form an upturned or downturned edge. In one form, the edge of the flange is folded over the flange through an angle of about 180°.

In one form, the edge of one or both flanges is formed as a turnover or foldover. The turn or bend may be a fold up or a fold down at any angle, such as up and partially over, or down and partially under. The bent or folded portion can extend outwardly from the plane of the flange, either upwardly or downwardly. In one form, the folded distal portion extends substantially perpendicularly to the plane of the main part of the flange. In one form, the width of the turnover or foldover at the edge of the flange ranges from about 2mm to about 6mm, preferably from about 2mm to 4mm, depending on the thickness of the flange.

One form of the strengthener is formed integrally within the body of the top hat section or is a separate component added to the top hat section. One form of an integrally formed strengthener is a gusset or similar brace for strengthening the flange. One form of the strengthener is one or more gussets, typically corner gussets or ridges extending along the lengthwise extending axis of the top hat section so as to increase the rigidity of the top hat section. One form of the gusset is formed in the fold of the flange, typically at an edge or corner of the flange, by working or forming the metal of the flange, such as by stamping, bending, folding, pressing, stretching, twisting or similar of the metal of the top hat section, typically using metal pressing machinery or the like. One form of the gusset is a generally triangular shaped groove, insert, rebate, channel or similar having a pair of substantially

triangular shaped walls in face-to-face or opposed relationship to one another to form a gusset with paired flanges.

The gussets or ribs may take or have any suitable or convenient form, and include a fold or similar in the material of the flange.

5 In one form, the strengthener is used as a screw locating point or similar. In one form, the strengthener is the guide.

10 In one form, the guide, typically in the form of apertures or perforations present in one side flange is centrally located between the inner edge of the turnover or foldover and the inboard edge of the flange forming the junction with the sloping or tapered wall of the centrally raised body portion of the top hat section on that side of the top hat section.

One form of the top hat section has an integral fastener or multiplicity of fasteners pre-located in the guides, typically in selected guides. One form of the integral fastener is a screw, typically a self tapping screw or similar.

15 One form of the top hat section is provided with separate fasteners, such as for example, in a separate container or the like.

20 In one form, the fastener is a screw or other suitable fastener. Preferably, the screw is a Tek® screw, a self tapping screw or self drilling screw, a sheet metal screw, hex head screw, such as a Type 17 screw, a hex head Tek® screw, MP Bugle Head Type screw or the like. However, any suitable fastener can be used to securely fix the top hat section in place.

Brief Description of the Drawings

25 One example of a connector in the form of a top hat section will now be described as one illustration of one form of the invention with reference to the accompanying drawings in which:

Figure 1 is a top plan view of a length of one form of a top hat connector,

Figure 2 is a transverse cross-section through the line 2-2 of Figure 1.

Figure 3 is a perspective view of the connector of Figures 1 and 2 showing part of the flange enlarged.

30 Figure 4 is a perspective view of another form of a connector showing part of the flange enlarged.

Figure 5 is a perspective view of another form of a connector showing part of the flange enlarged.

35 Figure 6 is a perspective view of another form of a connector showing part of the flange enlarged.

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Figure 7a is a schematic top perspective view of one form of a strengthener in the form of a gusset viewed from above.

Figure 7b is a schematic underneath perspective view of the form of the strengthener of Figure 7a viewed from below.

Figure 8 is a schematic cross-section showing the location of one fastener positioned so that the head of the fastener is clear of the strengthener at the side of the connector and clear of the tapering side wall.

Detailed Description of an Embodiment

The figures of the accompanying drawings illustrate different forms of the connector in the form of top hat sections for securely connecting a building panel, cladding or similar to a suitable support, such as a frame member.

One form of the connector, generally denoted as 10, is shown in Figures 1 to 3 and comprises a main body portion 12, having a centrally located flat top section or shelf 14, spanning between a first tapering wall or web 16a, located on one side of the main body portion 12, and a second tapering wall or web 16b, located on the other side of the main body portion 12 so that the outwardly tapering walls are on either side of top section 12 so as to be in a substantially inverted U-shape with the side walls tapering outwardly from the top section in the direction away from the centre line of the top section. A first extension portion forming part of a first side portion, in the form of a flange 18a, is located at the base of tapering first wall 16a and extends outwardly from the tapering wall or web 16a. Flange 18a extends the entire length of top hat section 10. A second flange 18b, is located on the other side of top hat section 10 and extends outwardly from the base of second wall section 16b. Flange 18b extends the entire length of the top hat section 10.

Flange 18a is provided with one form of a strengthener, being in the form of a rib 20a, which is formed along the extreme outer edge of flange 18a. In one form, rib 20a is formed by folding over a small distal section of flange 18a along the outer edge of flange 18a so that the distal section is folded over the main part of the flange to be superposed thereover as illustrated more particularly in Figure 1. Rib 20a extends the entire length of flange 18a. In forms of the connector, the width of the foldover rib is from about 1mm to about 1mm, preferably from about 2mm to 6mm, more preferably from about 2mm to 4mm inclusive.

A second strengthener in the form of a second rib 20b, is formed along the outboard edge of second flange 18b by folding over or turning over a section of the outer edge or distal part of flange 18b upon a more proximal section of flange 18b, to form rib 20b

having a thickness double that of the main part of the flange and a width similar to or the same as rib 20a.

It is to be noted that ribs 20a, 20b provide a strengthening element for top hat section 10 on either side thereof. Further, it is to be noted that the strengthener can take
5 any suitable or convenient form.

Another form of the strengthener will now be described with reference to Figure 7(a) and 7(b). The form of the strengthener shown in Figures 7a and 7b, is a substantially triangular shaped gusset generally denoted as 42 having a first wall portion 44 comprising a generally curved wall section 46 extending from the sides of flange 18 and a generally
10 planar substantially triangular flat wall portion 48a, 48b. It is to be noted that flange 18 has two parts being the main flange part 18 and the folded edge part 20.

Curved wall portion 46 extends in a continuous generally elliptically shaped loop around the edge of gusset 42. A generally lengthwise extending U-shaped concave end wall 50 extends obliquely along the inner surface of gusset 42 from one end of elliptical or
15 oval shaped curved wall to the other end of the oval shaped curved wall to form the body of gusset 42. The two substantially triangular planar end walls 48a, 48b are in opposed face-to-face relationship on either side of gusset 42. Gusset 42 provides a brace for the folded part 20 of flange 18 to resist determination of the shape of the flange during use of top hat section 10.

20 Other forms of the strengthener are possible such as any convenient or suitable form.

With particular reference to Figures 2 and 3, top hat section 10 is provided with a guide in the form of a plurality of spaced apart perforations 24. Spaced apart individual perforations 24, are arranged to extend in a line along the centre line of flange 18a in which
25 the individual perforations 24 are located at regularly spaced apart locations along the entire length of top hat section 10 from one end to the other end. However, it is to be noted that the size, shape, spacing and type of perforation can be of any suitable or convenient type.

In one form, the profile of the perforations is circular. However, other profiles can include any suitable shape, including square, and rectangular apertures, such as shown
30 more particularly in Figure 4, or similar generally rectilinear shape. However, other shapes are possible, such as slots, ellipses, or other polygonal shapes, including triangular shapes, four sided shapes or the like. Additionally, the guide can be in the form of a groove or continuous indentation, trough, slit, notch or similar as denoted by V-shaped notch 30 of Figure 5 or U-shaped notch 32 of Figure 6. It is to be noted that the U-shaped notch 32 of
35 Figure 6 is provided with indentations 34 located at spaced apart locations along the length of notch 32 to act as locating points for the tip of the fasteners. Indentations 34 can have

any suitable or convenient form including perforations, slots, apertures or the like, including perforations through the thickness of the flange, or an indentation of the surface of the flange in the groove.

5 A second set of guides, in the form of spaced apart perforations, is arranged to extend in a second line of perforations 26. The second set of perforations 26, are provided in a line extending along the centre line of second flange 18b on the other side of top hat section 10. The spacing apart of individual perforations of the second line of perforations is the same as the spacing apart of the individual perforations of the first line of perforations so that the perforations appear in opposed pairs of perforations on either side of the top hat
10 section to enable both sides of the top hat section 10 to be attached to the same stud or similar to assist in securely attaching top hat section 10 in place without risk of unwanted or unintended movement. However, the pattern, arrangement or relationship of individual perforations to other perforations can have any suitable or convenient configuration, such as staggered pairs of apertures, off-set pairs of apertures, and similar.

15 Typical sizes of the individual perforations, is about 1mm, such as for example, 1mm in diameter. Typically, the spacing of adjacent perforations in each line of perforations is about 10mm measured from the respective mid-points or centres of two adjacent perforations.

It is to be noted that the size of the perforations can be any suitable or convenient
20 size and also the spacing apart of the perforations can be any suitable spacing.

Typical properties of forms of the top hat section are as follows.

Typical properties and/or characteristics of one or other forms of the top hat section are provided in Tables 1, 2, 3 and 4 included with the present specification. in particular, the tables illustrate the properties of

- 25 (i) one form of a top hat section having a height of 24mm made from different thickness sheets of metal having a rib of a first width, say 2mm,
(ii) another form of a top hat section having a height of 24mm made from different thickness sheets of metal having a rib of a second width, say 4mm,
(iii) a first form of a top hat section having a height of 35mm made from different
30 thickness sheets of metal having a rib of a first width, say 2mm, and
(iv) a second form of a top hat section having a height of 35mm made from different thickness sheets of metal having a rib of a second width, say 4mm.

In operation, a top hat section 10 having two lines of perforations 24, 26 is selected and placed in approximate position against a plurality of upright support members, (not
35 shown), typically in the form of wooden or steel studs or engineer timber studs 60, forming a stud wall with the top hat section 10 in approximate position so that more than a single

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perforation 24, 26 is located in alignment with the same support member 12. A suitable fastener, such as a Tek® screw 62 is selected and placed in a selected one of the perforations 24 to act as a guide for locating the fastener with respect to support member 60 and as a guide for facilitating entry of the fastener into and through the thickness of flange 18 of top hat section 10 and into the substrate of support member 60 against which the top hat section is located. Using a suitable power tool, the Tek® screw 62, is driven into and through the perforation 24 of the flange of the top hat section using the perforation to locate the exact position of the tip of the Tek® screw 62 and to guide movement of the Tek® screw through the flange and into support member 60. In the illustrated form of the top hat section 10 of Figure 8, as perforation 24 is located at the approximate midpoint of the width of flange 18a, the location of the perforation is such so as to guide screw 62 into support element 60 in a direction such that head 64 of the Tek® screw 62 is clear of the base of sloping wall 16a of top hat section 10 on one side of flange 18a and is clear of the inner surface or inboard edge of rib 20a at the outboard side of flange 18a to enable Tek® screw 62 to be driven fully home so that the underside of the rim of head 64 of Tek® screw 62 firmly contacts the surface of flange 18a to securely fasten the flange to support member 60 and accordingly affix the top hat section to the support member, particularly as shown in the enlarged circle of Figure 8. It is to be noted that owing to the central location of the aperture, the location of the screw is guided to the desired position clear of both the sloping wall of the top hat section and the rib of the flange thereby addressing the shortcomings or disadvantage of currently available fixing strips including top hat sections and also contributing to the working of the top hat section of the present invention. Additionally as the tips of the screws are located within the perforations, there is less chance of the screw fastener being deflected off the correct line so that the fastener goes into the support member substantially perpendicular to the plane of the flange having the perforation acting as a guide. Additionally, the perforation allows the point or tip of the screw to contact directly the stud, rather than having to be forced through the thickness of the material of the flange, usually made of metal, which could have deflected, damaged or blunted the tip of the screw, hence resulting in less wastage of screws caused by the screws being deflected by the metal flange until they slip off the flange and fall to the ground.

Advantages of the Present Invention

Advantages of one or other forms of the connectors of the present invention include one or other of the following.

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The guide, particularly in the form of perforations, facilitate ease of use of the connector, such as the top hat section, by facilitating ease of entry of the screw fastener to securely attach the top hat section to the support member.

5 The presence of the guides in the flanges of the top hat section allows lengthwise extending adjustment of the top hat section with respect to the support member.

There is a reduced wastage of fasteners through deflected, damaged or blunted screws that are not or cannot be retrieved from the building site.

The speed of installation of the top hat section, and hence the wall construction is increased by using connectors with guides.

10 The task of installing wall panels, even lightweight wall panels, is a physically demanding job requiring strength and endurance, due to the number of connectors that need to be attached collectively to the support members so that installers tire quickly. The connector of the present invention is less demanding physically owing to the ease at which the fastener can be embedded in the support member to secure the connector in place.

15 The described arrangement has been advanced by explanation and many modifications may be made without departing from the spirit and scope of the invention which includes every novel feature and novel combination of features herein disclosed.

Those skilled in the art will appreciate that the invention described herein is susceptible to variations and modifications other than those specifically described. It is
20 understood that the invention includes all such variations and modifications which fall within the spirit and scope.

TABLE 1

HEBEL 24mm TOP HAT SECTION PROPERTIES				
BASE METAL THICKNESS, BMT	0.42mm	0.55mm	0.75mm	1.15mm
STRESS GRADE	G2	G2	G2	G2
YIELD STRESS, f_y	270 MPa	270 MPa	270 MPa	270 MPa
ELASTIC MODULUS, E_s	2.0×10^5 MPa	2.0×10^5 MPa	2.0×10^5 MPa	2.0×10^5 MPa
SECOND MOMENT OF AREA, I_{xx}	$5.28 \times 10^3 \text{ mm}^4$	$6.85 \times 10^3 \text{ mm}^4$	$9.19 \times 10^3 \text{ mm}^4$	$13.83 \times 10^3 \text{ mm}^4$
SECOND MOMENT OF AREA, I_{yy}	$39.44 \times 10^3 \text{ mm}^4$	$40.23 \times 10^3 \text{ mm}^4$	$55.59 \times 10^3 \text{ mm}^4$	$87.53 \times 10^3 \text{ mm}^4$
TORSION CONSTANT, J	3.1 mm^4	5.9 mm^4	17.6 mm^4	63.4 mm^4
WARPING CONSTANT, I_w	$0.797 \times 10^6 \text{ mm}^6$	$1.059 \times 10^6 \text{ mm}^6$	$1.444 \times 10^6 \text{ mm}^6$	$2.258 \times 10^6 \text{ mm}^6$
FULL SECTION MODULUS, Z_{xx+}	405 mm^3	525 mm^3	704 mm^3	1044 mm^3
FULL SECTION MODULUS, Z_{xx-}	481 mm^3	625 mm^3	839 mm^3	1246 mm^3
FULL SECTION MODULUS, Z_{yy+}	753 mm^3	992 mm^3	1364 mm^3	2127 mm^3
FULL SECTION MODULUS, Z_{yy-}	753 mm^3	992 mm^3	1364 mm^3	2127 mm^3
CROSS SECTIONAL AREA, A	52.52 mm^2	68.88 mm^2	94.09 mm^2	144.9 mm^2
SELF WEIGHT	0.41 kg/m	0.53 kg/m	0.73 kg/m	1.12 kg/m
MATERIAL COATING LEVEL	Z275/Z450	Z275/Z450	Z275/Z450	Z275/Z450

TABLE 2

HEBEL 24mm TOP HAT SECTION PROPERTIES				
BASE METAL THICKNESS, δ_{MT}	0.42mm	0.55mm	0.75mm	1.15mm
STRESS GRADE	G2	G2	G2	G2
YIELD STRESS, f_y	270 MPa	270 MPa	270 MPa	270 MPa
ELASTIC MODULUS, E_s	2.0×10^5 MPa	2.0×10^5 MPa	2.0×10^5 MPa	2.0×10^5 MPa
SECOND MOMENT OF AREA, I_{xx}	5.19×10^3 mm ⁴	6.72×10^3 mm ⁴	9.02×10^3 mm ⁴	13.38×10^3 mm ⁴
SECOND MOMENT OF AREA, I_{yy}	26.78×10^3 mm ⁴	38.03×10^3 mm ⁴	52.55×10^3 mm ⁴	82.76×10^3 mm ⁴
TORSION CONSTANT, J	3.0 mm ⁴	6.8 mm ⁴	17.3 mm ⁴	62.95 mm ⁴
WARPING CONSTANT, I_w	0.713×10^8 mm ⁶	0.939×10^8 mm ⁶	1.292×10^8 mm ⁶	2.022×10^8 mm ⁶
FULL SECTION MODULUS, Z_{xx+}	404 mm ³	523 mm ³	700 mm ³	1038 mm ³
FULL SECTION MODULUS, Z_{xx-}	466 mm ³	603 mm ³	811 mm ³	1204 mm ³
FULL SECTION MODULUS, Z_{yy+}	712 mm ³	962 mm ³	1322 mm ³	2061 mm ³
FULL SECTION MODULUS, Z_{yy-}	712 mm ³	962 mm ³	1322 mm ³	2061 mm ³
CROSS SECTIONAL AREA, A	51.68 mm ²	67.76 mm ²	92.59 mm ²	142.6 mm ²
SELF WEIGHT	0.41 kg/m	0.53 kg/m	0.73 kg/m	1.12 kg/m
MATERIAL COATING LEVEL	Z275/Z450	Z275/Z450	Z275/Z450	Z275/Z450

TABLE 3

HEBEL 35mm TOP HAT SECTION PROPERTIES			
BASE METAL THICKNESS, <i>BMT</i>	0.55mm	0.75mm	1.15mm
STRESS GRADE	G2	G2	G2
YIELD STRESS, <i>f_y</i>	270 MPa	270 MPa	270 MPa
ELASTIC MODULUS, <i>E_s</i>	2.0×10^5 MPa	2.0×10^5 MPa	2.0×10^5 MPa
SECOND MOMENT OF AREA, <i>I_{xx}</i>	$15.75 \times 10^3 \text{ mm}^4$	$21.28 \times 10^3 \text{ mm}^4$	$31.99 \times 10^3 \text{ mm}^4$
SECOND MOMENT OF AREA, <i>I_{yy}</i>	$42.76 \times 10^3 \text{ mm}^4$	$59.07 \times 10^3 \text{ mm}^4$	$92.94 \times 10^3 \text{ mm}^4$
TORSION CONSTANT, <i>J</i>	8.0 mm^4	20.3 mm^4	73.0 mm^4
WARPING CONSTANT, <i>I_w</i>	$2.448 \times 10^6 \text{ mm}^6$	$3.368 \times 10^6 \text{ mm}^6$	$5.265 \times 10^6 \text{ mm}^6$
FULL SECTION MODULUS, <i>Z_{xx+}</i>	847 mm^3	1143 mm^3	1713 mm^3
FULL SECTION MODULUS, <i>Z_{xx-}</i>	960 mm^3	1299 mm^3	1959 mm^3
FULL SECTION MODULUS, <i>Z_{yy+}</i>	1081 mm^3	1486 mm^3	2315 mm^3
FULL SECTION MODULUS, <i>Z_{yy-}</i>	1081 mm^3	1486 mm^3	2315 mm^3
CROSS SECTIONAL AREA, <i>A</i>	79.47 mm^2	108.54 mm^2	166.99 mm^2
SELF WEIGHT	0.62 kg/m	0.85 kg/m	1.30 kg/m
MATERIAL COATING LEVEL	Z275/Z450	Z275/Z450	Z275/Z450

TABLE 4

HEBEL 35mm TOP HAT SECTION PROPERTIES			
BASE METAL THICKNESS, BMT	0.65mm	0.75mm	1.15mm
STRESS GRADE	G32	G32	G32
YIELD STRESS, f_y	270 MPa	270 MPa	270 MPa
ELASTIC MODULUS, E_s	2.0×10^5 MPa	2.0×10^5 MPa	2.0×10^5 MPa
SECOND MOMENT OF AREA, I_{xx}	$16.04 \times 10^3 \text{ mm}^4$	$21.65 \times 10^3 \text{ mm}^4$	$32.66 \times 10^3 \text{ mm}^4$
SECOND MOMENT OF AREA, I_{yy}	$44.96 \times 10^3 \text{ mm}^4$	$62.11 \times 10^3 \text{ mm}^4$	$97.72 \times 10^3 \text{ mm}^4$
TORSION CONSTANT, J	8.1 mm^4	20.6 mm^4	74.0 mm^4
WARPING CONSTANT, I_w	$2.726 \times 10^6 \text{ mm}^6$	$3.746 \times 10^6 \text{ mm}^6$	$5.864 \times 10^6 \text{ mm}^6$
FULL SECTION MODULUS, Z_{xx+}	852 mm^3	1149 mm^3	1724 mm^3
FULL SECTION MODULUS, Z_{xx-}	991 mm^3	1340 mm^3	2019 mm^3
FULL SECTION MODULUS, Z_{yy+}	1109 mm^3	1524 mm^3	2375 mm^3
FULL SECTION MODULUS, Z_{yy-}	1109 mm^3	1524 mm^3	2375 mm^3
CROSS SECTIONAL AREA, A	80.57 mm^2	110.04 mm^2	169.23 mm^2
SELF WEIGHT	0.62 kg/m	0.95 kg/m	1.30 kg/m
MATERIAL COATING LEVEL	Z275/Z450	Z275/Z450	Z275/Z450

CLAIMS:

1. A connector for connection to a building item comprising a centrally located top section, a first side portion located on a first side of the central top section, a second side
5 portion located on a second side of the central top portion,
the first side portion extending along the first side of the connector,
the second side portion extending along the second side of the connector,
the first side portion having a first wall section extending in a first wall plane and a first
flange section extending in a first flange plane, the first wall plane and the first flange plane
10 being angularly inclined to each other,
the second side portion having a second wall section extending in a second wall plane
and a second flange section extending in a second flange plane, the second wall plane and
the second flange plane being angularly inclined to each other,
the first wall section located intermediate the central top section and the first flange
15 section,
the second wall section located intermediate the central top section and the second
flange section, and
a strengthener for enhancing the strength and rigidity of the connector,
wherein at least one of the first or second flange sections includes at least one
20 guide adapted to cooperatively engage with a fastener, the fastener for connecting the
connector to the building item, wherein the guide locates the position of the fastener with
respect to the connector and guides movement of the fastener to connect the connector to
the building item, and
wherein the strengthener is in the form of a folded over or turned over end or strip
25 superposed over either the first flange section or the second flange section.

2. A connector according to claim 1 in which the building item is a support or structural member or element including a frame member, a post, a stud, a channel section, or a pole.

3. A connector according to claim 1 or 2 in which the connector is locatable
5 intermediate the building item and another building item.

4. A connector according to claim 3 in which the other building item is a building cover item, assembly, member or element including a panel, a partition, a sheet, a board, cladding, a slab, a block, a preformed panel or prefabricated panel.

10 5. A connector according to claim 3 or 4 in which the other building item is an aerated autoclaved concrete panel or block, including a lightweight autoclaved aerated concrete panel, block or slab, or including a reinforced autoclaved aerated concrete panel, block or slab.

15 6. A connector according to any one of claims 1 to 5 in which the connector is in the form of a top hat section.

20 7. A connector according to any one of claims 1 to 6 in which the central top section is located symmetrically between the first side section and the second side section, or the central top section is located off-set to one side between the first side section and the second side section so as to be closer to one of the first side section or second side section than the other of the first side section or second side section.

25 8. A connector according to any one of claims 1 to 6 in which the first wall section and/or the second wall section are arranged to extend from the central top section substantially perpendicularly to the central top section.

30 9. A connector according to any one of claims 1 to 6 in which the first wall section and/or the second wall section is tapered to extend from the central top section at an outwardly inclined angle.

10. A connector according to any one of claims 1 to 9 in which the guide is one or more of perforations, apertures, holes, bores, surface discontinuities or surface interruptions to the surface in which the guide is located.

11. A connector according to claim 10 in which the guide is a slot, groove or line located on one of the first or second flange sections or on both the first and second flange sections.

12. A connector according to claim 10 or 11 in which the guide is a groove, slot, channel, indentation, line of weakness, line of reduced thickness, segmented array of discrete slots, grooves, channels, indentations, perforations, apertures or bores.

13. A connector according to any one of claims 10 to 12 in which the guide is in the form of multiple perforations or apertures which are located in aligned spaced apart relationship to one another to extend along the length of at least one of the first flange section or the second flange section, or the first and second flange sections.

14. A connector according to claim 12 or 13 wherein there are two lines of aligned spaced apart apertures or perforations, one line being provided to extend along one flange and the other line being provided to extend along the other flange, wherein the apertures or perforations are located in spaced apart pairs in which one of the pair is located on one flange and the other of the pair is located in the other flange, the pairs being located along the length of the connector from one end to the other end.

15. A connector according to any preceding claim in which the fastener has an operative end and a head located remote from the operative end in which the guide is for guiding the location of the operative end of the fastener for securely attaching the connector to the building item in addition to guiding movement of the fastener during entry into the building item so that the head of the fastener is clear of the wall section of the side section of the connector in which the fastener is located.

16. A connector according to any one of claims 1 to 15 in which the strengthener includes a first strengthener located on the first side portion of the connector and a second strengthener located on the second side portion of the connector in which the first strengthener includes the first flange section and the second strengthener includes the second flange section.

17. A connector according to claim 16 in which the strengthener is located on the connector so that the head of the fastener when received through the aperture of the first flange section of the first side section or the second flange section of the second side section is clear of the strengthener of the connector.

18. A connector according to any preceding claim in which the spacing apart of the individual guides is in the range of about 3mm apart to about 50mm apart, or is in the range of from about 5mm apart to about 20mm apart, or are about 10mm apart.

19. A connector according to any preceding claim in which the size of the guide is in the range from about 0.5mm to about 5mm, or is about 1mm.

20. A connector according to any one of claims 16 to 19 in which the first strengthener includes the first flange section having a first outer edge portion and a first inner body portion, in which the first outer edge portion is superposed on at least a part of the first inner body portion to form the first strengthener, and the second flange section has a second outer edge portion and a second inner body portion wherein the second outer edge portion is superposed on at least a part of the second inner body portion to form the second strengthener.

21. A connector according to any one of claims 16 to 20 in which the strengthener is a rib located at the edge of at least the first flange section or the second flange section or both the first flange section and the second flange section in which the rib has a width in the range from about 2mm to about 10mm, or in the range of from about 2mm to about 6mm, or in the range from about 2mm to 4mm inclusive.

22. A connector according to any one of claims 16 to 21 in which the strengthener is in the form of a gusset.

23. A connector according to any one of claims 16 to 22 in which the fastener is one or more integral fasteners pre-located with respect to the guide within selected ones of the guide.

24. A connector according to any one claims 16 to 23 in which the guide is in the form of an aperture having a round, circular, square, rectangular, elliptical, oval, triangular or other polygonal shape for receiving the fastener therethrough.

25. A connector according to any one of claims 1 to 24 in which the plane of the central top section is substantially parallel to and spaced apart from the plane of the first flange section and from the plane of the second flange section in a first direction and wherein the plane of the first flange section and the plane of the second flange section are substantially in the same plane and spaced apart from each other in a second direction.

26. An elongate connector to connect a first building item to a second building item, the connector comprising a top section, a first side portion located on a first side of the connector, and a second side portion located on a second side of the connector, the top section being located intermediate the first side portion and the second side portion, the first side portion extending along the first side of the connector, and the second side portion extending along the second side of the connector, the first side portion including a first wall section extending in a first wall plane and a first flange section extending in a first flange plane, the first wall plane and the first flange plane being angularly inclined to each other, the plane of the first wall plane being different to the plane of the first flange plane, the first wall section being located intermediate the top section and the first flange section, the second side portion including a second wall section extending in a second wall plane, and a second flange section extending in a second flange plane, the second wall plane and the second flange plane being angularly inclined to each other, the plane of the second wall plane being different to the plane of the second flange plane, the second wall section being located intermediate the top section and the second flange section, the plane of the top section being displaced from the first flange plane and displaced from the second flange plane, wherein the first flange section has a first outer edge portion and a first inner body portion, in which the first outer edge portion is superposed on at least a part of the first inner body portion to form a strengthener to strengthen the connector, or the second flange section has a second outer edge portion and a second inner body portion wherein the second outer edge portion is superposed on at least a part of the second inner body portion to form a strengthener to strengthen the connector or both the first flange section and second flange section have the strengthener, at least one of the first or second flange sections being provided with a guide to locate and guide movement of a fastener to attach the connector to the first building item, wherein the guide is at least one perforation, aperture, hole or bore through which the fastener is received to connect the connector to the second building item.

27. A connector according to claim 26 in which the connector is a top hat connector in which the top section is located symmetrically between the first flange section and the second flange section or the top section is located asymmetrically between the first flange section and the second flange section by being located off-set between the two flange sections so as to be closer to one flange section than the other flange section wherein the guide is a multiplicity of perforations, apertures, holes or bores, located in aligned spaced apart relationship to one another to extend along at least one of the first or second flange sections or along both of the first and second flange sections.

28. A connector according to claim 26 or 27 in which the guide includes a first row of a multiplicity of aligned spaced apart apertures, perforations, holes or bores, and a second row of a multiplicity of aligned spaced apart apertures, perforations, holes or bores, wherein the first row extends along the first flange section and the second row extends along the second flange section, such that the apertures, perforations, holes or bores of the first row and of the second row are located in spaced apart pairs in which one of the spaced apart pair is located on the first flange section and the other of the spaced apart pair is located on the second flange section, the spaced apart pairs being located in substantial alignment with each other in the spaced apart locations along substantially the length of the connector from one end of the connector to the other end of the connector.

29. A connector according to any one of claims 26 to 28 in which the fastener has an operative end for being received in the guide for facilitating movement of the fastener through the connector into the first building item and a head located remote from the operative end for use in forcing the fastener through the connector into the first building item, the guide for guiding the location of the operative end of the fastener for securely attaching the connector to the first building item in addition to guiding movement of the fastener during entry into the body of the first building item, the head of the fastener being clear of the first wall section or the second wall section of the connector on which the fastener is located for attaching the connector to the first building item.

30. A connector according to any one of claims 26 to 29 in which the guide includes individual spaced apart perforations in which the spacing apart of individual spaced apart perforations is in the range of from about 3mm apart to about 50mm apart, or is in the range of preferably from about 5mm apart to about 20mm apart, or is in the range of about 10mm apart, and each perforation has a size in the range from about 0.5mm to about 5mm, or a size of about 1mm.